Condensed in the form of extracts from the book of Antoine Béchamp:

"Microzymas with heterogeny, histogeny, physiology and pathology"

Table des matières

Foreword

The book that I finally decide to release is the fruit of long research, the starting point of which was the study of a very simple chemical fact.

It was announced that pure cane sugar, dissolved in distilled water, inverts over time, even when cold; That is to say that this sugar thus fixed the elements of water to form the 2 glucoses, of unequal rotating powers and in opposite directions, the mixture of which constitutes the inverted sugar.

Chemists knew that the inversion takes place under the influence of strong acids, slowly when cold, almost instantly at a boil. It would have been remarkable that such a profound reaction, which determines a doubling of the sugar molecule, could have taken place without provocative cause. So I repeated the experience. The inversion took place, but at the same time I noticed that there was mold in the solution; I ignored it at first, and published the result as confirmation of the stated fact. However, I had varied the experiment: in one of the solutions I had added zinc chloride, and in another calcium chloride, and the sugar was not inverted.

....

Thinking about it, I came to wonder if the mold might not be the provocative cause of the reaction. It was a ray of light. After a few more or less demonstrative trials, I instituted several series of experiments which lasted from 1856 to the end of 1857. The result was conclusive: the inversion only takes place after the development of the mold. And so it was that pure chemistry research, in itself very simple, became the starting point for physiological studies that occupied me almost continuously for almost thirty years.

The start was therefore modest. Nothing is more ordinary than seeing mold growing in the most diverse solutions, organic or even mineral. If I had stuck to the theories that were accepted among scholars, I would have neglected mold after having, as a faithful historian, noted its presence. It was for not having considered the fact as a fortuitous encounter that it resulted in the discovery of the physiological theory of fermentation and, later, the enunciation of a new doctrine concerning organization and life, of which this book contains the history ...

...

I must not hide it, the fundamental fact on which the new doctrine is based, despite the most irrefutable proofs, the verifications which have gone until the appropriation, is not yet accepted by everyone whose opinions it contradicts. systems and interests;

The guiding idea, moreover, was too much against accepted opinions not to raise objections. I must have neglected nothing: this is above all what obliged me to give the work so much scope.

<updates on priority claims made by Pasteur p.VII to IX>

...

I have said that this book contains the enunciation of a new doctrine concerning organization and life. Isn't that pretentious?

That’s why we have to explain.

<history p.IX - X>

...

It was in this state of science that I began studying the cane sugar reversal. I had taken care to assure myself of the purity of the sugar I was using; I had particularly insisted on the fact that it was devoid of albuminoid matter. So I had nothing in my solutions that could be considered as being capable, by spontaneous alteration, of giving rise to a ferment.

Thus, it is quite certain that in 1854, nothing was known about the function of infusoria molds, nor did we know their origin when they appear in infusions. M. Pasteur had, in 1857, reserved the question of the spontaneous origin of his lactic ferment. So at the same time, I demonstrated that they originate from the germs of the air, that they are ferments, that they secrete a zymase and create the matter of their tissues and their albuminoid matter. But I had in addition made another observation which was fertile in unintended consequences. It is about the discovery of microzymas and hence the nature and function of molecular granulations.

Microzymas or molecular granulations

Under the general name of mold, I understood everything in these solutions that involved the reversal of the sugar and the acidification of these solutions. Now, in a few experiments, where the inversion did occur, I saw only extremely small microscopic forms, unlike anything known among infusoria. These forms, which the Memoir of 1857 designates as small bodies, I considered them as organized, looking at them as ferments. Little by little, I came to compare them with the molecular granulations that M. Berthelot, in his research on alcoholic fermentation, at the same time, had noted without attributing to them a role, considering them as amorphous matter; then finally to all the molecular granulations of the authors, which were specified as animated by Brownian motion ...

In a letter to M. Dumas (September 1865), I even compare the molecular granulations of chalk and milk. Finally, in 1866, in a note on the role of chalk in lactic and butyric fermentations, I called them microzymas.

...

The discovery of microzymas, considered a new category of organized beings, has been fertile in theoretical and practical consequences of considerable importance. It was she who, when I found that the microzymas of chalk, those of milk, as well as those of the atmosphere can, for evolution, to become bacteria, has allowed us, Mr. Estor and me, to demonstrate that the molecular granulations of cells, tissues and humors are, not amorphous, fatty or other granulations, but indeed really living forms and organized. In short, from this simple observation it followed that living organisms, even the highest in the series of beings, conceal life in any part detached from this being.I said that in the past we did not see how it would be possible to experimentally attack the problem of organization and of life. In fact, the living being was conceived as an indivisible whole, all of the parts of which live together as a whole.

After death, everything is supposed to be dead in man; in the animal that has just died, everything is dead.

Not 2 years ago, discussing these questions with an English doctor, I told him about the persistence

of life in the corpse. He smiles significantly! This is the common opinion ...

<development of this common opinion p.XV - XVI>

... The purpose of these lectures is to demonstrate that the vital, irreducible, physiologically indestructible unit of which the cell itself is formed is none other than the microzyma. It is the living form, reduced to its simplest expression, having life in itself, without which life does not manifest itself anywhere .... In short, the microzyma is the living unit per se; and that is what cannot be asserted from the cell.

I did not manage to conceive of this idea at the outset, which flow from the facts as from a clear source; the lectures retrace the history of its development. It has been almost a quarter of a century since it was formulated, and its consequences, even the most distant ones which relate to pathology, were deduced from it. Mr. Estor, who worked next to me, early became my devoted and convinced collaborator, so much so that in some parts, I do not know how to distinguish between him and me ...

.... I said there were plenty of checks. In Germany, microzymas have been discovered, under other names ....

... A Swiss scientist, M. Nencki, professor of medical chemistry in Bern, did not limit himself to helping to demonstrate the new doctrine, he had the generosity to formulate in favor of microzymas a claim for priority in rule:

“There is no doubt,” says Mr. Nencki, “that the germs of putrefactive enzymes exist in most tissues of living animals. To my knowledge, it was A. Béchamp who was the first to consider certain molecular granulations, which he calls microzymas, as being organized ferments and who resolutely defended his view against various attacks. A. Béchamp then formulates the following three propositions based on the research he had undertaken jointly with Estor.

1. In all the animal cells examined, there are constant and necessary normal granulations, similar to what Béchamp called microzyma;

2. In a physiological state, these microzymas retain the apparent shape of a sphere;

3. Outside of economics, without the intervention of any foreign germ, microzymas lose their normal form; they begin by associating in a rosary, which has been made a separate genre under the name of torula; later they stretch out to represent isolated bacteria or associated.

We see, adds M. Nencki, that the later researches of Billroth and Tigel are in their results only the confirmation of these three propositions. "

... Mr. Estor and me, speaking of normal microzymas in organized beings, have never heard of anything but healthy and living animals, that is, examined immediately after being sacrificed.

When there were other circumstances to be noted, we were always careful to do so. This is how Mr. Estor, guided by the theory, had observed the presence of microzymas in strings and bacteria in the material of cysts examined as soon as opened, thus proving that the microzymas could evolve in the living, in the body of the man himself, in the state pathological...

... As a result, we imagined that microzymas are living beings andrangers in the body. Hence the error of those who, finally seeing the microzymas in the tissues that have become diseased, invariably take them for parasites which have made genera and species ...

... I devoted a whole lecture - the 11th - to right these mistakes. Microzyma is no stranger to the living organism; on the contrary, it is in him that the life and activity of each living center in this organism are concentrated, each according to the goal it is to achieve.

<explanation of recurring problems with Pasteur ... p.XIX to XXII>

... Before Mr Pasteur, I looked in the air for the cause of the appearance of molds and microzymas in my solutions. Later I demonstrated, which Mr. Pasteur had not done, that microzymas constitute the essential part of what are called air germs, thus giving a body to these germs which were neither spores or eggs; while Mr. Pasteur was still looking for the eggs of the bacteria, I proved that they were the result of the evolution of microzymas. Long before 1876, ..., I had even researched whether atmospheric microzymas, far from having been created on purpose, were not the living remains of extinct organisms: the 11th lecture contains the history of this research.

<more ... of the discoveries he made, claimed by Pasteur p.XXII to XXIX>

I do not dispute the remarkable qualities of the experiments of M. Toussaint and M. Pasteur, concerning the attenuation of viruses; they are very interesting when one considers them in the theory of microzyma, I explain myself in the 14th lecture; but they do not understand M. Pasteur's system. In fact, apart from really parasitic diseases, there were not, initially, originally, the germs of real diseases: smallpox, syphilis, typhoid fever, anthrax, etc., in the air. It has never been demonstrated to exist. In the air, there are microzymas; M. Pasteur denies it, and I demonstrate that they are those of the disappeared organisms; that they can be accidentally morbid, but losing their morbidity as a result of a change that I see experimentally.

I have long understood the reason for the persistence of Mr. Pasteur's attacks. I believe the situation is cleared up. If microzymas exist and if the theory that follows from their discovery is true, the opposite system is false. And if, from beginning to end, this book has taken on the character of a polemic against Mr. Pasteur, whose merit I like to proclaim, however, it is not only the incident in London; there is his word, which acquires so much authority from the eminent position which he so rightly occupies. I could not help but remark that having taken as the basis of his last work on the etiology of diseases an unverified hypothesis and principles which observation has never confirmed, he was taking medicine in the wrong direction. .

<continued idem p.XXIX to XXXIV>

... And now I close by expressing to the Academy of Sciences and the Academy of Medicine, my feelings of deep appreciation. The first of these illustrious companies has always admitted our

communications and our complaints in the minutes of the meeting; the second kindly listened to my communications with the benevolence that she never refuses to those who cultivate science with disinterestedness!

A. Béchamp

Lille on March 12, 1883

Appendix

Since 1860, at the Faculty of Medicine of Montpellier, every year, at the start of the course in medical chemistry, the preparer wrote down on the board the statement of the fundamental principles of my teaching. I reproduce here this table, in order to prove that from that time, my ideas were fixed.

- There is only one chemistry.
- Matter is endowed only with chemical and physical activity.
- There is no organic matter in essence: all matter is mineral.
- What we call organic matter is only mineral matter, of which carbon is necessarily a constituent part.
- Organic matter, chemically defined, is profoundly distinct from organized matter.
- The chemist can, by synthesis, form organic matter; he is powerless to organize it: he cannot create a cell.
- The ability to organize matter resides primarily in pre-existing living organisms.
- In organized beings, the various apparatuses of the organism are the place where the mutations of organic matter, organized or not, take place; and these mutations take place according to the ordinary laws of chemistry.
- Plants are, from a chemical point of view, essentially synthetic devices, animals are analytical devices.

1st conference

Introduction

... The question we are going to deal with, the history of what is fundamental in living organization, is that of microzymas; and, you understand, it will be nothing less than the renewal of the basics of physiology, histogeny and pathology. Nothing is more true; the study of microzymas touches on 2 major problems, the solution of which is equally important to physiologists and physicians: on the one hand, to the origin and histological constitution of living beings; on the other to find the cause of the chemical, physiological or morbid activity that manifests in them during life and that of their total destruction after death. These phenomena, as we will see, have a rational explanation only in the experimentally observed properties of microzymas, living atoms that are found at the origin of living beings and after their total destruction.

The ancient systems deliver the generation of living beings to the hazard of cosmic forces; ….

Spontaneous generation

If someone were to tell you today that ... a mouse, a frog, a fly or some other insect were suddenly born, without parents, from damp earth, warmed in the sun, from a pile of rags, …, With a piece of rotting flesh, we would laugh in the face of the strange observer. However as I speak, there are certainly some very authoritative scientists who assert, not these things in these terms, but that certain lower organisms, monera and infusoria, can be born without antecedents, and that by evolution, if not today, at least in ancient times, these monera have successively produced everything that lives in this globe. It is this mode of generation without ancestors that we call spontaneous or equivocal generation, spontparity, heterogeneity.

... *<History then description of the experiences of "sponteperists" and opponents p.3 to 25 including a typical example: Schroeder and Dusch experiment p.19-20>* ...

Pasteur's experience and method

... <the goal is to prove that in the absence of airborne germs, no organism can be born>

Mr Pasteur has built very complicated devices but also very simple ones. What result did he achieve? Whenever he used filtered infusions, very clear, in which the microscope did not reveal any part of the material which had been used to prepare them, he saw nothing appear organized or infusory. , animalcule or others, nor mold. In this respect he only confirmed the experiments of Schwann, Helmholtz, Schroeder and Dusch. He failed, especially when he operated on the milk every time he confined himself to heating it to 100 ° only for a few minutes. He was not happier in his meat studies. The milk curdled and bacteria appeared in it, the meat spoiled ...

... He was able to crush his opponents, he could not convince them, because he could not demonstrate why in old experiments as in his own, milk, blood, meat are corrupted, despite the absence germs in the air.

...

Certainly, Gentlemen, the difficulty is not in assuming; the difficulty is to disentangle the true from the false, to discover the real. In fact by all these reasoning, one wanted to explain things naturally obscure by imaginary details; it was adding darkness to the darkness without making it less dark ...

Lavoisier admirably described this state of mind which leads so many scientists, now as in the past, to reason on hypotheses as if they were demonstrated truths.

Advice and Lavoisier method -

"... it is therefore not surprising that in the physical sciences in general, one has often assumed instead of concluding; that the assumptions, transmitted from age to age, have become more and more imposing by the weight of authorities that they have acquired, and that they have finally been adopted and regarded as fundamental truths, even by very good minds... "

The method which follows from these precepts consists in not paying for words; not to make free assumptions; never proceed except from the known to the unknown; to ceaselessly guide experience, to use it ceaselessly to control the views of the mind; to consider the same objects for a long time in order to see them under all their faces; to consider the same fact from all sides, from all points of view, before concluding.

....

2nd conference

…It was while pursuing the solution of a pure chemistry problem that, for the first time, I saw microzymas; that I have been put on the path of research which I am going to share with you and which will make you understand how in science there are often such intimate contacts that a question of chemistry can turn into a subject of high physiology.

Cane sugar inversion

You know that cane sugar, in aqueous solution, under the influence of powerful acids used in small quantities, slowly in the cold, almost instantly at the boiling point, is reversed, that is to say that the dextrorotatory solution which 'it was at 15 ° c., becomes levorotatory at the same temperature; before the inversion it did not reduce the cupropotassium reagent; it reduces it afterwards, because the cane sugar, by fixing the water, by a deep chemical reaction, has been transformed into 2 glucoses, of unequal rotating powers and opposite directions, which compose the inverted sugar.

... *<cane sugar reversal experiments not inverted in solutions of zinc or calcium chloride inverted in distilled water solution with appearance of mold p. 47 to 50>...*

... in 1855, this simple question was a big novelty:

"Are molds endowed with chemical activity? "... another one immediately followed, which reads:" What is the origin of the molds that appear in sugar water? "

It is in accordance with these concerns that I proposed to institute experiments intended above all to demonstrate the following proposition:

"Cold water only changes cane sugar as much as mold can grow in the solution, these basic vegetations then act as ferments. "

And, after more or less successful attempts, on June 25, 1856, I started in Strasbourg, observations which were continued in Montpellier until December 5, 1857 ...

… See Table III *<p.52>* for a summary of the experiences that interest my subject.

We see there that, like zinc chloride and calcium chloride, the addition of certain salts prevents the inversion of cane sugar, as does that of a very small amount of creosote *<in fact, carbolic acid >* or mercury bichloride. This was not the case with arsenious acid and certain salts, under the influence of which the inversion took place, with or without the production of molds.

The influence of salts seemed to promote the growth of molds, whether they were neutral like oxalate and nitrate of potash, with an alkaline reaction like sodium phosphate, or with an acid reaction like alumina sulphate….

But the role played by creosote, a substance endowed with such a weak chemical activity and known as an antiseptic agent, is extremely remarkable; it prevented both inversion and the growth of molds. It was necessary to clearly determine that there had been nothing in this capable of drying up the fertility of the producing cause of microscopic, infusoria and other organisms. On March 27, 1857, I instituted another series of tests ...

… *<Description of experiments over eight months p. 53 to 55>….*

It is important to remember that the memoir in which I recorded this research was sent to the Academy of Sciences at the end of 1857 and inserted, by extract, in the minutes of the meetings, on January 4, 1858. The complete memoir has appeared 8 months later. These dates are of great importance from the point of view of my quarrels with Mr. Pasteur ...

... By its title this dissertation is a work of pure chemistry ... But soon the question, as I had suspected, got complicated; it has become at the same time physiological and dependent on the phenomena of fermentation and spontaneous generation ...

And the experiences that I have just summarized, I have given them as being contrary to the doctrine of spontaneous generations ... I add that they constituted the first serious attempt to found the physiological theory of fermentation, on which we will insist at length, because it is through this that these studies have applications much more physiological and medical than chemical.

It is by showing that molds are endowed with chemical activity; that they feed on, that is to say assimilate and disassimilate, that we can later get a clear idea of the absolutely similar chemical phenomena which are carried out by the highest organized beings in organization.

... *<continuation of the experiments for 6 years until the end of the sugar reversal p.59 to 69>* ....

... It is therefore shown that the inversion is a function, not of mold as an organized being, but of a product that it generates in its tissue; just like in the stomach, the digestive function is not an action of the body directly, but that of a product called gastric juice, and in this juice the result of the activity of pepsin, a substance more or less analogous to diastase. This is the capital fact that emerges from this study ...

… *<Demonstration of the distinction between soluble ferment (one would say enzyme now) and organized ferment p.70 to 72>….*

All this proves that the cause of the sugar reversal is preformed in mold and yeast; and, since the isolated active ingredient acts without the presence of an acid, ... It was after establishing these facts that I gave a name to this active ingredient: I call it zymase. We will see later how this word zymase, originally intended to designate the active ingredient of yeast and mold, became a generic term. Today I refer to the zymase of yeast and molds as zythozymase. It goes without saying that zythozymase, like diastase, loses all of its activity upon boiling. You now understand why molds and yeast lose their inverting power through heat.

And I must point out: these things were so little known; so little was known about the relation which binds soluble ferments, or zymases, to the organisms which produce them, zythozymase in yeast, for example, that M. Pasteur, three years after the publication of my memoir of 1857, did not believe in the inverting action of yeast ...

... you should know that in 1856, despite the demonstrations of Cagniard-Latour and the insistence of Turpin, we did not believe that the yeast was organized and fermentation a physiological act ...

… *<Studies of molds born from various environments p.77 to 79>….*

Sugar water obviously does not bring together the sum of the various materials that can constitute organized matter, plant or animal. Sugar is a soluble substance, which by itself, ..., can be stored indefinitely, even in water and in air, in a soluble state, without changing its nature or composition. However, solubility and organization are contradictory terms. Any organism, whatever it is, is endowed with 2 fundamental properties, without which there can be no organization: insolubility and non-volatility. And this is true not only of the complete being but of the anatomical elements of its tissues ...

... There are no exceptions: everything that lives is organized, and everything that is organized is insoluble.

… <Physical and chemical conditions of the development and life of molds p.90 to 95>….

Reversal case without the appearance of mold

There was sometimes one of my sugary solutions in which the sugar was transformed without me seeing mold itself appear: I was very surprised; but not being able to admit that there could be chemical transformation without a provocative cause, I turned my attention to the very light deposit, mostly white, which was at the bottom of the vials where the inversion was taking place without apparent cause. However, examining this often insignificant deposit at sufficient magnification, I recognized that it was the little bodies I told you about earlier, smaller than anything I had seen so far. Collecting as much as I could of these small bodies, I noticed that they were nitrogenous, and that they could, being isolated and put back in the sugar water, invert it and act as ferments: this is how I have included in the general name of mold, not knowing where to classify them. It is to the search for their nature, their origin and their properties that I have devoted more than twenty years of my life. I told you before, these little bodies were microzymas. We will see how I came to give them this name and relate them to what histologists called molecular granulations, amorphous granulations, etc. It is thanks to the knowledge of their properties that I have succeeded in giving the explanation of phenomena that Schwann, Schroeder and Dusch, and later M. Pasteur left unexplained. But for that, it was necessary to create a method different from that of Spallanzani, more or less modified, and of which one cannot say that its application kills the reproductive faculty, the productive force of the infused materials.

The new anti-heterogeneous method

follows naturally from what I have just explained to you, in accordance with the Memoir of 1857. The experiments of this Memoir had been published for over a year, when M. Pouchet,…, raised the issue again. problem of spontaneous generations. When the debate arose, I inquired whether the method which worked so well with pure sugar water or with the addition of various salts would not be applicable in all cases. This is the purpose of the experiences that I still have to share with you ...

... Here is the continuation of some of the experiments that I have successively tried:

Since this is to keep the airborne germs out, it goes without saying ...

... <experiments free from airborne germs compared using the new method (creosote = carbolic acid), p.97 to 110>.....

And in closing, let me make a remark which applies to all the experiments of this conference, as to those of M. Pasteur: that is, as regards spontaneous generation, they were made on carefully filtered solutions or infusions. I did not speak to you about urine, blood, milk, or meat; is that the method by creosote or carbolic acid, used in non-coagulating dose, did not prevent the urine from spoiling, the milk from curdling, the meat from rotting or at least from undergoing some alteration. It is that in these different cases, there are other phenomena to be interpreted. We will deal with this at the next conference, after we have researched the true nature of what are called air germs, and among those germs something that no one has yet considered.

3rd conference

...

You will remember that in the last century, Bonnet and Spallanzani assumed that the birth of animalcules and other infusion products had a common origin: living germs, universally spread, in the air, in the waters, in the earth. It was a very relative truth, but all intuition, not experience; because we had not demonstrated the existence of these germs, at least in general, and we have seen that Bonnet readily admits that they were the product of his imagination that reason obliged to admit. But Needham, without further direct evidence, denied the existence of these alleged germs. Modern sponteparists have been more demanding, and Pouchet, ..., has tried, by a very large number of microscopic observations, to convince himself of the non-existence of these germs. MM. Pasteur, Lemaire and I have experimentally established the reality of their presence in different places. Well, Pouchet and his collaborators, using arguments which I will make known, denied that these germs had anything to do with the success of their experiments. As for Mr. Pasteur, he admits, as demonstrated, that any appearance of organisms in infusions or in dead matter has no other cause than these same germs; and this panspermia, he admits, in the same terms, as the producer of all infectious or epidemic diseases! There are errors there, the fruit of a preconceived system, which I persist in combating, because they make one lose sight of what is essential, ignoring the true notions of higher physiology concerning the origins of life and of 'organization.

I told you how I came to distinguish under the name of small bodies something that I at first confused, under the same name, with true molds, and which, like these, invert the sugar of cane. I have found these small bodies in a host of circumstances: in certain limestone rocks, in some mineral waters and in various environments; we will see that they exist in the air. It is about a work on chalk that I named them with a name that recalls organized and living ferments, and designates them as forming a new class of beings: microzymas. Now, all the ferments being of a microscopic order, the etymology of the new name is clear: they are the smallest ferments. It is above all to their study that we devote these conferences.

Having noticed their presence in my cane sugar solutions as early as before 1857, it took me 7 years to convince myself of their independent existence, their functions and their organized nature. I then discovered them in the air, where no one not only had looked for them, but could not find them, blinded as one was by false notions about the organization. Yet we knew them, we even described them under the name of molecular granulations, of amorphous matter; but they were considered unimportant and meaningless in the order of organization and functions in the body. They were nothing, and I dare assure you that they are the whole of the organization! Even today, although reality prevails, we seek to deny it, while making an effort to seize it under other names.

... *<experiment of M. Berthelot and Robin: unexplained fermentations away from air germs, with observation of the presence of granulations without their being attributed the slightest role p113 to 115>*

Analysis of atmospheric dust

... Things were there when Mr. Pouchet first, then Mr. Pasteur, looked for the germs of the air: both passed by the molecular granulations without noticing them and without giving them any 'importance.

... <search for air germs by M. Pouchet: "He has never encountered a single spore, a single microzoan egg, or an encysted animalcule. »P.115 to 118>

<Pasteur, using a magnification of x 350, found organized shapes between 1/100 mm and 2/1000 mm p.118 to 123>...

... Well, there is something organized in the air that is much smaller. These are the atmospheric microzymas; something that M. Pasteur and all observers have neglected, not to draw, but to describe, but to study. To discover and observe them, I use this device ...

<description of the air intake experiment p.122> ...

... It bears repeating, what is most abundant is not the spores or the eggs of microzoans that are yet to be found, but the microzymas; and it is not by the thousands that they are counted in 1.5 liters of air, but by hundreds of thousands and more in some cases ...

... But are microzymas germs, spores or infusoria eggs? or are they organisms of a very special kind? ...

Notions about living matter

... Can we say that a definite organic matter, however complex its molecule, or a few numerous species which are found mixed together, can be considered alive? Or does the idea of life suppose an organization with structure; so that the expression of living matter is synonymous with matter endowed with organization, that is to say, organized matter? These are the serious questions to think about when dealing with spontaneous generations.

And if life supposes organized, structured matter, after the death of the organized being, do the organization and the structure with life disappear without return? And if the organization is not absolutely destroyed, life not completely destroyed, where have they taken refuge?

These are the important issues raised by microzymas.

... <Views of M. Berthelot, Dujardin, Ch. Robin: experiments of fermentation of mannite. Mr. Berthelot claims that organization and life have nothing to do with these phenomena and yet he only obtains alcohol in the presence of all types of tissues and animal matter, fibrin, pancreatic tissue, spleen kidney.... But never by replacing them with the most diverse nitrogenous combinations p. 125-126>...

... All of this is of the utmost importance. We will deduce the consequence that, without the conserved organization of the tissues, in what it essentially has, no chemical action had occurred ...

... There was yet another motive for not worrying about the structure and the particular influence of the fabric; this motive is this: it was implicitly admitted that after death everything was dead in a corpse; much better, we supposed that a piece of muscle, or blood, or urine, or

milk, withdrawn from the living animal ..., have nothing alive as long as they no longer participate in the life of the whole!

… Mr. Robin got it right by interpreting very badly…

... We understand why Mr. Robin thus saw nothing alive in certain liqueurs of Mr. Berthelot, because for him the molecular granulations that the learned chemist had noted ... were only amorphous matter without structure.

... Mr. Ch. Robin called blastema, the organized substance, essential primitive, which is used to constitute the tissues. The anatomical elements are supposed to arise from scratch in the blastema. It's a way of spontaneous generation ...

… The theory of protoplasm, a counterfeit of this one… is accepted by naturalists as well as by Cl. Bernard. These theories assume, and this is their common flaw, that life derives from physico-chemical forces and the general properties of matter.

A rival theory, the cell theory, admits that a living organism proceeds from a primitive organized cell, having life in itself; it reads like this:

Omnis cellula e cellula.

We will discuss it in due course; let me just tell you that there is something profoundly philosophical about its conception that must be remembered; it is the notion that what is alive comes from what is already. But the cell is not what is alive per se; it is, on the contrary, something essentially temporary....

Molecular granulations

.... <P.131>

Molecular granulations had therefore been noticed, some had even attributed to them a certain function in the genesis of cells, but an entirely mechanical function ... M. Charles Robin even devoted several lessons to their history, distinguishing several kinds; in an article in the dictionary of medicine and surgery *<de Littré and Robin>,* he gives the following description: “molecular granulations, molecular granules, molecular corpuscles. Very small granulations, formed of organized substance (organized, without structure), wide from 0.0005 to 0.003 mm, which are found either in suspension in all the humors of the body, or interposed in the fibers of the tissues, or included in the substance cells, fibers or other anatomical elements, especially in many amorphous materials. They may be very abundant, especially in the tuberculous substance, in the morbid white plaques of the serous membranes, in the normal medullary tissue. "

I would add that in all the treatises and all the histology and pathological anatomy plates, these granulations are cited and drawn like a fine dust or in the main form of the drawing… It is even mentioned in the genesis of the cells… They are noted as agitated by a Brownian movement, as well as fatty or pigment granulations. And as we often see them moving in the very cell that contains them, we give this inner movement as proof that the cell has a cavity and a distinct wall. Mr. Robin finally recalls in this same dictionary, that the leucocytes and the infusoria, by decomposing, let escape molecular granulations which offer a Brownian movement with the

most intense hopping, and which have sometimes, wrongly, he says, been considered as particular infusoria animals.

… Not only are they not made to play any role in histology, but nothing is known about their physiological or chemical functions.

... What is certain is that not all molecular granulation is microzyma, but all microzyma is molecular granulation. The discovery that I claim as my own is to have brought them out of their obscurity, it is to have demonstrated:

1. That some of them are ferments of rare power, and therefore they are organized in the sense of structure;

2. That they can, under certain conditions, evolve physiologically to generate other organisms, and

3. To have established that, under other conditions, they can reconstitute cells.

In short, it is not because they are animated by Brownian motion that I have concluded that they are living and organized being, but from all the facts that I am going to enumerate to you.

… *<Reflection of different authors on living matter after death p. 133-134>…*

Regardless, the cadaver being examined histologically after a few days, a little more, a little less, depending on the organic centers, the cells disappear; what happens to them and why do they disappear?

If it is true, as Mr. Robin assures him, that anatomical elements arise in blastemas and if these elements are not the product of spontaneous generation, what is the cause of this generation?

If it is true that the protoplasm is the place where cells are formed, in what resides the life and the capacity to form cells, if one cannot admit that there is living matter without structure?

All these questions are answered by careful study of microzymas ...

Chemical activity of molecular granulations

… *<Examination of atmospheric dust, see implementation p.135>…*

... I am using the Nachet immersion lens n ° 7 ...

If one pays attention to them "the granulations" one invariably finds that they present themselves with a shining center, endowed with a certain mobility, a sort of trepidation, back and forth movement. This bright spot, in a certain position, looks like a black spot, but when in focus, you get the idea of a sphere whose center is bright with a dark outline. Most of these granulations are less than a thousandth of a mm in diameter, but there are some that are as little as half a thousandth of a mm (0.0005 mm). There are certainly smaller ones. And to get an idea of how small they are ... he can ... fit 15 billion of them into a cubic millimeter, the size of a pinhead. And we find, if the volume of air which passed through the solution was at least 3000 liters, that despite the large quantity of creosote, without noticeably changing shape, these microzymas, accompanied by some spores that can be found there. meet, are able to invert cane sugar ...

The chalk microzymas <p.136>

Now, by examining under a microscope the chalk which I used "in various experiments", it was the chalk of commerce (which we call white from Spain, white from Meudon), I invariably discovered the same small bodies as I had noted in my other experiments. It took me several years to convince myself that the little chalk bodies were ferments, therefore organized and alive. Suffice it to tell you that it was from seeing them under a microscope, analyzing them and proving their function as ferments that I came to give them the name of microzyma. The first mention was made of it at the Academy of Sciences and Letters in Montpellier, in 1864 and the Memoir was published at the Académie des Sciences in 1866, 9 years after the Memoir on the inversion of sugar water. by molds ...

Microzymas in general <p.137>

… As early as 1865, I pointed them out in the milk, comparing them to those in chalk.

... The result of this research is that microzymas make up the major part, the very large part of the organized corpuscles of the atmosphere, and that, depending on the environments in which they are forced to live, they produce the organisms we call ferments.

But before the date of these last works, I already reported in the urine which rots, without naming them, the microzymas, under the name of small mobile beings. The same is true of wine: … as the cause of their aging and deterioration.

This is how I came to deal with the granulations of animal tissues and cells ...

Chemical action of microzymas

… Let's try to make people understand that microzymas are chemical agents.

It must be admitted in principle that there is no chemical action without a provocative cause.

... I first admitted that microzymas are living things because they operate on their own, chemical fermentation actions.

... <various experiments including fluidification and then fermentation of the starch with the addition of pure lime carbonate in contact with air p. 139>…

… But you should not imagine that the microzyma is converted into a bacterium without any transition: on the contrary, we can see several intermediate forms between the microzyma and the bacteria… You must remember that the environment has a great influence on such and such. such form of the evolution of the microzyma, and that there is a quantity of species as to the function; finally that depending on the environment, the microzyma can produce cells instead of bacteria, true cellular microphytes and molds

...

Microzymas of higher organisms

To see them, all you have to do is take a fragment of an organ, an almond embryo, the parenchyma of a leaf, a little liver, pancreas, thymus or kidney, a little egg yolk; with a scalpel

you lightly scrape the fragment in a little water on the microscope slide, or you mix a particle of egg yolk in a little water, you cover the preparation with a thin slide and you look attentively, under a magnification of 500 to 600 diameters (objective 3, eyepiece 2, from Nachet), what is smallest in the suitably illuminated field. In all preparations, they are very small spheres similar to those depicted in air dust and chalk. If the magnification is greater, you will find there, as in those of air, a shining center and an envelope.

... Let's get straight to the point, and prove by unmistakable experience, their ability to transform into bacteria.

The pulp of the green and soft parts of the plants is not long in being invaded by myriads of bacteria, of various sizes and, no doubt, of various species. However, this pulp, before the appearance of bacteria, only shows cells and molecular granulations under the microscope.

To explain the presence of bacteria, we used airborne germs, or spontaneous generation. You will judge the little basis of these 2 ways of seeing.

In Montpellier, during the cold winter of 1867-68, I had the opportunity to notice two frozen Echinocactus plants. A few weeks after the thaw, I looked at the kind of histological damage the freezing had caused to the tissues of this plant. His skin showed no signs of damage, it was as tough as it was before the frost. Now, you know how hard, thick, resistant and smooth this epidermis is: obviously, the great density of the tissue and the thickness of this epidermis were a sufficient obstacle to the penetration of bacteria, vibrios or their atmospheric germs; you will admit it all the more easily as Mr. Pasteur assures us that the body of an animal is impenetrable to these same bacteria or germs. However, an incision being made in the frozen part, the material, taken in the depth of the wound, or immediately under the epidermal layer, contained bacteria in crowds, or the species called Bacterium termo et putridinis, extremely mobile, were predominant.

This observation was too important for me not to attempt to verify it.

… <A number of examples are given, the examination was carried out 10 to 12 days after the thaw, the frozen parts contain bacteria but no more microzymas or microzymas in the process of transformation, the healthy parts only contain cells and microzymas p. 142 - 143>…

Fourth example: Agave americana. The frozen and blackened part of the leaf no longer contains microzymas, just small bacteria and a few bacteria that are 0.008 to 0.02 mm long, all very mobile. In healthy parts, microzymas are normal; but as we approach the frozen parts, we see the microzymas change in shape and size ...

… <Another example of an overwatered plant whose roots were rotten and the epidermis covered with mold, examination of the plant: in the very base of the foot, there were only microzymas, of which a small number formed of 2 articles, and therefore no invasion had crossed the epidermis p.143 - 144>…

... It was natural, from what I have told you about the influence of media on the appearance of this or that organism, to examine for comparison, the chemical state of the frozen medium and the preserved medium. It turned out that the chemical environment has changed in most cases.

… <Acid reaction in healthy parts, alkaline reaction most often, but sometimes neutral and even acidic in frozen parts p. 144>…

Although it is believed otherwise, bacteria can thrive in an acidic environment, which may remain acidic or become alkaline, as well as in an absolutely neutral or remaining neutral environment ...

Microzymas and bacteria of animals

… It would certainly be permissible to generalize and… to conclude that animal microzymas have the same aptitude as plant microzymas. I won't do it, first of all because the question becomes particularly complicated when you consider an animal to compare it to a plant. This one is in contact with the air only by its external surface, so well protected by the epidermis, while the animal admits air and its germs in its lungs, and that besides of other openings can be assumed to give them access, not to mention food, drink, etc. Then there is consideration of pathology: regardless of ordinary parasites such as cestoid worms and helminths, there is certainly cause for concern with parasitic diseases caused by microscopic parasites. There is therefore a very great interest in knowing whether or not bacteria can be born in animal tissues without the contribution of external germs. You are well aware, moreover, that this is the point of the great debate which is between Mr. Pasteur and me.

... in 1865, in a letter to M. Dumas, I pointed out that creosote, used in a non-coagulating dose, does not prevent the milk from curdling later, nor the chalk from transforming, without foreign aid, the sugar and starch in alcohol, acetic acid, lactic acid and butyric acid. From these facts I concluded that chalk and milk contain living beings, cause of the observed transformations, of which the creosote did not prevent the activity from manifesting. However, the coagulation of milk is accompanied by the development of bacteria, despite the presence of creosote.

I wondered if in the experiments with meat things would not be like with milk ...

... *<method of experimenting with meat free from airborne germs development of bacteria, moving sticks and the presence of various granulations. p.148>* ...

... How to explain these exceptional results, if not by the presence in the muscles of the living animal, not only of germs, but also of bacteria, at a lower degree of development?

We will see that we must banish the word germ in this case; when the idea of bacteria at a lower stage of development, I believe it to be more and more correct; it will make us understand the inanity of the point of view that we were looking for the eggs of bacteria!

We applied this method, Mr. Estor and I, to experiments on the origin and development of bacteria in the liver, kidney, spleen, pancreas.

… *<Experiments applied to the liver p.149 - 150>…*

... These experiments show us that, all other things being equal, bacteria appear in sugar solution much earlier than in water, and in poison earlier than in sugar water. You will also notice that the appearance of bacteria is preceded by what we have called associated microzymas.

<Experiment D - mouse liver after 48 hours in a bottle of creosote water> ...

... We find isolated microzymas, other associates in rosary beads; we see microzymas with a large and a small diameter, which progress like bacteria; finally we also see real bacteria. Many are associated in linear groups of 2 or 3. Isn't it obvious that these are the various forms of the various phases of microzyma evolution?

... *<typical experiment, E, in which all causes of error are eliminated p. 151>…*

... Here is a circumstance that convinced us that bacteria do not come from outside. In a large number of trials, these bacteria appeared in the center of the livers before being visible in the ambient fluid. Kidneys, pancreas, spleens, placed under the same conditions, but usually more slowly, eventually let bacteria appear in their center, while the fluid around them does not yet contain any.

... We will see that fibrin itself, which we look at as a special albuminoid material and an immediate principle, is something that contains microzymas, the microzymas specific to blood.

...

Degrees of bacterial evolution of microzymas

... At the time of the death of an animal sacrificed in the state of health, in all tissues, at all ages, the microzymas are all independent.

Under the conditions that I have just specified, one can enter microzymas coupled to 2 grains, forming strings. Later, the granulations elongate to have a small and a large diameter; soon these characters become even more pronounced and we have real bacteria, sometimes even real leptothrix, that is to say very long filaments.

… In summary, the various vibrios, the chain bacterium, the Bacterium termo, the bacterium capitatum, the bacteridium, are only phases of the development of microzymas, or certain microzymas, more or less dependent on the nature of the environment. But let's not anticipate, and let's only say that it will be shown that the naturalist cannot distinguish microzymas by description, because they are morphologically similar; and as size does not in general constitute an essential botanical or zoological character, we will see that they can only be distinguished by their function, which can vary, as M. Joseph Béchamp has demonstrated, for the same gland and the same tissue, with the age of the animal.

Moreover, microzymas and bacteria with the modifications of form which can be observed between the microzyma and the bacterium, can meet, at a given moment, in the intestinal canal, from the mouth and the stomach to the rectum.

... The microzymas of the mouth and its bacteria are other than the microzymas of the stomach, and the latter other than those of the rectum, not morphologically but functionally. It may even

happen that the presence of a parasite such as tapeworm in the intestine causes some change in the intestinal microzymas and modifies their evolution, so great is the influence of changes in the environment.

But we will come back to all these facts when we deal with the functions of microzymas. For the moment, it is necessary to tell you that these facts were not admitted without dispute, especially by Mr. Pasteur, whose system they thwarted.

... However, it is not that other experimenters were not concerned with these facts. There are even some who have confirmed them, but without citing the authors of the discovery ...

... <from an article published by MM. Nencki and P. Giacosa... indicating in particular that other experimenters, Billroth and Tiegel, Burdon Sanderson came to the same conclusions p. 154 - 155>

<reproduction experiments (fermentation away from airborne germs) by Nencki then Servel p.156 to 158> ...

Let us therefore conclude that there are atmospheric microzymas and geological microzymas, capable of evolving into bacteria, just as there are physiological microzymas endowed with the same ability. There are therefore among the bodies referred to as molecular granulations presently living organisms. We will find out that it is their common origin.

4th conference

Spontaneous coagulation of milk

... With regard to the organized forms that, in their experiences, Messrs. Pouchet and Pasteur saw, and on the nature of which they did not agree, ..., they are the least numerous; spores or eggs, their origin is very natural as well as simple, and Spallanzani had already known the dissemination of spores from mucedinea, like botanists the transport of pollen from flowers. But what MM Pasteur and Pouchet did not perceive in ordinary air, or which they let pass without noticing it, are the molecular granulations, not only of the air, but of the materials which they used. in their experiences; these same molecular granulations of which chemists, physiologists, anatomopathologists and histologists themselves had neglected the study, although they indicated the presence of them in the fermentations which they studied, in the pathological or normal tissues which they described! Well we have shown that these molecular granulations, first reported as small bodies in certain sweet solutions, could invert cane sugar and act as a ferment, as well as those which I have observed in certain limestone rocks and that I named, because of their function, a name that recalls this function of the ferment: the microzymas. We then acquired the new certainty that certain molecular granulations, in the tissues and cells of plants and animals, could generate bacteria, as well as those of the air and rocks, and we concluded, except to demonstrate it also by their functioning, that they were also microzymas. Finally, you are convinced that I am not the only one to believe in the reality and the value of my demonstrations, since other scientists, warned of the objections made to them, have refuted them by demonstrating that the seeds of air are not the cause of the appearance of bacteria in the most diverse animal tissues: muscles, glands, nervous matter.

...

You remember the experiments of Schwann, Schoeder and Dusch on milk and meat <free from airborne germs>: the application of their preservation method did not prevent the milk from curdling and, in some cases, the meat will spoil. M. Pasteur came to the same conclusion*:... <p. 163>*

... What is the explanation for these facts? Can the theory of microzyma give it? Certainly ! Indeed, a new theory has no real value, is the expression of the facts, only if it is at the same time able to explain the old difficulties, to solve new ones and to lead to the discovery of new Horizons. It will therefore happen that the experiments of Schwann, Schoeder and Dusch, of M. Pasteur, considered carefully, are in their way a demonstration of the normal existence in milk of microzymas of a particular category.

<Dusch and Gmelin experiments - milk boiled for 2 hours is not curdled - then Pasteur experiments on milk + carbonate of lime p.163 to 168>

… In short, M. Pasteur was not concerned with the histological constitution of milk, nor with the way in which it is formed in the mammary gland: he only saw a more or less complex liquid that he had. studied in the same way as any infusion. You know how I came to give my full attention to animal molecular granulations ...

Histological nature of milk

... These living beings already developed, that is to say having a life of their own, independent, able to act as ferments, what are they in milk? they are microzymas similar to those of chalk! We will see later how I isolated them to observe them in the free state; let us only understand why they must necessarily be found in milk.

The milk secretion is normally manifested at the time of parturition. The mammary gland then constitutes an admirable apparatus in which profound chemical reactions take place. Casein, for example, neither milk sugar, nor certain fats, nor other products of which we will speak, do not exist in the blood; they form in the cells of the gland, which become the site of changes that histologists have noted. At the start of lactation, milk is called colostrum; this liquid, whose composition is very different from milk, contains what are called colostrum corpuscles, namely: granular cells that soon disappear; colostrum may still contain breast cells or their debris. The glandular cells (of the mammary gland) first become larger, fill with fat and, destroying themselves by a true physiological resorption, dissolve in a way, completely inside the gland itself; then the fat globules of the milk and the microzymas become free and are found in the milking product.

... Finally, let us note that according to the research of Mr. Dumas, the fatty globules are themselves provided with a membranous envelope.

I first had some difficulty in demonstrating that the microzymas of milk are the sole and primary cause of its coagulation, before any appearance of vibrios or bacteria, so that the problem was not completely resolved until 1873.

How I operated: *<procedure p.169 and 170>*

The experiment was repeated several times, always with the same success. By the time coagulation is complete and the whey separated from the cheese and the cream is clearly distinguished, it is impossible to discover anything other than the original microzymas. In an experiment that lasted 15 days, there were isolated microzymas, articulated microzymas and bacteria.

You will notice the conditions under which the experiment was carried out: it was in the absolute absence of oxygen! This is what I insisted on in another communication, the results of which I must share with you, as they are the confirmation and generalization of the previous experience, and in general of certain facts concerning microzymas and the general theory of fermentation.

Alcohol and acetic acid in milk

We know ... that lactic acid exists in sour milk. … We also knew that milk can, under certain circumstances, undergo a real alcoholic fermentation: mare's milk, for example, gives koumiss, whey that the Russians and the Tartars consume. But alcohol and acetic acid have never been looked for in milk when it has just coagulated, nor especially when coagulation takes place in the absence of oxygen or air. However, I have constantly found alcohol and acetic acid in notable quantities in my experiments, whether the microzymas have evolved into bacteria or not. But, you understand now, if the microzymas, during the coagulation of milk, before having

formed bacteria, form alcohol, normal milk must contain some, since in the gland it already contains free microzymas. The guess has become a reality.

<Experiments p.171 - 172>

Adulteration of meat and its products

… You remember that in the experiment of meat heated in a bain-marie, without water, and then exposed to calcined air or filtered by cotton, the deterioration occurs, without the authors noting the presence of 'no infusorium. Mr. Pasteur also notes this alteration and also believes that it occurs without the development of infusoria.

Relying on experiments that were very well done, but poorly studied and consequently poorly interpreted, Pasteur claims to have proved that "the body of animals is closed in ordinary cases to the introduction of germs from lower beings; from which it follows that "the putrefaction will first establish itself on the surface (of the corpse), then it will gradually gain the interior of the solid mass"

… Starting from this hypothesis, M. Pasteur… *<p. 173 to 175>*

... All of this is just the imagination. M. Pasteur, having observed, like his predecessors, some transformation, and unable to bring in its atmospheric germs, imaginatively invented the "reaction of solids on liquids, the actions of contact, the actions of diastases" without knowing what are the solids in an organism and without knowing the liquids of which it speaks. And notice that it is a chemist who has been involved in research on fermentations who speaks of contact action absolutely as those who do not admit the physiological action of ferments speak ...

... I affirm that if we put together all the liquids and all the solids of the same organism, but previously reduced to the state of immediate principles, they would not produce anything similar to what M. Pasteur calls pheasant or reduced meat. state of gangrene.

... Be that as it may, the observation and the hesitations, the very explanations of Mr. Pasteur are of great importance; this scholar has observed, in short, that the meat or a fruit, detached from the animal or the tree, undergo some transformations, materially observable, which he could not attribute to the intervention of the germs of the air: the cause is entirely internal; the meat, the fruit, carry it within themselves. If therefore we demonstrate that the microzymas of the fruit or of the meat are the transforming agents, it will result that Mr. Pasteur, in his own way, demonstrate the role of the microzymas ...

We know that meat, like all tissue, contains microzymas that can evolve into bacteria or vibrios; that milk curdles through the influence of its own microzymas, producing alcohol and acetic acid, and then lactic acid ...

I will talk to you shortly about the microzymas of the liver and the fermentations they determine there. The deterioration of meat is a phenomenon of the same order as these; this results from the research of M. J. Béchamp which I am going to share with you.

<Experiments: alcoholic fermentation of meat, method of J. Béchamp p.177-178>...

M. J. Béchamp drew all the conclusions which stemmed from his research; he made the most important toxicological applications of it, observing what a grave error would be made if one wanted to conclude from alcohol of liquids or tissues of the body as poisoning. ... I only add that the author has rightly observed that it is probable that in the very advanced putrefaction one would not find alcohol: it would have been destroyed by the very microzymas that produced it. Indeed, I have observed for a long time that alcohol is perfectly fermentable and that the products of its fermentation are the acids of the formic series, etc. ...

All these facts lead to assert, with the most certainty, that animal tissues, to speak like certain authors, conceal the germs of vibrio. For us the meaning is higher; it is proof of the existence of microzymas as organisms living a clean, independent life. ...

Microzymas and bacteria of living tissue

.... At some time after that M. Estor published the Note... *<p. 180, for references>*

"M. Béchamp and I," says M. Estor, "sent the academy a note on the evolution of microzymas or normal molecular granulations in animal cells. These microzymas, under the conditions we have specified, group together in pairs or in greater numbers, then lengthen slightly, finally more, so as to form real bacteria. These facts result from a large number of experiments carried out on various animals. The following observation demonstrates that the same transformations can take place in humans. Three days ago I extirpated a cyst in my labia majora, filled with a semi-liquid, greenish material. Immediate examination, under a microscope, showed the microzymas at all stages of their evolution: isolated granulations, others associated, others slightly elongated, finally real bacteria. "

Dr. Liouville, at the same time when we published our first studies, demonstrated that the serosity of blisters contains microzymas, and that these produce bacteria.

Dr. Onimus, in an important work, also showed that vibrio can appear in the serum which penetrates in the distilled water contained in an ampoule which is inserted under the skin of a living animal.

... You saw earlier from what point of view Mr. Pasteur considers gangrene. Here is the cause of its production:

“A patient had just had his arm amputated following a serious traumatic injury; the deleted part was immediately taken to the laboratory; the forearm had a dry, black surface that had been known to be insensitive before the operation; all the symptoms of gangrene existed; Microscopic examination shows us, not bacteria, but associated microzymas, strings. The accident had proceeded so quickly that the bacteria had no time to form, they were only in the process of forming; they are therefore not the cause of gangrene*... <p. 181>* ...

I will give you another example of the presence of evolving microzymas in the organism itself ... We looked for evolving microzymas in the tuberculous material of the lung of a consumptive patient ... *<observation and analysis p. 182>...*

... It is therefore possible to observe, even in living organisms, in certain pathological states, the existence in the body, in the deep parts, of various states of the evolution of microzymas, up to the state of bacteria.

Impenetrability of membranes to vibrios

To several of these facts one can object, and M. Pasteur always objects, the presence of airborne germs, which we have not avoided. … Consequently, it is necessary that I demonstrate to you directly this very real impenetrability…

<Chicken egg yolk experiment p.183> ...

... We had the opportunity, Mr. Eustache and I, to study moldy eggs in this way: we never found the mycelium penetrating into the yolk ...

We can therefore demonstrate the impenetrability of a membrane to atmospheric germs. But it is worth dwelling for a moment on this consideration of the relationship of living beings with the atmosphere in which all are immersed. ...

Relationship of atmospheric germs

… Mr. Dumas demonstrated that, in Paris, a man who takes 16 breaths per minute, penetrates his lungs nearly 8 cubic meters of air (8000 liters) per 24 hours.

Now, since M. Pasteur constantly objects to those who refuse to believe in his multiple panspermia (normal and pathological), the possible penetration of atmospheric germs and that he admits that they are retained by infusions and other substances that one exposes in contact with the air, I asked for a long time why he does not admit that they are also retained by the whole surface of the respiratory tracts and by this vast wet sheet which the lung supposedly spread out on the surface represents , and do not enter ...

... But apart from the air that enters through the lungs, there is also the air that envelops us, and it is quite certain that the entire surface of the body is covered with a myriad of organized microscopic corpuscles. There is also the one who enters with food and drink into the stomach; this air leaves there most of these organized molecules. Finally, the eyes whose surface is always wet and other openings, natural or accidental, can be considered as the places, through which microzymas could enter. In fact Mr. Pasteur assures us that the vibrios of the intestinal canal originate from germs in the air or in water; he doesn't see any other! For us, we see above all the vibrios coming from the microzymas of our own tissues, our food, our drinks.

You see by this what the complication of the problem is, and how difficult it is to say that this or that result or that other should or should not be attributed to the germs in the air. The easiest way was to ignore these germs by reducing their influence to nothing….

The question, therefore, is not whether microzymas enter organisms, but whether the microzymas of these presently possess properties that those in the atmosphere do not enjoy ...

We already know that, by the use of carbolic acid or creosote, we can prevent the evolution and multiplication of atmospheric germs and keep the most alterable matters unaltered; We have also seen, through experiments with milk, as with molds, that if we can stop the development of microzymas, we do not suppress their activity.

… Let me relate to you the experiences which demonstrate the following proposition:

The influence of atmospheric microzymas on putrescible matter can be made as small as desired or reduced to zero.

Removal of the influence of atmospheric microzymas

<Chalk experiment p.186 - 187>…

You see by this that the microzymas of the atmosphere, which fell into the pure carbonate of lime while it was stirred in the air, and into the yeast broth while the mixture was being made, not only did not acted, but have not increased. On the contrary, the chalk, which contains a host of microzymas, has increased in weight, because these microzymas have proliferated and partially transformed! They have more than tripled!

<Control experiment p.187 - 188>…

Now you can see why Mr. Pasteur saw bacteria appear in the sweet yeast infusion with the addition of chalk. If he had used pure carbonate of lime, he certainly would not have had to heat his mixture under pressure.

Thus in the experiments in which Mr. Pasteur so easily sees vibrionians appearing, creosote or carbolic acid are absolutely opposed to their appearance when the substances tested do not already contain the microzymas that produce them….

That said, let's compare the multiplication of chalk microzymas in sweet yeast broth to the multiplication of microzymas in the body.

... The liver is one of the glands where a very active proliferation of molecular granules occurs. I find in the works of Cl. Bernard valuable information on this subject. The illustrious physiologist noted in the rabbit digesting carrots and bread, in the dog digesting starchy foods, that the liver cells are turgid, rounded and surrounded "by myriads of small molecules animated by an excessively rapid Brownian movement. . "On the contrary, in fasting animals the cells are not surrounded by molecular granulations, the edges of these cells are very sharp, and they are flattened in the fasting rabbit ..... <p. 189, for references>… We will come back to this very interesting observation when we deal with the physiological and chemical, even histological, functioning of microzymas.

Physiological death of a bacteria or a cell

In the third lecture, I told you that shortly after an animal dies, the cells of the organs disappear. What are they becoming? In their place we discover a multitude of molecular granulations! The destruction of a cell is obviously death, more than the death of that cell. In this regard, I wondered what could be the death of a cell and also that of a bacterium or a vibrio. And as we

will see later, this connection is not by chance, because we will demonstrate that microzymas produce bacteria and vibrate by evolution, they produce cells by construction. Well, the physiological end of a cell is its dissolution, its regression, its return to the formative microzymas: when the cell is destroyed, the microzymas remain. It is the same for bacteria: when the bacteria disappear, the microzymas reappear.

In the stomach of a digested dog, there are bacteria which, physiologically, pass with the digested products in the small intestine; a little beyond the pylorus it is no longer found, thereare only microzymas; but the bacteria reappear in the large intestine and even a little before…

Microzymas at various ages

M. J. Béchamp set out to investigate whether the microzymas were functionally the same at different ages of the same being, from the fetal state to the adult state; and what could be their chemical function at different ages in the same organic center.... *<Method on egg yolk microzymas p.191-192>*

...At the time ... only the microzymas of the liver and pancreas were known to be functionally different ...

The author has operated on muscles, lungs, brain and glands, at various ages from fetal state, in some animals and in humans ...

… *<Sampling method p.192-193>…*

... when it comes to studying the chemical function of a tissue or organ, there are 3 things to consider:

1. Their soluble albuminoid matter without chemical function;
2. Their zymases;
3. Their insoluble part, in which we must also consider the anatomical element and the immediate organic principles that constitute it.

… *<Explanation of the technique on a muscle p.193 - 195>…*

We will come back, in another conference, to the chemical functions of microzymas in different tissues. We will focus on their uneven ability to evolve into bacteria, either in poison or in sugar water.

<Experiment results>

... Airborne germs had absolutely no influence on the observed phenomena.

… Consider successively in each series the non-glandular tissues and the glands.

Muscular.

• In poison, bacteria always appear, but more difficult in the experiment where fetal muscle is used.

• In cane sugar solution, bacteria appear more slowly, and we can easily follow the various stages of their evolution; with fetal muscle, it may happen that bacteria do not appear and that the associated microzymas exist on their own.

Lung.

• Things go pretty much the same with muscle, in poison and sugar water. It even seems that bacteria appear more slowly.

• For the fetal calf lung in sugary water, the 3 and 4 month old lungs gave only associated microzymas without bacteria.

Brain.

Brain matter provided some very noteworthy results.

• That of adults, in poison, does not give rise to bacteria, the evolution stops at the associated microzymas.

• The brain matter of the fetal calf does not give bacteria either, but a little more easily associated microzymas.

In these experiments as in the following ones, everything was similar in terms of the amount of tissue…, the temperature…, and the microscopic observations were made at the same time…

With the cerebral matter, although the phenomena of true putrefaction had manifested, the bacteria did not appear at any time ...

On the other hand, isn't it remarkable that the lung, whose contact with air takes place over such a large area, does not more easily than the muscle, for example, let bacteria appear? I will try to explain this fact.

... All other things being equal, microzymas in glands evolve more easily into bacteria than those in non-glandular tissue.

Liver.

• The liver produces bacteria with the greatest ease, and it has been noted that growth is slower in sugar water.

• The microzymas of the fetal calf, at 3 or 4 months, in sugar water, did not give rise to bacteria; evolution seemed to stop at the associated microzymas.

Pancreas.

The pancreas is roughly the same as the liver. It should be noted that bacteria there often acquire the length of leptothrix.

Salivary glands.

These glands presented the particularity of easily giving rise to bacteridia (immobile bacteria) and leptothrix (very long immobile bacteria) ...

Finally, all this, with a few nuances, is verified with human tissues ... You will notice that the human fetal brain produces bacteria in the starch poison, more easily for the younger fetus.

The ability to produce bacteria decreases with the age of the fetus, so much so that the brain matter, at the age of 6 months, only produces associated microzymas slightly elongated, without real bacteria, and that of adults does not produce more than associated microzymas.

Regarding the bacterial evolution of microzymas, Mr. J. Béchamp has noticed… that it is incomparably easier in poison than in any other environment…. That the transformation of microzymas into bacteria was done more easily in adult tissues, and, in this regard, he recalls that it is the microzymas of the egg yolk that undergo this development the most difficult ...

... I don't want to let this opportunity pass by pointing out an important check. We have seen that Mr. Estor has found bacteria and the various stages of microzyma evolution in the material of a cyst , examined at the time of its opening.

The first is the placenta from an abortion in the fifth month of pregnancy…. In short, the tissue of the placenta behaved like an adult tissue, coming very close to the way of being of the liver, which agrees with certain observations of Cl. Bernard, who, having found glucose in the placenta, brought it closer in this function, to the liver itself.

Second, it is the fetus from a 6-month-old abortion. He had stayed 12 days after his death in the womb. It was in the state called macerated; showed no sign of rotting, exhaling only a stale odor; all its tissues are considerably congested and flabby. When starting the experiments, the histological state of the tissues is examined under a microscope, from the point of view of cell preservation and the state of microzymas.

Muscle (pectoralis major).

In the tissue, associated microzymas and rare small bacteria.

Liver.

All clean cells have disappeared; we only find the nuclei, many free microzymas and a few rare small bacteria, including bacterium termo.

Lung and heart.

Nothing to note

Pancreas.

Associated microzymas and bacterium termo.

Thymus

Rare associated microzymas.

Spleen

Nothing to note

The tissues of this fetus contained bacteria although it did not come into contact with air.

We will come back in another conference, to another aspect of the studies of M. J. Béchamp, dealing especially with the purely chemical function of the molecular granulations of adult or fetal tissues that he examined. For an infinity of secondary details, the thesis can be consulted

<Ref. p. 199>. The author insists at all times on the evidence establishing that the results he recorded are absolutely independent of airborne germs. This is really so and you see, by all these accumulated facts, that when the animal dies, something alive, in the chemical sense, persists in the corpse: the microzyma.

... <The heterogeneous systems - ancient and modern - that of Buffon - of Pouchet... p. 200 to 217> ...

5th conference

The tissues of all living things, from the largest tree to the smallest mold, from man to the humblest animal, contain microzymas that can, by evolution, produce bacteria.

... <Conflict of interpretations between Pasteur (physico-chemical reaction) and heterogenists (spontaneous generation), while all obtain the same experimental results without ever noticing or giving importance to the granulations p.219 to 222> ...

... We will devote this session to demonstrating that microzymas of all origins are by themselves ferments of the order of organized ferments.

... *<Update on the use of carbolic acid, p.222 to 224>* ...

Atmospheric microzymas are not killed by creosote

Let's start with microzymas and atmospheric germs. If the creosote or carbolic acid is killing them, they should not process the cane sugar or ferment it.

... *<Experience of sugar and creosote water crossed by an air current of 3000 l - result eight days after the air flow ceased p.224-225>....*

... We could see granulations of less than a thousandth of a millimeter. There was not a single bacteria ...

What happened to the sugar water? His reaction was obviously acidic ...

So creosote does not kill germs in the air: the onset of fermentation puts this fact beyond doubt. And if in my first experiments the same agent prevented the inversion of cane sugar, it is not for having killed these germs, but for having stopped their evolution and multiplication ...

The experiments on chalk also lead to the conclusion that creosote is not lethal for microzymas, since chalk alone, despite its presence, can operate the alcoholic, acetic, lactic and butyric fermentation of cane sugar and starch; however, here too, the microzymas retain their shape, that is to say do not evolve, if the desired conditions are met ... so that the antiseptic agent does not hinder fermentation, it is necessary that the quantity of this chalk , ie microzymas, is considerable, so that the phenomenon is measurable.

It has been claimed to explain the ferment activity of microzyma chalk by airborne germs. But we want to forget that chemically pure carbonate of lime, used under the same conditions, remains absolutely inactive. Moreover, the chalk itself becomes inactive as soon as it is subjected to the action of a sufficiently high temperature; finally, ..., all microzyma limestones do not have the same properties as some chalk samples ... we will come back to this when we investigate the origin of the microzymas of these limestones, as well as those of the atmosphere.

Moreover, I did not conclude for the existence of geological microzymas only from the chemical activity of the rocks that contain them. I isolated them.

… *<Technique for isolating microzymas p.226>…*

... just incinerate; the loss expresses the organic matter of the microzymas; finally, elementary analysis can prove that this material contains the carbon, hydrogen and nitrogen that any organized ferment must contain.

... the microzymas of some limestones can carry out much more difficult fermentation, since in the presence of an animal material which is used as food, musculin, for example, they are able to ferment the alcohol itself. We will come back to all of this.

... Creosote is lethal in a coagulating dose, it is not in a non-coagulating dose; but it can be considered as moderating the dual property of microzymas of producing bacteria and of being ferments.

Let's see now how it is possible to isolate microzymas from animals and plants to study them in their state of freedom, in their properties, their composition and their functions.

The microzymas of the liver

... I will, in a few details, tell you how we can isolate the microzymas, and then we will apply the process to other glands.

… *<Technique for isolating microzymas from the liver p.227-228*>…

… After these long treatments, the microzymas were found unaltered; their shape and mobility had remained the same.

... I also separated the microzymas from the non-hydrotomized liver: they are apparently the same, at least morphologically; but the chemical composition seemed a little different to me, probably because in this case, they can be soiled by the microzymas of the blood which I will tell you about later.

In isolation, ... liver microzymas are in the state they function in the gland itself.

… <Other preparation detail p.229>…

Back in the days when we first isolated animal molecular granulations to study them outside of tissue, we had to distinguish them from other identical granulations in shape. Authors, we said, sometimes consider them to be fatty granulations; some, being silent about their nature,

confine themselves to representing them as endowed with Brownian motion. For us, we have characterized them by saying that, in order to perceive them distinctly, like small spheres, a magnification of nearly 600 diameters is necessary; that they are insoluble in acetic acid and in ten-tenth caustic potash, as well as in ether, which excludes their fatty and albuminous nature; and we added: water does not alter them in any way; even after several contacts; they are, in a way, rot-proof. The movement of trepidation, says Brownian, is their own.

The microzymas of the pancreas

The way to extract microzymas from the pancreas is basically the same; but it requires much more care, because of their special activity. The operation is only successful at low temperatures ...

… *<Clarification on the technique for isolating microzymas from the pancreas p.230>…*

… The filtered liquids are used in the preparation of pancreasymase (pancreatin from Cl. Bernard).

...

... You end up collecting, on a filter, a mass, similar to the one you have in front of your eyes, which has the appearance of beautiful blond yeast: it is made up of microzymas such as they exist in the gland. Under the microscope, it resolves into a host of small, fairly large spheres, larger than the pure microzymas as we are going to obtain them. In this state, they already have the chemical properties that we recognize in them.

But as you see them, they are not pure, they are thickened in a layer of fatty substance, which forms them like a rather thick atmosphere: this is what led to believe that the molecular granulations of the pancreas were granulations fat.

… *<Fine extraction technique p. 231>…*

... After washing again with water, which removes all traces of leucine, tyrosine, xanthine, hypoxanthine, etc., the microzymas can be considered pure. Under the microscope, they appear much smaller than those of the liver; they are certainly less than 0.0005 mm in diameter. Despite the length of the treatment, no trace of bacteria was found and barely a few associated microzymas; it is, however, difficult to separate absolutely some debris of cell membranes and crystallized-appearing bodies.

These microzymas have this peculiar character, that despite washing with ether, the most prolonged and desiccating in a vacuum the fastest, they always meet in a rather hard brown mass, and like cornea. En masse and moist, their color is olive brown, greyish.

Twenty beef pancreas provides over 130 grams of moist, well-drained microzyma containing about 12% dry matter.

Microzymas of various glands and organs

In this way, I extracted the microzymas from the thymus, spleen, kidney.

Stomach microzymas, I first isolated them from the mucus that flows along with the gastric juice from the stomach of a dog with gastric fistula on an empty stomach. This mucus is made up of cell debris from the stomach glands and a host of microzymas ...

... *<extraction technique p.232>* ...

... Gastric microzymas are very small. I will tell you about the extraction of microzymas from the stomach glands themselves later.

A similar process can be applied to isolate microzymas from the intestinal canal, either on an empty stomach or while the animal is digesting.

And it also applies to the isolation of microzymas from barley, wheat, almonds, hazelnuts, etc.

Microzymas of almonds or hazelnuts

... *<technique for isolating microzymas from cotyledons and embryos (separately) of almonds p.232>* ...

... But the process is not applicable to all cases, to that of gastric gland microzymas and fibrin, for example.

Microzymas of fibrin and blood

It may seem strange to hear me talk about fibrin microzymas. This substance which is extracted from the blood is considered, in fact, to be a special albuminoid material, an immediate principle comparable to musculin. It is not so. And as the thing is of importance as much from the point of view of the history of microzymas as that of blood, it is necessary that I tell you how we arrived, Mr. Estor and I, to regard the fibrin as a kind of false membrane containing microzymas of a particular species.

The demonstration involves several kinds of experiments - and to follow the order we have adopted, I will first prove to you that fibrin, like milk, meat, liver and other tissues or glands, can in determined conditions allow bacteria to appear.

The study we are about to undertake will have yet another object: research and the cause which determines the formation of fibrin; which will lead us to the discovery of blood microzymas and their properties.

... *<implementation - study of fibrin microzymas (venous and arterial blood from a young animal) p.233-234>* ...

... The poison is quickly fluidized, often after five to six hours, twelve to twenty-four hours at most. And, notice the good, thinning usually precedes any appearance of forms other than microzymas; more and more fibrin breaks down: in its place we soon find all the intermediate states between the microzyma and the bacteria.

In sugary water, we see that the inversion follows the evolution of microzymas, ..., the evolution is slower than in poison.

The presence of carbonate of lime has the effect of hastening the thinning of the poison and the bacterial evolution of microzymas.

...

Physiologists have long recognized that fibrin is not identically endowed with the same properties depending on whether it comes from venous or arterial blood; blood from a particular region of a very young animal or an adult animal.

...

In most cases, especially when the fibrin is supplied by a very young animal, its disappearance is so rapid that it is difficult to follow the stages of microzyma transformation. We looked for a way to slow the phenomenon down, and we found that the microzymas in fibrin may not be killed by heat at the temperature of boiling water.

... *<experiment with fibrin analysis of venous blood from a dog in poison p.235>* ...

… Fibrin reveals bacteria and the forms which precede them: it therefore contains microzymas; and this experience shows it to us as constituted like a false membrane woven of microzymas united by a special albuminoid material ...

… We will see that the plant production called Mother of vinegar recalls, by its constitution, fibrin; it is also a membrane with microzymas manifesting in the same circumstances similar phenomena. Molitg's mucus is likewise a natural production, the entire organization of which resides in the microzymas.

… *<P. 236-237*>…

... Fibrin has been considered by chemists to be a definite immediate active ingredient, which has long been confused with muscle fibrin. However, muscle fibrin dissolves easily and instantly in hydrochloric acid to one thousandth. ... The same is not true of blood fibrin.

… *<Experience p. 238>* ...

… These are the isolated fibrin microzymas. Let us prove that they are the direct cause of the thinning of the poison.

… *<Experience p. 238>* ...

The microzymas of fibrin therefore reproduce 2 essential properties of this substance: that of thinning poison and producing bacteria.

They reproduce a third ...

... Indeed, when these microzymas are introduced into hydrogen peroxide, ..., there is immediately an abundant release of oxygen which appears to be released from the particles of the mass. When the microzymas have been well separated ... the decomposition of hydrogen peroxide is even more active than by fibrin itself under the same conditions.

… *<Study of microzymas and other fibrin compounds p. 239-242>…*

... The conclusion is legitimate: the fibrin of the blood is a false membrane that contains microzymas, and these communicate the properties that we know to it.

We will explain later how microzymas are involved in the dissolution of fibrin by very extensive hydrochloric acid. We will prove that this fluidification is a function of the activity of microzymas.

Blood microzymas

... The blood could not contain microzymas, since it is a fluid in which, necessarily, there are always 2 cellular anatomical elements: red blood cells or red blood cells and white blood cells or leukocytes. There exists, in fact, in the blood of all the animals that we have examined..., an innumerable number of mobile molecular granulations, having all the characteristics of microzymas...

But, you understand it well now: for the observation to be conclusive, it must relate to the blood when it leaves the vessels, before the formation of the clot, that is to say before they do. were used to form fibrin and especially on blood that we know to give little of this substance; the blood of very young animals is in this case ...

In the middle of the globules, we always see a crowd of microzymas. They are quite similar to those of the liver, but smaller and more transparent. It was their thinness and transparency that prevented histologists from seeing them. In addition, because of their small size, it is useful to use the immersion objective, No. 7 from Nachet. ... In the blood defibrinated by the beating, almost all of the microzymas have disappeared. They are difficult to see in mixed blood. But after their action on starch or sugar water and their development in strings of 2 to 20 grains, they are positively insoluble ...

Blood, contrary to popular belief, therefore does not contain only two histological forms: microzymas are the third organized element of blood.

But do blood cells contain microzymas? We answered yes, Mr. Estor and I.

... *<Decomposed or crushed blood cells experiment p.244>...*

... The globules are torn, and the microzymas, become free, swim in the liquid with their own oscillatory movement.

But while it is easy to see microzymas in blood, it is very difficult to isolate and study apart from those in blood cells, whether water alters or deforms them.

Regardless, the microzymas of blood cells are those that have difficulty producing bacteria.

... *<Experiment on the microzymas of red blood cells p.245>...*

...

..., we do not take enough account of the action of the glands on the blood flowing through them. These glands, in addition to their own structure, contain in their cells, or in a state of freedom, microzymas, the functions of which we will learn about. However, these microzymas necessarily exert a chemical action on one or the other of the materials which the blood brings there; the microzymas of the blood themselves, undergoing, like the globules, the influence of

the new environment, can acquire new functions which will be manifested, at the exit of the gland, by new properties of the blood which contains them; because don't forget, microzymas in themselves sum up what is essential in the chemical functioning of a given cell or mood.

... *<Microzymas of the blood before and after the liver p.247>...*

... sushepatic blood cells are significantly smaller than those in portal blood.

... Leukocytes increase in the hepatic veins; ...

... You see there that the liver exerts a certain action on the incoming blood; ... but I cannot go back on the observation already made regarding the influence of digestion on the increase of microzymas in the liver. You remember the 2 figures by Cl.Bernard concerning the histological state of the liver in the state of abstinence and in the state of digestion of starchy foods. "When," he says, "you examine the liver of an animal digesting starchy substances under a microscope, you see in the liver cells an infinity of small globules of fat; around these cells are scattered myriads of small molecules, which also appear to be fatty matter, and which are animated by an excessively fast Brownian motion. " We know that these molecular granulations that Cl. Bernard took for fat, are the microzymas of the liver. However, in the state of abstinence we no longer find, or we find fewer of these microzymas. What have they become? The authors don't care!

And the case of the liver is not isolated ...

Blood fibrin and its varieties

... *<P.248 to 250>...*

These considerations suggest that blood coagulation and fibrin formation are immediately dependent on microzymas. And here is an experiment which shows us a production more or less similar to fibrin only forming in a liquid where microzymas have been left ...

... *<P.251 to 252>...*

New blood experiments

... *<Pasteur's experiment, blood stored for eleven years, in open vases, without bacteria being observed p.252>* ...

... I replied that blood was one of the liquids in which bacteria are most difficult to appear and that the lung, the organ which is most directly in contact with the air, is, after death, the viscus which rots Lastly ; all forensic scientists know this ...

I added this again: "But how does the absence of bacteria and the putrid smell of the experiment Mr. Balard put against me prove that there has not been a change? Recently, Mr. Pasteur invoked this famous experiment again in his book on beer. We'll take a look at it later, and you'll make an informed judgment that this experiment verifies the theory of microzyma.

I have already spoken about the evolution of microzymas in the blood into bacteria. Here is a series of experiments that I carried out in Montpellier in September 1873. They are intended

to demonstrate that the environment has a considerable influence on the development of microzymas and on the more or less prolonged conservation of the red blood cell.

… <A certain number of preparations are observed and studied every day p.253 to 260>

... I did not hesitate to give you all these details to convince you that blood is one of the liquids or animal tissues in which bacteria are most difficult to appear, under any conditions whatsoever, except in carbonic acid. All the experiments I have cited therefore prove that microzymas in blood are of a special species. However, we found differences depending on the animal and the region of the vascular system from which the blood comes…. What must be remembered from all this is that the air, whose contact we have not avoided, whose intervention has even been exaggerated in some experiments, has nothing to do with the observed phenomena, if not a conservative influence ...

The important thing to remember from these experiences is that blood is an extremely variable mixture, a product of the body in which all the vicissitudes of nutrition and the various conditions to which an organism may be subjected resound. And these considerations are of major importance in pathology: it may happen that the microzymas are placed, during life, in conditions such that they evolve to give bacteria in the vessels themselves, which probably coincides with a change of function…

… *<Pasteur's blood "conservation" experiment p.261-262>…*

… Here is the result. I ask you, is this preserved blood? No doubt there is no smell of rotting proper, that is to say the horrible smell of really rotten blood, but it does take on a smell of laundry; but it changes color, but crystals are produced; but the globules disappear, but there is oxidation. And no doubt, if M. Pasteur had taken the analysis further, he would have found other fermentation products. The author did not see any bacteria there; but we know he hasn't seen any in the meat that is being cooked either, as he puts it. I am happy that Mr. Pasteur did not see long bacteria, those that everyone can distinguish; but he neglected for not having seen them, or for having looked at them without significance, the molecular granulations, isolated or coupled…… It is with lightness that M. Pasteur concludes in such serious matter: he acts exactly as in his studies on milk, on meat, and, we will have to come back to this, on urine….

The microzymas of the egg yolk

… *<Experiences and descriptions p.263 to 266>…*

So there are microzymas in the egg; they are rare in white, innumerable in yellow.

... The microzymas of the yolk, isolated, or in the presence of accompanying materials, put in creosote poison in a non-coagulating dose, or in sugar water, do not produce bacteria, if not accidentally; and when the phenomenon occurs, it is always possible to see that it is preceded by associated microzymas.

In summary, the tissues and fluids of the body all, without exception, contain molecular granulations of the order of microzymas; and these microzymas, with unequal abilities, are capable of producing vibrio. So far we have only studied this side of their history and the art of

isolating them. We are now going to study them from the point of view of their functioning as ferments and thus legitimize, better than we have done so far, the name given to them.

6th conference

Theory of fermentation

… "The microzyma is organized and alive like the germ that produces the embryo. But we deny their vitality and organization, arguing that the bacteria that come from them are the fruit of spontaneous generation. This negation, as we will see, is due to the state of science: we do not know what living matter is.

The study of microzymas will unravel the mystery.

... The term "germs" is not applicable to microzymas, they are not like eggs, ova of vibrios or bacteria that need fertilization to multiply.

…. <History of science… M.Gerhard's point of view in 1856 "… organized beings are never the determining causes of fermentations or putrefactions p. 269 to 275> "

…. It is in this state of mind of science ... that I undertook my experiments on the inversion of cane sugar in solutions exposed to contact with air <1st lecture> I demonstrated 3 things:

1. That the inversion is produced by several species of molds and by the small bodies that I later called microzymas;

2. That the inversion was due to the development of molds and that at the same time an acid was formed;

3. That the direct cause of the inversion was due to a soluble substance analogous to diastase, and I called it…. Zymase.

… There is in these 3 points all the physiological theory of fermentation, such as I developed it thereafter, and of which M. Pasteur has not yet understood the meaning, as I will show you… Here is the 'statement of this theory: instead of saying that fermentation is an effect of the vegetation of the yeast, as Cagniard-Latour and later M. Pasteur expressed himself, inspiring me with ideas and a luminous statement from M. Dumas, on the basis of precise experiments, I considered alcoholic fermentation as a phenomenon of nutrition. Yeast digests cane sugar by means of zymase; assimilates the glucose formed and disassimilates alcohol, acetic acid, carbonic acid and the products which are found in the residue of the distillation of the fermented liquid, products among which M. Pasteur had the glory to discover glycerin and, after a German chemist, succinic acid.....

We started, M. Pasteur, and I before him, from the point of view that the germs of all ferments exist in the air; that all the phenomena of fermentation and putrefaction recognized these same germs.

However, in 1863,….

…. I wondered if it was true, as I had taught it until then, that a phenomenon as constant as vinous fermentation, was randomized by germs in the air. The difference in the fermented products obtained… made me wonder if the grape would not be carrying the germs of the ferments which make the wine.

...

... We had to fight 2 rooted errors:

- The error which attributes to air through its germs too great a generality of action

- And the error that attributes the production of the ferment to oxygen ...

... *<Succession of explanations on Pasteur's errors in the implementation of his experiments, repeated in others p.277 to 283>* ...

... I am, in scientific matters, of Boileau's feeling in matters of poetry

Make haste slowly ; without losing heart,

Twenty times on the loom, hand over your work,

and I only publish an experiment after having recalled the precept of Lavoisier twenty times that I quoted to you *<see foreword>.*

... We are going to study the microzymas considered from the point of view of which we consider brewer's yeast and other organized ferments, that is to say in themselves, as agents capable of effecting chemical transformations. We will then see that apart from this chemical function, they have another that can be considered to be physiological and histological.

Their chemical function in the isolated state or even contained in the tissue separated from the animal which is of the order of that of organized ferments, ... will explain to us the role they play during life, in the tissues, in the glands or in the body itself, either retaining their shape or developing into bacteria.

... Chemists call ferment a nitrogenous organic matter of albuminoid order capable of producing some chemical transformation in a given organic matter. They then distinguished two orders of ferments: insoluble ferments and soluble ferments. Brewer's yeast was the type of insoluble, diastase, of those which are soluble ...

... Today everyone recognizes that insoluble ferments are all organized.

But we persist in looking at each other's activity from the same point of view.

…. The arm's length relationship exists so well that you can say this:

Any soluble ferment supposes an organized ferment (cells similar to that of yeast, bacteria, microzyma) which generates it.

I have all the more the obligation to demonstrate this proposition to you as it was explicitly contested, denied by Mr. Pasteur ...

…. *<Experiment p.286 and 287 yeast on cane sugar>…*

There are therefore 2 functions of yeast independent of each other, the inverting function takes place outside the yeast, without its direct assistance, the other, the alcoholic fermentation function imperatively requires its presence.

…. But maybe this only happens with yeast? Think again. Here are ferments of very different origin, since they are of animal origin, much more, of human origin! Through this filter the oral saliva of a man was filtered. The filter retained microzymas, bacteria, leptothrix and some epithelial or mucus cells….

... *<experiment p.288 human saliva - starch poisoning on the 25th>*

... the phenomenon of fluidification and saccharification of starch followed by acid fermentation

…. And all organized ferments, without exception, down to microzymas, have these 2 distinct and independent functions.

….

Organized ferments have two functions:

• A chemical function which is exerted on the outside by their zymase;

• A nutrition function

<Demonstration of the first function: action of zymases or soluble ferments (diastase) compared to chemical agent (sulfuric acid) p.289-290>

... It is quite clear that zymases are purely chemical agents, the activity of which under certain circumstances can be supplemented by those of acids and heat.

…. The other function, which I refer to as nutrition function, what is it? What can the function of nutrition be in an organized ferment, in a being reduced to the most elementary state of a cell?

These are very important and very delicate questions which touch on the highest regions of physiology.

… We know that the brewer who introduces the necessary quantity of yeast into the must, collects 6 to 7 times more. Cagniard-Latour and Turpin said that the yeast thus seeded was nourished in this environment favorable to its multiplication.

…. I demonstrated…. That the yeast, dissolved in pure water, gave off carbonic acid and formed alcohol and acetic acid, etc. However, these products came from yeast, which was shown to be free of sugar….

This is the physiological theory. We must distinguish two circumstances in the nutrition of a being: the one where all the nutrients he needs for the regular performance of this necessary act are provided to him and the one where some of these foods are refused.

…. It is the same for yeast, that which is given only sugar, far from multiplying in number and weight, decreases in weight. In order for it to multiply in number and weight, it must be given at the same time what it finds in the brewer's wort, that is to say, in addition to glucose, albuminoid materials and appropriate minerals.

… *<follows a difference between Pasteur and Béchamp, Pasteur defending the theory of "contact": it is the contact of the yeast which operates the decomposition, since the sugar does not penetrate into the yeast according to his disciples and himself>*

…. Anyway, I see a permanent activity in yeast: it lives, even when we do not feed it; like an animal lives, more or less long when you deprive it of food. These are solid facts.

<What follows is a demonstration of the penetration of food into yeast p.297-299>

… *<Last remark on zymases>.* And this is the marvelous harmony: the acids would have produced formidable disorders where the zymases act with physiological gentleness <generally at temperature 37 to 40 °> worthy of the greatest attention and which causes astonishment.

Chemical function of microzymas

... We will find, as with other organized ferments, that they can have a zymatic function and a nutritional function ...

….

The microzymas of the liver (dog or rabbit, on an empty stomach or in digestion) are capable of thinning the starch poison, but without saccharifying it ...

... Cl. Bernard had observed that a well hydrotomized liver, no longer containing glucose, contained it 24 hours later, if we left it to itself. And he concluded with reason, that the glucogenic material, after a certain time, reproduced the glucose which the washing removed…. If it's a zymase, who produces it?

… *<Experience p.302- 303>…*

The microzymas of the pancreas….

….

- Transform the starch while retaining their shape, it is only after a prolonged stay that they evolve into tiny linear bacteria and strings of grains or 8 ...

-… have no effect on cane sugar….

- Action on fatty substances…. The litmus blue paper ends up turning red <so acidic - Still to be studied>

- Action on animal materials - But the most remarkable property of these microzymas is to dissolve and deeply transform the most diverse albuminoid materials <beef blood fibrin,

fibrinin, musculin, casein…>… among these substances, the insoluble ones are quickly dissolved or, as we say, digested and transformed… Solubles are deeply modified and transformed too…

Let us first insist on the fact of the dissolution of insoluble albuminoid matters:

<demonstration with fibrin p.308>

... I throw on a filter, a liquid flows that contains all the transformed fibrin, minus its microzymas, which remain mixed with the pancreatic microzymas. I will tell you later about the subsequent influence of the microzymas of fibrin on the resulting mixture.

... You remember that fibrin swells before it dissolves in very deep hydrochloric acid. The phenomenon is quite different in the present case: the fibrin breaks up and disappears without any swelling.

….

Gastric microzymas and microzymas of the stomach glands

We have just seen that the pancreatic microzymas operate the same transformations as the pancreatic juice and, moreover, that the products of these digestions: albuminoses, fibrinoses ..., are not the same as one obtains, albuminoid substances by the action of Gastric acid.

….

Action of gastric juice on cane sugar and poison

….

The organic materials, pepsin and others, which the gastric juice contains have no effect on the cane sugar. I add that they are incapable of saccharifying the starch poison ...

... Physiologically, it is the stomach glands which provide the hydrochloric acid necessary for pepsin to manifest its activity, in normal gastric juice, on albuminoid matters.

…. In a dissertation on albuminoid materials, I demonstrated that these materials are complex amides and, like many amides and amide compounds, they can contract in combination with acids… I demonstrated that some of these substances could contain up to 14 per cent hydrochloric acid, which is not given off by desiccation in a dry vacuum by quicklime; and these combinations resist even to temperatures of 100 ° and above.

... However, the analysis of physiological gastric juice allowed me to recognize, in addition to pepsin ..., special albuminoid materials which are similarly capable of combining with hydrochloric acid; ….

…. So gastric juice does not contain free hydrochloric acid, since this acid cannot be in the presence of albuminoids without combining with them.

...

My intention is not to give you the history of digestion ...: it suffices for me to tell you that the zymase it contains, pepsin or gasterase, is accompanied there by some other albuminoid substances: that this zymase and the other materials are incapable of inverting cane sugar or

saccharifying the starch; that isolated pepsin is equally powerless, on its own, to digest insoluble substances, to modify those which are naturally soluble. In order for the gastrase to act on albuminoid matters, the presence of certain acids is necessarily necessary. This condition is physiologically fulfilled in gastric juice, which contains hydrochloric acid combined either with gastrase or other albuminoid substances, or with both.

Now we can usefully begin the exposition of the experiments concerning the microzymas which accompany gastric juice and those which I have finally learned to isolate from the proper glands of the stomach, we will recognize that they sum up the properties of pepsin of the same so that the microzymas of the pancreas summarize those of pancreatic juice and pancreasymase.

Properties of gastric mycrozymas

<series of experiments p.317 to 323>

... It is very remarkable that during their stay, often prolonged beyond 24 hours, in the liquid resulting from the digestion of a given albuminoid material, the gastric microzymas or those of the pepsigenic glands retain their shape without evolving into bacteria.

And these microzymas do not exhaust their activity by a first digestion; they can be used again and again, either to digest the same albuminoid matter or to digest another one….

These are the facts; they are important in themselves, as much as because of the comparisons which establish a functional specificity of the gastric microzymas.

7th conference

….

We have also explained how we can observe a double function in organized ferments: a chemical function belonging to the zymase that the organized ferment secretes, and another function, also chemical by the products generated, but which is of a physiological order if we considers it from a particular point of view ...

... *<reference to Liebig's doctrine of alteration p.332>*

Zymases are not the result of the deterioration of an albuminoid substance, but of the normal and physiological function of a currently living organism. An organism generates soluble ferments to use it. So yeast continually contains and forms, ..., the substance that I called zymase ... This is an albuminoid substance ... It is not ... a decomposition product; it is formed by yeast for its use, that is to say for the physiological purpose of transforming cane sugar into glucose that it can consume ...

... In my eyes, brewer's yeast and other organized ferments are beings reduced to the state of cells, in which phenomena of the same order occur as those which occur in an animal which digests and eats itself ...

Microzymas in human oral saliva

... Human oral saliva has a very high power to saccharify starchy matter: it can be argued that no fluid in the body can be compared to it in this respect.

... <historic>...

We know that oral saliva comes from several parotid, submaxillary, sublingual, bucco-labial glands ... the mixture of liquids secreted by its glands is called mixed saliva; it also contains the mucus proper to the mouth.

Mixed saliva is a very complex thing made up of soluble and insoluble materials.

….

Preliminary experiments on parotid saliva in dogs and horses

… There is therefore a notable difference between the parotid saliva of the horse and that of the dog; the second contains a zymase capable of transforming the insoluble starch in the starch into soluble starch.

….

Comparative action of filtered human saliva, oral organisms and the water from their washing

… The oral microzymas and bacteria therefore operate the saccharification of starch in the same way as saliva itself.

…. <Analysis of transformation products (successively soluble starches, dextrins, glucose) - optical rotation p.352-353>…

Oral microzymas, etc., therefore have the same function as the saliva that contains them.

… The oral microzymas of dogs and horses are not functionally the same as those of the human mouth.

….

Action of saliva and oral organisms on cane sugar

… *<Experience p.358>*

It is therefore very remarkable… to see the organisms alone transform cane sugar so rapidly and lose this property by mixing them with parotid saliva. This is explained by the fact that oral organisms, feeding on parotid saliva, secrete a zymase which acts differently from the zymase they produce in cane sugar solution.

….

The saliva of a clean mouth contains little more than microzymas; there are undoubtedly globules or cells of another shape, but which themselves are carriers of microzymas and which, by destroying themselves, leave them free.

Functional variation of microzymas

... We have seen that the microzymas of the different organic centers do not all act on starch in the same way. Those of the pancreas, for example, act very strongly to saccharify poison; those of the liver are limited to thinning, and it is the same with those of the thymus, brewer's yeast or almonds. We have also seen that the action on cane sugar is just as diverse. All these facts should convince you that the germs in the air have nothing to do with the results: if they were the cause of the observed phenomena, these phenomena, instead of varying with the origin of the microzyma, should be constantly the same.

... So, it is a proven fact, the function of microzymas varies not only in different organs of the same being; it also varies in the same organ of different beings and, ..., also with the age of that being.

... <Experiments with various actions of different tissues of adults and embryos on poison> ...

Comparative action of zymases and organized ferments

… <P.367-371>

Composition of microzymas

….

… <Comparative table p.372>

… The comparison of ashes <mineral matters> deserves some attention. That of the pancreas contains a lot of iron ...

... The great abundance of ash from the microzymas tonsillitis really struck me ...

... The composition relations between these various organisms is very simple and recalls the composition of albuminoid matter, but any living cell, animal or plant, has more or less the same composition, with the exception of certain utricles or plant fibers. .

Doesn't this analogy of composition explain the analogy of function?

...

Spontaneous fermentation of ostrich egg?

….

It is very strange that events have led me to study the function, as organized ferments, of microzymas in egg yolk. M. Donné, the scientist to whom micrography owes such useful observations, did not share M. Pasteur's opinions on the universal influence of atmospheric germs to determine alterations and putrefactions. And so that these germs could not be summoned, he tried to determine the putrefaction of the eggs without opening them.

...

The ostrich egg, which M. Donné had brought to me on July 24, 1865, was in the state of a shaken egg; white and yellow were exactly mingled together; it was fermenting, ie giving off gas.

…. The foamy matter, immediately examined under a microscope by M. Donné, showed nothing foreign to the usual contents of eggs under these conditions: there were only microzymas. As for the reaction of this material it was frankly acidic ...

The gases were released through the abductor tube applied to the egg like a fermentation device, immediately I was able to collect some….

… <Experiment spread over several days p.378>

… What substance in the egg was used to form this alcohol and these acids?

You know that egg white and yolk contain sugar (glucose). Well ! The sugar had disappeared, the most careful search failed to find it ...

…. As for the microzymas, they were found mixed with the fatty substance and the lecithin retained on the filter.

….

We have in these experiments all the characteristics of alcoholic fermentation and butyric fermentation ...

The microzymas in the egg therefore destroyed glucose in the same way as brewer's yeast and the microzymas in chalk or the bacteria from butyric fermentation ...

...

As for the microzymas…, they remained without transformation….

The egg normally carries the cause of this fermentation within itself and it is especially in the yolk that this cause lies ...

….

Ah! certainly the egg is organized, expertly organized. And how many precautions so that nothing naturally disturbs the admirable order that reigns there. How many precautions are taken to isolate it from external accidents. The shell, the membrane which lines it and which by its folds forms towards the end the air chamber. The yellow or yolk is suspended there by chalazes in the white, itself formed of 2 concentric layers of unequal fluidity. In the yellow there is a reserved part, the proligerous cumulus, the scar, this white spot where the embryo will develop. The yolk itself, during its stay in Graaf's gallbladder, as it is protected before arriving in the oviduct, where it is immediately enveloped by albumin which is secreted by special glands.

Embryologists have admirably described all these parts…

... But after noting these wonderful arrangements, did they look for, what is endowed with transformative activity in the egg, what is really alive, what weaves the cells, the tissues of the being that will come from it? And if they looked for it, did they recognize it? Until I answer these questions, do we ask ourselves what happens when everything is muddled up in jerks?

It happens that what in the divine plan was a premeditated arrangement, something structured, built for a definite purpose, has been destroyed; so that the things that in the building were meant to be kept separate were confused; what was acid was mixed with what was alkaline; subsequently the desired result is no longer achieved, although the necessary material is still present! What has changed? The conditions: not much in appearance, but essential in reality, otherwise the material will remain sterile!

Yet, what, just now, was capable of producing a chicken, with its future, is it absolutely destroyed by the fact of having shaken the egg? No doubt it is an egg corpse, to speak like M. Donné; but in the chemical sense is it a corpse? No, since there is activity. However, M. Donné and M. Pasteur refuse to see anything organized there, and all the more so, nothing alive!

….

Let's come back to the function of the microzymas of the egg yolk.

…. Microzymas and yolk cells are the 2 essential anatomical elements of the yolk of the egg. But, as we shall see, the yolk globules are transient; microzymas alone are permanent and never fail….

<Demonstration of the action of microzymas on poison p.383 to 385>

<Fermentation of starch and sugar by isolated yolk microzymas p.386> ...

The yolk microzymas are therefore ferments that produce alcohol and acetic acid, both when they act on the entire substance of the egg, but they are slow ferments. If instead of leaving them to act for 5 or 6 months, we had stopped the experiment after a few days, alcohol, acetic

acid would not have been noticed and we would have legitimately concluded that they do not have the second function of organized ferments. You see by this that we should not rush to conclude. The second function can manifest itself very slowly.

And don't forget that thanks to creosote or carbolic acid, we have the right to assert that the germs in the air have nothing to do with the result of these experiments, because by putting poison and l sugar water under the same conditions, in the presence of pure albuminoid materials, free from microzymas, neither alcohol nor acetic acid is obtained, however long the duration.

<other fermentation experiments with oral organisms, liver microzymas, etc. p.389 to 396>

8th conference

....

M. Donné's new work on eggs concluded that there was a spontaneous generation of molds and animalcules in the material of the placed egg, it is true under other conditions.

...

Egg matter, according to Pasteur, is a natural substance that life develops, endowed with transformative virtues that boiling destroys ...

If the egg is nothing but that, it is not surprising that M. Pasteur saw in a corpse only matter in which there is no longer anything living and which needs germs. air to rot!

.... You know what to think of this opinion because you know that the liver, muscle, brain, milk and eggs, from live animals, or taken from the corpse, contain the microzymas which do not die, but which, placed in new conditions, operate chemical transformations similar or identical to those which they operated in the living being, either because they evolve, within the tissues, to become bacteria, or they do not change.

Mr. Pasteur studied the putrefaction of meat, but concerned with making his system triumph over panspermia, he explained everything by the germs in the air ...

...; that according to him, if during life the body of animals is closed to the introduction of germs from lower beings, it is not the same after death! Once again, you know what to expect: M. Pasteur did not see well; for denying the existence of microzymas, he did not see the bacteria in the center of the pieces of meat he was examining.

...

In 1869, during the scientific congress of Montpellier, we, M. Estor and I, made a communication in which the microzymas of higher organisms were considered even from the point of view of pathology. Here is the conclusion of this work:

"After death - here we are leaving the domain of pathology to enter that of the physiology of the species - matter must return to its original state, because it has only been lent for a time to the be organized alive. In recent times, airborne germs have been made to play an excessive role; air can provide some, indeed, but they are not necessary. Microzymas in the state of bacteria are sufficient to ensure, by putrefaction, the circular movement of matter ... Living beings, filled with microzymas, therefore carry within themselves the essential elements of life, disease, death and destruction. Hey! Gentlemen, let this diversity in the results not surprise us too much, the procedures are the same; our cells, it is a fact of constant observation, are constantly destroying themselves, as a result of fermentations very similar to those which follow death; by entering into the intimacy of the phenomena, one could really say, were it not for the shocking nature of the expression, that we putrefy ourselves incessantly. "

...

It is important that you become more and more convinced of the activity of microzymas in the parts of organisms which are withdrawn from the life of the whole, and that the phenomena of fermentation are those which characterize the regular life of the most higher in organization.

...

The seed, throughout its germination, functions like an animal organism. A zymase is born there, which digests the starch or the materials which take its place; ... I am speaking here only of the phenomenon of digestion in the seed which germinates. But the analogy with what happens in fermentations goes further ... I was able to isolate enough alcohol to ignite it, by distilling barley that I had germinated ...

Spontaneous fermentation of fruit

... I distilled pears, apples, air-ripened peaches and saw with certainty the presence of alcohol. But it was by studying what happens to sorbia that hurt that I was able to show that the phenomenon really takes place in the cells of the fruit.

... <P.403 to 406>

... In short, Mr. Bérard has established that the fruit separated from the tree is the site of profound chemical transformations. This is a crucial fact. It is certain that a fruit may not be altered in appearance, that nothing has entered it from the outside, and yet there are chemical transformations taking place. If Bérard had distilled the fruits he had subjected to his various experiments, he would have found what I discovered in milk, urine, scrambled eggs, that is to say alcohol and 'acetic acid.

<sorbia and medlar injury experience>

... Sorbets absorb oxygen and still form alcohol; a part of this oxygen is, doubtless, employed to form carbonic acid, but a great part of this gas is evidently formed by the fruit itself, like that which we have seen appear in the fermentation of eggs and as some are produced in alcoholic fermentation in the complete absence of oxygen. But you also see that alcohol and acetic acid are much more abundant in the sorbets which have been placed in a limited atmosphere where carbon dioxide accumulates.

<sorbia and medlar injury experience continued>

... You will not fail to observe that oxygen can intervene in the functioning of cells, but as an auxiliary; not as acting directly ...

.... <Pasteur's inconsistencies presenting his "new" ideas on fermentation, taken up by A. Béchamp but without going so far as to admit the presence of ferment in organized beings p.409 to 414>

....

... I was the first to highlight these two essential points, namely:

1. That organized and living ferments can arise in environments devoid of albuminoid matter;

2. That the phenomenon of fermentation by figurative ferments, considered from the point of view that M. Dumas had formulated in 1844, are essentially phenomena of nutrition.

… The cell is an aggregate of an infinite number of small beings, having an independent life, a separate story… We have seen the microzymas of animal cells associate 2 to 2, or in greater number, stretching out to 'to become bacteria or even bacteridia. We saw very long bacteridia (a kind of mycelium), a little larger, and, in the tubes they represented, granulations which were only waiting for a favorable environment to renew the series of phenomena observed.

...

... This is how the truth prevails. M. Pasteur, in order to arrive at writing what we were obliged to reply, has come a long way. He was obliged to renounce all these early works on putrefaction, since he comes to seek the origin of putrid gases, putrefaction and gangrene, apart from the germs of the air (he says "outside organized ferments ")

… You now know where the question was in 1872: death, even for Mr. Pasteur, does not kill everything in an organism which ceases to live; fermentation phenomena can and necessarily occur there.

... A remark about Mr. Pasteur's hypothesis, that an organized being, a cell, etc. act as ferments, producing alcohol when deprived of free oxygen. ... Remember that the milk coming out of the mammary gland, brain and liver, taken from animals just being sacrificed and still hot, rowanberries, ripe apples, contain alcohol. All tissues are loaded with oxygen ... Mr. Pasteur's hypothesis is belied by the facts.

... When Penicillum vegetates in the air, it is in the situation of any plant; when it is immersed in sugar, it produces alcohol, because the microzymas change their function.

... The second error is to believe that the cells are the agents which, after death, produce the phenomenon of fermentation you could see it yourselves, since you know the animal cells perish very quickly and disappear to leave others traces of their existence that microzymas ... I will show you, later, what is the mechanism of the destruction of cells and the physiological release of microzymas. And remember finally, that the isolated microzymas, which have become free in a tissue after death, can evolve to produce bacteria, and that artificially isolated, they can act on poison to produce alcohol and 'acetic acid.

... And now you will easily understand that the transformative virtues that boiling destroys, as Mr. Pasteur expressed it, are none other than microzymas. In any organism, the microzymas alone are endowed with a life of their own in a chemical sense; It is in them that the virtue of transformation resides, and many other virtues that Mr. Pasteur does not yet suspect: their durability, for example.

Effect of temperature on microzymas

And these transformative virtues, this chemical activity is not destroyed, for all microzymas

at the same temperature. While the microzymas in the air lose not only their chemical activity, but their ability to produce bacteria after a few minutes of boiling, in neutral, slightly alkaline or slightly acidic solutions, there are microzymas which do not lose it. that after several hours of boiling or by a temperature higher than 100 °... that can depend on the circumstances and the particular conditions where these microzymas are placed. Finally, there are some very inferior organisms that resist a temperature close to boiling, others at a much lower temperature: brewer's yeast is completely rendered inactive before 60 °.

.... <P.418>...

Function of glands

.... Let's come back to microzymas ... and show by 2 topical examples, that they act by themselves in the cells of the glands that contain them.

The pancreas

This gland contains a highly developed vascular network that brings blood to it and a network of capillary collecting ducts, which lead to large ducts where the products produced by the gland are collected to be poured into the intestine. Glandular vesicles contain cells unique to the pancreas, all immersed in a mass of connective tissue. Such is the constitution of the gland and you will have a clear idea if you add that the cells are more or less abundantly provided with microzymas. It is in this device that the pancreatic juice is produced which is intended to be poured into the duodenum.

Notice first that the gland receives nothing except through blood. However, blood, Cl Bernard has already remarked, does not contain the active principle of the pancreas.

... However, independently of zymases, pancreatic juice contains several crystallizable compounds: leucine, tyrosine, xanthine, hypoxanthine or sarcine and other products that are not well known or that vary according to the nature of the animal.

That said, notice that the pancreatic microzymas have the property of thinning and saccharifying starch poison, like pancreatic juice; to dissolve and deeply transform albuminoid materials with as much energy as the pancreatic juice itself and pancreasymase. But, in addition, these microzymas, which do not contain leucine, tyrosine, etc. produce it at the same time as other crystallizable compounds in the action which they exert on these albuminoid matters.

I made sure that when the tissue of the pancreas was freed, by careful grinding, and by sufficient washing, of all the microzymas, this tissue, although absolutely unaltered from the chemical point of view, ended up not working. on starch poison. In short, all the activity of the tissue of the gland is concentrated in the microzymas.

.... <Continued p.420 - 422>...

It is only after the second month of birth that the poison-thinning action begins to manifest itself. Unfortunately we do not yet have information on the time when pancreatic microzymas act on albuminoid materials.

The function of the pancreas, as seen in adults, is therefore only established little by little, and the specific activity of the microzymas in the gland, as in other organic centers, is the result of a sort of maturation, functional evolution which testifies to the spontaneity of the organism at the same time as the change of function of its fundamental histological elements: the microzymas ...

The stomach: secretion of gastric juice

... If the structure of the pancreas is already very remarkable, it is quite different for the stomach glands. These glands are surrounded by an abundant capillary network and filled with a large number of cells, which, on an empty stomach, are pale and transparent, while the glandular tubes or ends of the sacs that contain them are sagging and shriveled. Sometime after the meal, on the contrary, the cells are swollen, increased in volume, and their content is disturbed by fine granulations. At the end of digestion, all the cells decrease again in size, but are still granular ...

... Let's see what happens when food gets into the stomach.

On an empty stomach, the entire stomach lining is pale and covered with a sticky coating, sometimes weakly acidic, neutral or even alkaline, secreted by the glands.

As soon as food passes through the stomach, or when the mucous membrane is excited by chemical agents, the circulation becomes very active; as blood rushes into the capillary network of the mucous membrane, the veins dilate, the blood within them takes on a lighter color, the entire surface of the organ a pinkish tint, and gastric juice flows through the glandular orifices.

... *<comparison of gastric juices with blood, the influx of which determines the functioning of glandular cells p.423 - 424>* ...

The gastric juice, variable in the quantity of organic matter and of salts which it contains, is constantly with a strongly acid reaction, ... it contains high proportions of sodium chloride, potassium, calcium and ammonium, with a small quantity of phosphate of lime, magnesia and iron. The amount of organic matter in gastric juice is always very minimal. I have never found more than 2% of it and usually less in dog gastric juice. The gastric juice of sheep and humans contains much less.

It is believed that the acidity of gastric juice is due to free hydrochloric acid. My own research led me to a different opinion. There is no free hydrochloric acid in gastric juice, but hydrochloride of albuminoid material.

... *<gastric juice analysis after administration of a bone fragment to a dog p.425> ...*

… But we can conclude, given the activity of the isolated gastric microzymas, that it is they which, in the cells, act on the ambient materials, to produce, with the help of these materials,

not only the gastric zymase but the hydrochloric acid which remains united with the albuminoid matter of the gastric juice.

… <Function of glands and tissues in general p. 426 to 429>…

All these facts lead us to believe, as if to a demonstration, that each tissue like each gland, each special cell, are so many centers of transforming activities which constantly act on the environment in which they are immersed, while they- even undergo internal modifications, both chemical and physiological. And this remark brings me back to the particular study of microzymas considered to be the cause of the transformations reported and then as builders of cells and tissues.

So far I have considered microzymas from 3 points of view:

• they generate bacteria by evolution;

• they perform a chemical function through the zymase that they can secrete

• and a nutritional function by virtue of which they operate profound transformations of the fermentable material from which alcohol, acetic acid and, in certain circumstances, lactic acid, butyric acid and others are born. more or less numerous products. This alcohol, these acids, etc., are said to be products of fermentation: in reality, they are products of disassimilation….

Microzymas cell factors

They have a fourth: a much higher order physiological function. They are factors of cells and, gradually, it is they who are responsible for building the organized being that we call an animal or a plant.

The difficulty of demonstrating this point in their history is much greater than when it comes to observing their other functions….

... fortunately, there are organisms, possessing all the attributes of organization and life, which are reduced to the state of cells, thanks to them it is possible to make fruitful observations on the mechanism of the construction of cells in raised organisms ...

… <Cellulogenesis by microzymas of the Vinegar Mother p. 430 to 435>…

… <Mother of vinegar and bacteria. p. 441> ...

… <Molitg's mucus regresses cells into microzymas. p. 445> ...

… <Yeast regression of cells into microzymas. p. 453>…

… <Mechanical destruction of yeast,. p. 454>…

9th conference

Origin of the cell

Nothing is more controversial among physiologists than the origin of the organized cell.

... <P.464 - 465>...

I profess the opinion that it is a mistake to believe that there can be living substances, protoplasm or blastema, anhistic, not morphologically defined. All the experiences of these conferences prove that there is life only in a substance which is complex by its chemical and structured composition: the microzyma is the last histological element of any living form! But is it true that a cell always proceeds from another cell? Isn't there another mode of cell genesis?

There is great interest in answering these 2 questions and in getting an exact idea of what is meant by these words: living matter!

We have found that a cell can be produced without the help of another cell.

The examples of those formed by the microzymas of the mother of vinegar, by those of Molitg's glairine and crushed yeast, are very simple, but relate only to beings who live in the preserved cellular form. Here are such simple examples of the formation of a higher order animal cell.

Formation of leukocytes.

... <M.Onimus leukocyte genesis experiments; balloons, parchment, bladder ... filled with different liquids and slipped under the skin of animals ... p.467 to 469>

Mr. Onimus didn't pay attention to the molecular granulations; like everyone else, he believes them without any physiological and histological activity. This is not the spontaneous generation of leukocytes, which are actual cells, but the meeting of conditions where microzymas, as in the experiments on the Vinegar Mother, are able to come together to form cells; and the proof that this is so is that when these conditions are not all met, microzymas evolve to produce vibrios or bacteria

... In short, leukocytes only appear under the circumstances where microzymas have been found under the conditions where they form leukocytes in the body.

... Second, microzymas, in some viscous liquors, pass through the tightest filters and membranes such as the balloon and swim bladder. In Dr. Onimus's experiments, microzymas from wound fluids pass along with fluids in the ampoule; you will conceive it all the more easily, if the fact of the birth of bacteria were not enough for you, by noticing that there are microzymas so small that they are only visible using the immersion objectives by Nachet; so small that you have to know how to look for them to discover them.

... In cases where the author did not see leukocytes or bacteria, he is not telling us that there were no molecular granulations ...

… In short, the facts observed by Mr. Ominus have their explanation in those that I made known to you on the Mother of vinegar…

Thus, the microzymas of the Vinegar Mother, those of animal tissues in the experiments of M. Onimus, depending on the environment, sometimes do not change, sometimes give bacteria, sometimes cells.

….

Mechanism of bacteria generation….

... I have confined myself to what patient observation has shown me to be positive in experimentation reduced to its simplest terms.

… So let's see how in the Mother of vinegar the bacteria proceed from the microzyma; we will then see how the cell is born. In the circumstances in which bacteria are born, here is what we notice: this little organism does not appear all in one piece ...; no, but the microzymas that were isolated actually proliferate; then we see some which are as agglutinated with 2, in 8 of number, then in straight strings, of three, of four and more grains…; then the beads of the microzyma strings seem to lengthen, the bacterium itself appears as the fusion, in a way, of all these grains that we have compared to a stick. <Plate 1 at the end of the book fig. 1, 2, 3 - explanations on the next page>. At the same time as these transformations take place, the membrane disintegrates, ..., and its tissue soon appears to be formed only of bacteria.

Cell formation

<Plate 1 fg 5 after the table of contents p.993>

Let's see what happens when the conditions are such that cells are forming.

… The Mother of vinegar is membranous… the microzymas are united there by a unifying material, hyaline. As the cells appear, things happen as if the microzymas were simultaneously consuming and the nutrients supplied to them by the sweet broth and the hyaline matter that unites them, and, clumping together, secreted the matter that formed the envelope, the walls of the cell. This is because while the cells are being formed, the movement of fermentation, which produces alcohol, begins. The point is that cells are not born not in all the mass of the Mother of Vinegar at once; but on the surface first and, little by little, in the depth; so that in the end you have a thin membrane made up of an agglomeration of cells loosely joined together and easily detached from them with the slightest friction. And if you look closely, you see microzymas on the edges of the flaps, separate microzymas, released from the membrane, which come together, and cells are born into the surrounding environment, by the same mechanism.

And it should be noted the independence of the 2 phenomena: the appearance of bacteria excludes the formation of cells proper, and vice versa ... This is also what Mr. Onimus saw: when leukocytes are formed, he does not note any vibrio, and when these appear, there are no leukocytes.

... *<clarification concerning an attack by Pasteur and inconsistency in his experimental conclusions, Pasteur confuses what calls Mycoderma aceti (which does not contain microzymas) with the Vinegar Mother p.473 to 477>* ...

Polymorphism

Polymorphism is the quality of being or a body that presents itself to us in many forms or states. Phosphorus and sulfur are simple polymorphic bodies. A given animal species has its own normal polymorphism which can manifest itself in several ways. The tadpole and the frog are the same species; caterpillar, chrysalis and butterfly are various forms of a lepidoptera. The normal microzyma of a tissue, of a given cell, is, likewise, like an earlier state of the bacterium, and it becomes that completed form by passing through the intermediate forms that I have shown you. ...

… The yeast does not become bacteria; one cell no more; but by destroying itself the cell sets its microzymas free and only then can they become vibrionians if conditions allow ...

...

Role of the cell envelope

… The cell is an enclosed space enclosing content which can itself be organized.

The cell envelope is a membrane that is essentially insoluble in the medium in which the cell is intended to live and function. More often than not, thanks to the insolubility of the envelope, the cell is also insoluble in water, so that more often than not it is possible to observe it outside the medium from which it has been separated.

I told you that the dimensions of the cells were of microscopic dimension: they are always less than 1 mm in diameter, there are some which are less than 1/100 mm, there are some which barely reach the 1/1000 mm….

... Most often, cells that are still young appear, under the microscope, as a homogeneous mass in which nothing figurative can be distinguished. But almost for all, there comes a time when it is easy to distinguish a finely grainy content that has been noted by all observers. Does this prove that these cells are devoid of microzymas? No, this is simply an optical phenomenon; if the refractive power of the microzymas contained is approximately the same as that of the substance in which they are immersed in the cell, they will not be observable; This is how the lens, which is formed only of tubes and figurative elements, is absolutely transparent. - Generally, when a cell has a nucleus and there are no granulations in it, it is in the nucleus that granulations first appear. But when the nucleus itself is not noticed, there comes a time when, in the cell, work is done which makes it appear as a nucleus, and it is in what we can consider as such that the granulations are noticed first, then the nucleus becomes granular: whatever form the cell takes, whatever the deformations or expansions which emanate from it, this is what we will always see.

In the experiments I have cited to you on yeast put in poison or subjected to autophagy, if it is young, if the content is homogeneous, this appearance is exaggerated at first, then the content contracts, and we can clearly distinguish the limited and distinct content of the envelope: a

little later, this mass becomes granular, and we can see the granulations moving in it beyond the outline; finally the whole interior becomes grainy, and the granulations collect together and fall against the walls of the cell. This is what happens with any kind of declining cell; finally the cell itself vanishes, and all that remains of it, as figurative objects, is the molecular granulations. And this is not the result of my personal observations alone, it is that of all observers.

… <Comparative fermentation experiment, intact yeast (alcoholic fermentation) and crushed yeast (lactic fermentation)…

... then other endosmosis and diffusion experiments p. 481 to 485>…

… The boundary membrane of the cell can therefore allow certain substances intended to be transformed there for the needs of the cell, by osmotic diffusion, into the cell cavity; conversely, the same membrane lets out of its cell cavity, by a reverse osmotic action, the materials which have been transformed there. Through the cell membrane, while the cell is functioning, there must be a double current, from outside to inside, and another from inside to outside. Doubtless, it is difficult to directly observe this double current; but it is easy to see this by observing carefully what is happening with the brewer's yeast during the alcoholic fermentation of the cane sugar.

In order for the materials that make up the liquid medium that surrounds the cell to enter it, they must first have the necessary diffusibility, and we know that it is not enough for a substance to be soluble to be diffusible. through all membranes.

Cane sugar, although very soluble, does not directly undergo alcoholic fermentation. As soon as you put yeast in the solution of this body, I have proved it to you, the zythozymase leaves the yeast by osmotic diffusion and will transform the cane sugar into glucose or invert sugar. Then alcoholic fermentation begins, because glucose can get into the cell, into the cavity of every yeast cell, and be transformed there.

In short, yeast, to feed on cane sugar, first converts it into glucose. And when, after this digestion (this is a digestion in the same way as the digestion of starch by saliva) the glucose formed has diffused into the cell cavity, which it has been assimilated, has become a momentary integral part yeast, that under this new state it was decomposed, then the products of its decomposition diffuse in the opposite direction in the ambient environment, at the same time as certain clean and transformed materials of the cell itself: and c ' This is what the disassimilation which follows absorption and assimilation consists. Disassimilated products, it is understandable, do not enter the cell, and this is how the constancy of the phenomenon and the harmony of the function are preserved. This is, in my opinion, the role of the enveloping membrane of the cell; it puts the microzymas in constant environmental conditions: the conditions do not vary, they do not change either form or function.

And this applies to free cells of a determined specificity, such as brewer's yeast, as well as to cells which can only live and function in the place where they are born, in the complex organism which constitutes an animal. or a plant ...

… And now you understand how the brewer's yeast cell is destroyed in poison. This is because the microzymas are placed in an abnormal situation: nothing can penetrate into the cell, since

it cannot form glucose, and that the dextrin, nor the starch are not osmotic for its membrane, they <them. microzymas> transform the very contents of the blood cells; the globules are thus gradually reabsorbed, and everything is resolved into soluble products and microzymas which become free. And this is what happens in the body itself, when after death the cells are in the state of inanition; they are devoured by their microzymas to which circulation no longer contributes anything to transform.

But independently of their chemical role..., the cells play a purely histological role: they serve step by step, and in each organic center, to constitute the tissues where they are joined together by a unifying intercellular substance. The genesis of cells in the body is incessant as well as their destruction; we will draw the conclusion that this is why in the normal physiological state, microzymas are scarce in the fluids of the body.

Genesis of cells in higher organisms

Constitution and formation of the egg

... <Egg seen by Milne Edwards p.488-489>...

... The cell that will be the egg is, from the start, isolated, possessing its individuality. In all the force of the word, the egg is the fruit of a new formation, I would say a creation if we did not know the agents who build it.

I have tried to understand the formation of the primordial egg; Before explaining it to you, we need to know more exactly the constitution of the mature egg, that is to say capable of the evolution which successively produces the embryo and the new complete being. I studied the bird egg in particular. The part of this egg that corresponds to the mammalian egg is the yolk, the yolk.

... It is important that you have an exact knowledge of the anatomical constitution of the yolk of the chicken egg ... we discover hollowed out in the mass, a central cavity (latebra) containing a material lighter than the rest; it has a channel that communicates to the germinal vesicle and the cutricle. So there is a certain anatomical structure in the yolk. The cavity of the latebra contains, like a hiding place, a material which undoubtedly has a different composition from that of the yolk which surrounds it, because in the egg hardened by heat, it is the material of the latebra which coagulates the last. But the yolk cells or globules that we discover there are of the same appearance as those of the yolk ...

... To see them, all you need is a low magnification. But to clearly distinguish all the peculiarities that I have observed, we must use the 5 oc objective combination. 1 of Nachet and sometimes objective 7. It is also important not to dilute the yellow matter in too much water, and it is better to observe it directly in a very thin layer.

I looked for the yolk cells in the yolk, still contained in the ovary of a hen, at various periods of its development, while it is still contained in the stroma of the ovary which it makes bumpy, and when, having become more voluminous, the calyx is clearly detached and suspended from the ovary by its peduncle. The ovum being detached is washed under a running water,

wiped on blotting paper, and broken on the sample holder to collect all of its contents, if it is small enough.

Here is what I observed on a series of eggs, from they were one mm in diameter, until they were over 3 cm:

... <Observations p.492 - 493 and representation plate II at the end of the book>...

... When the ovum has not yet reached 2 cm in diameter, it is possible to discover states of this ovum where there are only molecular granulations; these are the extremes. When the microzymas decrease, the yolk cells increase and vice versa: this is the average state. What is the significance of these facts? This is what needs to be examined in light of the experiences which have led me to assert that microzymas are cell factors under certain favorable circumstances.

Yolk microzymas

Let us first assume, as absolute evidence, that there is a greater abundance of matter in a 30 mm yolk than in a 1 mm yolk, and as, in both circumstances, a taking of the material that contains appears under the microscope as uniformly grainy. It must be concluded that the microzymas, or, if you will, the molecular granulations, have increased proportionally. However, from the start, it is often impossible to discover anything other than microzymas; on the other hand, as the vessels that supply the ovary, blood and lymphatic vessels, do not enter the ovum and do not go beyond the capsule that forms the Graaf's vesicle, it is clear that nothing figurative penetrates through the vitelline membrane in the yolk cavity; it can only enter what is sufficiently osmotic; the histological elements therefore cannot multiply other than by the mechanism which I have tried to discover, by using the nutritional materials which enter them by endosmosis. The microzymas in the yolk of the chicken egg, I have shown you, are organized; they are alive; they contain several species of albuminoid materials, one of which is obviously a zymase; their elemental composition is not the same in the ovum taken from the ovary and in the yolk of the completed egg; while they multiply, they obviously act, in order to assimilate it, on the unorganized nutritive matter which endosmosis brings to them. But where does this multiplication take place? They do not multiply, while they are free since in ova of the same size we can find, in some, only isolated granulations, in others yolk globules all by themselves, without ambient granulations; then in larger cells, again, just microzymas, and then nothing but globules, and so on until the yolk has become relatively large! In short, experience shows that there is alternate formation and destruction of yolk cells. Since these globules then form and disappear, it is probably because they are not essential for the development of the future embryo. They must, however, have a final goal! What is he?

It is here that the theory of cell formation by microzymas finds the first application to the development of the animal organism and to organisms in general.

... there is no spontaneous generation, because nothing happens without anything. The conclusion is compelling: it is the living microzymas of the yolk that make the cells, ...

But what is the purpose of this cell formation? I explained it to you earlier, it is to place the microzymas themselves in a medium that does not vary. In other words, microzymas trap themselves in order to mature. In fact, there is considerable work being done in these cells, made manifest by the changes that we have observed. They grow larger, and a nucleus appears in them; this nucleus divides and the cell ends up having several of them, and these nuclei become granular, then the whole cell becomes granular in turn. It can also happen that, the nuclei having grown, the cell is reabsorbed to set them free, and we can see as in fig. 2, one of these kernels dividing, one half being already grainy and the other half becoming so; finally, all the yolk cells having finished their career, they are reabsorbed, and all the yolk contains only microzymas and oily globules.

... <Observations of Schwann and Reichert p.496 - 497>...

... I noted other peculiarities which prove that even when the globules in question, even when they are homogeneous, that is to say appear of a uniform texture, without interior granulations, these granulations do not exist. less, but endowed with the same refractive power as the environment in which they are immersed, we do not see them.

One way to study yolk cells is through the use of Muller's liquid (a solution of bichromate of potash and sodium sulfate in water). Thus, the homogeneous yolk globules of the drawings concerning the ova still contained in the calyx, become mostly granular when this liquid is added to the preparation; nuclei that were not seen can then be seen if there are any; usually the blood cells get much bigger, sometimes they double in size, break up, and the granules are seen to escape like a cloud.

... <P.498>...

Only one thing seems constant, and that is that the latebra always contains yolk cells until the incubation phenomena that give birth to the embryo begin ...

... In the yolk of the egg, we hardly ever discover ... nucleus cells, neither in the mass of the yolk nor in the latebra; but we have seen that they are observed constantly, at some point in the ovum. Finally, I have never seen this nucleus appear, by means of Muller's liquid, in the yolk cells that have matured in the complete egg.

It seemed to me that the yolk with its microzymas was an apparatus admirably arranged to verify, directly, the consequences which flowed from the experiments on the formation of cells by the microzymas.

... <note that more than a hundred chicken egg yolks were examined at various times p.499> ...

I have already talked about the impenetrability of the yolk membrane to outside germs, even bacteria and vibrios, and also about the difficulty with which yolk microzymas evolve into bacteria. Before showing you these same microzymas as factors of cells, let me, as a final verification of this fact, report yet another experiment of the same kind which will show you at the same time that in certain media the yolk cells can be preserved intact.

... <Experiments p.499 to 505>...

These experiments have been repeated: It is a general fact that the yolk of the egg placed in sweetened water is preserved without apparent deterioration, and that the yolk cells multiply there, becoming larger ...

...

And now there are several conclusions to be drawn from these varied experiences.

1. The yolk microzymas evolve with difficulty into bacteria, either outside the yolk or in the yolk itself.

2. Alcohol and acetic acid are constant products of the egg's stay, or yolk, or microzymas isolated in sugar water ...

3. Yolk cells can be stored indefinitely in a suitably concentrated sugar solution.

4. The yolk cells are formed in the sweet medium, so that the microzymas can completely disappear in the yolk.

5. In the sweet medium, the globules formed do not regress, probably because under the conditions of the experiment the medium does not change quickly enough.

6. Yolk cells are not identically the same in the eggs of different birds.

7. The mechanism of the formation of these globules is the same, physiologically in the ovum and in the egg; extra-physiologically in the egg, or in the isolated yolk that is placed in sugar water.

8. It is probable that it is in the yolk cell that the microzymas effect the chemical transformations of the materials which circulation brings to the ovum; transformations which result in the production of lecithin, fatty substances, albuminoid materials specific to the yolk that do not exist in the blood; coloring matters and glucose, some of which are used for the multiplication of the microzymas themselves in the cells which are growing. Hence the more general consequence that the yolk cells perform in the ovum, during its development, the same role as the cells in the glands and in other tissues.

...

So I firmly believe that it is demonstrated, on the one hand, that the yolk microzymas are the factors of the yolk globules and, on the other hand, that these microzymas multiply, mature in this globule and become free again by its destruction ...

...

Here is the constituted chicken egg; what will become of the organized elements that we observed there, when the egg is incubated either by the hen or in an artificial incubator? We searched for him, Mr Estor and I, in a work that dates back to 1870 and which we published in 1872.

Microzymas during embryonic development

After having recalled the facts of cellulogenesis that you know, we announce that we propose to examine the role of microzymas during tissue development, and we demonstrate their presence in all anatomical elements during the early stages of the embryonic life of the chick.

You remember that at a given moment, one discovers in the yolk, in fact of figurative elements, only microzymas, and that these microzymas disappear or are dissolved under the influence of acetic acid and potash in tenth in aqueous solution. There is some change in this regard during incubation; microzymas that are not in the developmental sphere of the embryo still disappear with acetic acid and potash; but in the embryo, they are usually resistant to acetic acid, and at some point in some centers also to potash. Throughout the embryonic period, according to the experiments I have reported, they should be able to be followed during the development of each tissue. And, indeed, we have seen and pursued them in connective tissue, blood cells, muscles, nerve centers, glands, etc.

... <Observations at the different stages of development p. 508 to 512>...

... And there is no need to hesitate, because in all this work we surprise the microzymas behaving as we have seen them behaving in the yolk to form the yolk globules, in the sweet yeast broth when those of the crushed yeast or those of the Mother of vinegar generate the cells of the alcoholic ferment! They come together, collapse into a sphere, and together, they secrete an envelope, and the cell is formed! I repeat, this is the immediate result of observation, not the product of a preconceived system. Microzymas are cell factors; and they are also able to produce vibrio!

...

My task would be finished here, since I have led you, starting from the study of atmospheric microzyma and chalk, to that of the microzymas of plants and animals that I have shown you evolving into bacteria and performing their highest function, which is to constitute the tissues of the bird, and consequently of all animals and of man! But you must insist, in order to make you see that the new theory of cellulogenesis agrees with a certain number of previous observations which they explain, and in order to guard against what some people may tell you that this theory is not new.

Anatomy reveals to us ...

... Pushing the anatomical analysis further, Bichat distinguished, in these organized systems, simpler parts, which he considered to be the elements of the organization: these elements are 21 in number in his classification. The impetus given to the scientific movement by Bichat was immense. It is from him that the truly scientific history of fabrics dates. But there is something simpler in Bichat's tissue, which the microscope alone has enabled to discover, it is the cellular element, what has been called the element of formation, the last organic unit, beyond which there would be nothing more organized. You know we stopped too soon ...

It is not, however, as you know, that histologists did not see the microzymas; as molecular granulations, they described and drawn them in tissues, in and around cells. They were even

made to play a role in cellulogenesis, but a purely mechanical role, not as gifted and organized.

Nothing is stranger than the attempts to explain the birth of the cell. ...

... <Overview of theories p.514 to 519>...

... <Experiment: observation of a dead fetus p. 519 to 520>...

It has been said that vital action must not, in the final analysis, be thrown beyond the cell: it is to pronounce prematurely. The cell is not the permanent histogenic element: its existence being transitory, it cannot be considered the vital unit. Beyond the cell, there is the microzyma; this forms the cell, and it remains when it is destroyed. Microzyma is immanent when compared to the cell; it is he who is the support of vital action, of life; it is he who is the primordial organized element.

10th conference

The considerations by which I ended the previous conference were like the summary of the doctrine that I have expounded from the beginning ... You must insist more, in order to fully penetrate you with the truth that so many facts bring out, namely: that the microzyma is the only permanent anatomical element of the organism, that in which is concentrated all the physiological and chemical activity, and, to put it simply, the vital activity of this organism. And, if so, I can make the following postulate, which so many proven theorems make legitimate, namely:

Microzymas are at the beginning and at the end of all organization. They are what an organism, a cell, a tissue, is alive. More generally still: any organism is reducible to microzyma.

In order to have this postulate as necessary and demonstrated, and to be able to legitimately deduce from it all the consequences, not only those relating to general and particular physiology, but above all to pathology, it is necessary to combat the prejudices that are made. penetrate people's minds two famous theories: the cell theory and the theory of blastemas and protoplasmas, which are currently in possession of answering the 2 questions below:

"What is it for a living being to be organized? "

"What is living matter? "

....

Cell theory and its insufficiency.

... According to Küss and M. Virchow, the cell is "the organic element per se (in itself)" "the vital action emanates from this element. ". The cell “is the last morphological element of all vital phenomena; and the vital action must not, in the final analysis, be rejected beyond the

cell... The living element is only active as long as it presents itself to us as a complete whole, enjoying an existence particular. "

... In pathology, he said <R. Virchow>, we can lay down this great law: There is no new creation, it does not exist either for complete organisms than for particular elements.... Likewise in physiological and pathological histology, we deny the possibility of the formation of a cell by a non-cellular substance. The cell presupposes the existence of a cell (omnis cellula a cellula), ...

... Yes, assert with Mr Virchow that spontaneous generation is a pipe dream and that everything that is organized proceeds from what already is. Only, we are going to investigate whether the cell is the essential organized element and whether the vital action emanates only from the cell ...

... <Following Virchow's theory p.524 - 529>...

This is like the summary of cell theory: on the one hand, the cell is represented by the membrane and by the nucleus; but this nucleus and this membrane are, according to M. Virchow, endowed with no activity, and the properties of such cells are related to those of the content which is variable. On the other hand, it is difficult to understand how the cell can owe some of its properties to the substance that is located outside it. However, this nucleus, which is supposed to be devoid of activity, would nonetheless be the starting point for the alterations which manifest in the cell. In addition, Virchow recognizes that there are transient cells, those that can lose their nucleus! We hardly understand how an autonomous element can be transitory, and how the nucleus, which is one of the characters without which the cell does not exist, can be lost. And, there are other cells which are as transient as the blood cell: I showed you that. All of Mr. Virchow's book is there to show us how much the cell can vary, and we can deal with histology treatises that have a chapter devoted to cell destruction. And I don't intend to go into the history of the vicissitudes of cell theory here: cells without an envelope formed only by a nucleus surrounded by a protoplasm; cells represented only by the nucleus, etc.

The cell is therefore not the essential, primitive anatomical element of tissues, which physiology and chemistry alike need, and omnis cellula a cellula is not the statement of experimental truth; this is a hypothesis that has not been fully tested.

... <Schwann's system: blastematic formation of the cell p. 531> ...

Organic atoms

Henle had protested against Schwann's system, according to which the cell is the result of crystallization; and to convince you that Henle considered the granulations to be organized, I will read you his Schwann rebuttal:

"... Things happen in a very different way in many cases: the nucleus develops at the expense of the granulations, these merge or become fluid, and the operation is therefore precisely the

reverse of that which takes place in the crystallization, in which solutes become solid. If now we wanted to admit that the cell and the nucleus are secondary forms, and if we pretended to consider elementary granulations as organic crystals, we would have to object that these granulations themselves are already composed of 2 united substances, not chemically, but only in a mechanical way, the albuminous envelope and the fat droplet included. The analogy between cells and crystals therefore boils down to the fact that both are bodies of determined figure, which are deposited in a liquid; ... "

...

“We have arrived at this result,” he said, “that the organism is composed of a certain number of elementary parts, monads or organic atoms, which, dominated and held together by a power withdrawn from our means of investigation, s 'arrange and develop in accordance with a type... These monads are endowed with particular forces, because a common source, the yolk or the blood, is enough to form and nourish all the cells, each according to its species. *<p.533 ref (1)>.* "...

"General anatomy, to be the science of the effective elementary parts of the body, should therefore today start from these monads, start by studying their structure, formation, forces, chemical and physical properties, then give birth to them tissues, which are nothing but aggregates of a multitude of homogeneous elementary particles. "

Certainly the organic atoms of Henle are nothing other than the molecular granulations of the authors ...

... <The cell according to Küss p. 534 - 535>...

... But Küss, while being one of the creators of cell theory, ..., taught us that it is a transitory organism, constantly forming and destroying itself, without explaining otherwise as to the cause of its destruction.

... Of the theory of blastemas, Küss has never spoken to us except to combat it; mechanical theories of cellulogenesis, he didn't want to hear about. In short, Küss must be considered as the precursor of Mr. Virchow; it was his doctrine that I was nourished throughout my medical studies.

The cell and microzymas

So I was ill prepared for the construction of a different theory, to discover the primitive organized element, the one from which the cell proceeds. So it is little by little, by deduction, that the new doctrine developed, which I continue to develop before you. However, everything must not be inaccurate in cell theory. I do not dispute the considerable role of the cell, but I say that this role is secondary; the cell is only by the microzyma, is governed only by the microzyma. But from the fact that the microzyma forms the cell, initially, it does not follow that it cannot reproduce.

Certainly a cell can come from another cell, it is an established fact; Moreover, the cell alone can constitute an organism; there are beings who are reduced to the cell and who live and reproduce in a unicellular state. Speaking of transient cells, according to Küss, these were those that function in higher organisms, of which they are necessary secondary elements; necessary both as a structural element and as dual-function devices: chemical and physiological. These kinds of cells can develop, live, function regularly, only in the place and the environment which sees them being born or transformed; some of them, when the function is performed, are destroyed and disappear without return: they do not reproduce; the egg, the sperm cell for example, or the spermatozoa that are born there: we will come back to these particularities later.

Brewer's yeast and other analogues are single-celled organisms. How they differ from the cells of higher beings, plants or animals!

Brewer's yeast is a living cell which, in the fermentable medium capable of providing it with all the nutritional elements it needs, can organize others which, having become independent, in their turn, become mothers of a numerous lineage. . However, morphologically, yeast cells do not differ substantially from cells found in more complicated organisms. And is it not worth noting that by multiplying in this way, they retain, along with form, the function of the mother cell? There are protozoa which are in the same case: the special authors have described the various modes of multiplication. Higher organisms contain cells that can reproduce in either of these ways. There are therefore organized beings whose structure is very simple and who live without vessels and without a nervous system.

Some animal tissues, even the most highly organized, have no capillaries or nerves, and over large areas they do not have cells; these tissues are in a way isolated in the organism of which they are part and are only united to neighboring tissues by contiguity: they are nevertheless alive! what then is the organized element capable of preserving their faculty of living?

But all the cells of the organism and each in particular, in each center of organization, have their individuality, their existence and their distinct and proper functioning; none communicates directly with the capillaries of the vascular system or with the nerves. In short, each has its own autonomy: the red blood cell in the blood, the hepatic cell of the liver, the pancreatic in the pancreas, the gastric in the stomach glands, etc. just like the brewer's yeast in the brewer's brew or the microzyma or bacteria in the medium that can feed them. And each of these cells, in its center or in the appropriate medium, lives, that is, acts physiologically and chemically as a device in which the materials in the medium are transformed. Yes, of course, the cell is an important part of the organization! But, once again, it is a transitory organism, which does not fulfill the conditions of the essential, autonomous organized element, having life in itself by primitive destination, that philosophy seeks.

I repeat that essential element is microzyma.

Microzymas represent those elementary parts, monads or organic atoms that Henle was looking for without finding them; they are those primordial elements which, "dominated and held together by a power withdrawn from our means of investigation, arrange and develop according to a type. When I distinguished the microzyma as a figurative ferment, I knew

nothing of Henle's works, nor did I know the organic molecules of Buffon or the molecular granulations of the authors. Even after having studied medicine, for a long time, I considered them to be vulgar ferments, and with Mr. Estor I first regarded them as the germs of bacteria; that was only part of the truth. Only later did I understand the great scope of their role, their physiological and pathological significance ...

Have confidence, and be reassured that many, Mr. Pasteur in the lead, reject microzyma only to mislead the opinion of those who are indifferent and then to appropriate the ideas and facts; already they call the microzymas of various names; they thus impose it on those who do not go back to the sources. It would only be a denial of justice if they did not mix up some serious and fearful mistakes. Despite everything, these attempts constitute proof of the reality of the theory. Yes, have faith, the doctrine that flowed from the discovery of microzymas is the doctrine of the future; what am I saying, it is already the doctrine now! Let's try to prove it.

The egg and the cellular system

... let us penetrate more deeply into this idea, that the cell destined to become the egg is an individuality already distinct from the stem individual and that it has no other factors than microzymas having acquired the necessary aptitude.

And first, this cell is very different from all other cells, in the way it is able to perform its function. It is constituted and develops in a special organ which, itself, is constituted slowly and which its special function has called the ovary; when this cell has gone through all the phases of its development smoothly, has reached maturity and formed the ovum, all is not finished; it must be fertilized, that is to say, the assistance of another organism which contributes a new contingent of organic matter. In short, to become the egg capable of reproducing a being similar to its parents, the egg needs the agreement, the consensus of the 2 activities. Yes, the egg is a cell, but by this summary table, you see that we cannot say that this cell proceeds from another cell by continuity.

...

... the animal comes from 2 cells. And this is a law that applies to all higher beings.

... <Different theories p.539>...

... Consider the egg already formed in the ovary of the hen. We saw, in the last conference, that the yolk microzymas multiply and mature in the yolk cells, by a kind of incubation. The yolk, before becoming the site of the transformations brought about by fertilization and embryonic development, is therefore a device in which cells are constantly formed, then their melting to set the microzymas free, etc. At one point in time the egg contains absolutely nothing but molecular granulations. If therefore, in the ovum a cell were produced which would be the origin of the future ovum, this cell would already be, like all cells, the product of the activity of these molecular granulations or microzymas. This conclusion would certainly be legitimate. But this cell does not exist in the ovum, even fertilized, as we have seen, since 24 hours after the start of incubation, only molecular granulations are discovered in the mass of the yolk and in the nascent tissues of the chicken. .

No doubt, the work of modern embryologists has taught us, it is already in the egg that has developed and has become the fetus that the cell destined to become the ovum appears; but this onset is late, it is preceded by the formation of the apparatus in the tissue from which it is to be born, and this formation is itself preceded by particular organs, destined to disappear after giving birth ...

... <ovarian formation continued p.541 - 542> ...

Küss, in his lessons, taught us that the essence of cellular life is, in addition to rapid proliferation, equally rapid destruction or death in the living being itself, whose structural unity remains despite these incessant changes. . However, let us not cease to remember that what is transitory, what disappears in order to reproduce itself, cannot be the vital unit. And then how can cell theory be brought into play in the genesis of tissues where we have never seen cells: such as the vitelline membrane, the anterior and posterior elastic laminae of the cornea, the capsule of the lens.

… *<Blastema theory p.543 to 545>…*

This is <speaking of the theory of blastemas> the absolute negation of the cell theory, it is the same for the theory of protoplasm ...

… *<Theory of protoplasm p.546 to 555>…*

... The theory of microzyma is able to complete the definition of blastema and protoplasm and to bring together the demands of reason and facts. The facts of anatomical generation without the immediate intervention of pre-existing cells are too indisputable for the blastema not to conceal what prevents it from being maintained that these elements, cells and others, are the fruit of spontaneous generation. The blastema and the protoplasm contain, I have argued several times already, something organized, structured, living, which is the microzyma; it is he who is, according to the mechanism that I have explained, the producer of cells and tissues without cells; and these microzymas, we have recognized them in all tissues, ab ovo, endowed with chemical and physiological activity. It is they who are the cause of the "continual transformations" invoked by M. Van Tieghem and in whom lie the "virtues of transformation" admitted by M. Pasteur; they are also the histogenic factors of the tissues; it’s not just me supporting it, you’ll be convinced of that.

Applications of microzyma theory prior to its discovery

Liégeois, in his treatise on physiology, applied the histogenic ideas of M. Robin. Mr. Grasset, currently professor at the Faculty of Medicine of Montpellier, looked there for facts to prove that the microzyma is indeed the initial organized element which produces the egg.

To demonstrate this proposition, says Grasset, I will rely on the descriptions of authors who were unfamiliar with microzyma and its role, who simply described things as they saw them, without taking sides.

According to Mr. Robin, we first see a granular mass; in this mass the granulations condense and form a nucleus. "The nucleus (I quote Liégeois verbatim, Traite de physiologie, p. 229) is surrounded by granulations united by amorphous matter (vitellus). Soon this mass is surrounded by an initially excessively thin envelope (vitelline membrane); then the nucleus becomes granular, then vesicular (germinal spot and germinal vesicle). "

It couldn't be clearer: in the beginning, microzymas and nothing but microzymas. They come together, settle, secrete an envelope, etc.

After all, should we not say that the first embryonic state of man is microzyma? "

But for the egg thus formed to become the egg, microzymas of 2 origins are needed. It is not enough that the egg is formed, it has to be fertilized.

The organized element which must complete the egg by fertilizing it, the spermatozoon, is also born in a particular glandular apparatus, which is like the ovary, and which is called the testicle, a gland of very complicated structure and richly vascular. which also originates in Wolff's body, etc. The testis contains a multitude of tubes, called seminiferous tubules, which are filled with cells, many of which are intended to produce the fertilizer element, the sperm (zoosperms, spermatozoa, sperm animalcules, zooplasts).

The cells in which sperm are born, not more than the egg, do not come from a pre-existing cell. In young subjects, these cells contain only finely granular material, mixed, in adults, with fatty granulations. It takes a long time for sperm to appear there, because it is only after a certain period, which varies with the species of animal, that sperm cells produce them. The authors investigated by what mechanism. All agree on one point: it is that the spermatozoon is born in a cell where previously there was only a content, blastema, finely granular protoplasm, and that a cell, at least in some animals, can produce it. many. I now give the floor again to Mr Grasset:

“And,” he says, “the origin is exactly the same, if, instead of looking at the egg, we take the sperm as the starting point. On page 195 of Liégeois's Traite de physiologie, there is a figure which represents, according to Godard, the development of spermatozoa. It really looks like the author wanted to represent the ideal type of tissue development by microzymas. And of course Godard and Liégeois cannot be suspected, when it comes to the theory of microzyma, of having seen only what they wanted to see. They show admirably first isolated granulations, then these agglomerated granulations without an envelope; then with an envelope; then squeezing inside, they form the sperm head, etc. Liégeois admirably saw and depicted the tail in the frog gradually forming into a string, then into a stick, always by the addition of granulations. “We see, he says, moniliform filaments due to the juxtaposition of these granulations. "

And he concludes by saying: "Our observations have led us to admit, like Godard, that spermatozoa, in all the animal series, are formed by the aggregation of a certain number of granulations. "

In other words, we cannot say better than humans, and in general all animals, come out of the microzyma.

The microzyma is therefore truly the vital unit, since it is both the last anatomical element of our tissues, the first term in the animal series and the embryonic principle of any organism.

It is therefore with the greatest reason that microzyma must become the basis of a complete and new theory for normal histology and, consequently, for pathological histology. "

I would add that it is impossible, by carefully considering the figures which in Liégeois's book represent the spermatozoa of the frog, not to think about the bacterial evolution of microzymas. In making this remark and this connection, I assure you that I am in no way violating the thought of the author. Listen **:**

“Frogs have this unique feature, which we believe is unique, is that sperm are found in their testes at all times of the year. However, their development, their form, are essentially different in winter and in summer.

In winter, round cells are found in testicular sperm, always containing a very distinct nucleus, in addition to numerous granulations distributed within these cells. It is at the expense of these granulations that the sperm is formed; in certain preparations, in fact, one can observe in the cell the presence of moniliform filaments, due to the juxtaposition of these granulations *(p. 196-199*).

In other cells, many more numerous than the first, there are bundles of straight and coiled sperm, and these cells have only a very limited number of granules. In all cases, the nucleus of the cell remains intact, and therefore does not contribute to the production of sperm. At some point, the cell breaks, and the bundle of sperm it contains escapes. While this bundle has abandoned its cell, the spermatozoa remain united by one of their ends with the granulations which were not used for their formation. These granulations are, moreover, animated by extremely rapid movements which tend to dissociate the filaments; it is these which, without a doubt, have been taken by the authors for the heads of the spermatozoa. But the spermatic filaments of the frog are headless, they appear as tapered filaments at their 2 ends, more taper on one side than the other, on the side that corresponds to the direction of movement ...

As a result, in batrachians, spermatozoa develop in winter inside the sperm cells; in summer, inside the pits; but that in all cases, their development takes place through the union with each other of the granulations contained in the cells or in the nuclei. These granulations are therefore the most essential elements for the formation of spermatozoa; they acquire an even greater degree of importance, when one considers the phenomena they present, whereas, not having served for the origin of spermatozoa, they left cells and nuclei. These granulations, liable to take a certain development, while remaining more or less rounded, move like the spermatozoa, with extraordinary rapidity. If they are still in relation with the heads of the filaments condensed into bundles, they seem to make an effort to dissociate them from one another; if they are completely free, they perform the most bizarre and singular movements in all directions indiscriminately, movements very different from Brownian movements. Finally, we can often see in the sperm of the frog, observed in summer, that the nuclei do not always lead to the formation of spermatozoa; large granulations replace them, and these granulations escape from the nucleus, carrying with

them a part of the substance of this one, preserving in a way the movement which the spermatozoon should have possessed, if it had been formed at their costs (Pl III fig. 4 and 5). "

… The spermatozoon is the product of the microzyma: just like a bacterium, a vibrio, a cell. Liégeois provides me with a further demonstration of this.

... In short, the male organism produces fertilizing matter by a mechanism comparable to that by which the female organism forms the ovum; and for the fertile egg to form, a certain amount of fertilizing matter must unite with the matter of the ovum; ...

... Suffice it to say that this penetration was observed directly and, moreover, that the spermatozoa, which have reached the yolk substance, disappear there so that no trace is found. I sought to directly demonstrate this resolution of spermatozoa into microzymas in yolk material; but there are great difficulties there which do not yet allow me to pronounce myself definitively.

... In short, for the egg to form, there must be microzymas of both origins, those of the ovum and those of the sperm cells of the same animal species. And this point of view will explain many things to us in the physiological order and in the pathological order.

… *<Other examples where microzymas in action are described p.563>…*

… But that's enough; with what I told you in the 3rd conference, you now have the elements of the reasoned conviction that none of the systems successively invoked or adopted by scientists: mechanical theory, cell theory, blastema or protoplasm theory, is able to account for physiological facts concerning the genesis of cells and to explain the mystery of generation.

The theory of microzyma, on the contrary, results in a great unity. Microzymas are structured and alive; they can multiply and communicate to the matter which is used for their multiplication the property which is in them, the chemical and physiological activity which characterizes them, because they transform this matter into their own substance and that it becomes what they are. In the organism, the cells, all the cells, are first of all the fruit of their activity, and these cells, in turn, being constituted, I repeat, are devices in which the microzymas acquire new abilities, in undergoing a kind of incubation, while they multiply: this is how the yolk microzymas become microzymas of the liver, microzymas of the pancreas, microzymas of pepsi cells, nervous microzymas, microzymas which, at a given moment, will acquire the fertilizing property in the spermatozoon, etc.

These are not gratuitous assertions, but established facts….

Let us now affirm that the theories which are current in science, were powerless when they claimed to answer the 2 questions:

"What is it for a living being to be organized? "

"What is living matter? "

We will try to give the answer, based on all the facts concerning the history of microzymas and in accordance with the demonstrated propositions that justify my postulate.

Living matter and organization

In all the courses of these conferences, I have reasoned on the assumption that microzymas are organized, structured; and this pleonasm is necessary, since it is admitted that there can be organization and life in unstructured matter called blastema or protoplasm, that is, in an assembly of purely chemical principles.

However, scientists, in considering protoplasmas and blastemas as living substances, although formed only of water and a greater or lesser number of various chemical compounds, are very embarrassed, so much does the notion of life seem to them to require something. more than the purely chemical properties in the matter they consider to be living. This is why everyone, seeking the cause which makes living matter differ so profoundly from purely chemical matter, adds to the latter something extrinsic. Therefore :

Mr. Robin supposes that the chemical components of the blastema are united molecule to molecule, by special combination and reciprocal dissolution. ...

Cl. Bernard, after having said that the protoplasm is a chemically defined body, as though embarrassed by the enormity of the assertion, resumes and adds: "or at least, by its physico-chemical constitution. "He had moreover expressed his view more explicitly:" Wherever there is matter, this matter is subject to the general laws of physics and chemistry; but in living things, the action of these laws is closely linked to a host of other influences that cannot be denied <ref. p. 565>. "

M. Pasteur supposes that the purely chemical matter of the protoplasm is endowed with virtues of transformation which heat destroys. And his disciple, Mr. Van Tieghem, recognizes in it a path of continual transformation.

As you can see, when they look at it closely, the physician, the physiologist, the chemist, recognizes that there is life only in what is different from purely chemical compounds.

It must be maintained, as a demonstrated thing, that there is only life that is organized; that living matter is organized matter. This is what I will show you. But first to avoid any amphibology, let's see what the meaning of words in biology is ...

... <Definition of the words “organize” and derivatives p. 566>...

This is what the dictionaries say. Organizing matter to make it fit to live, to be animated, is to shape it and arrange it into organs like the artist shapes and arranges the organs, the cogs of a machine .... And organization is the clever arrangement of parts towards a specific goal.

Organization and ability to live are correlative things for the subject. The conditions of manifested life are the organization and the appropriate environment from which the organism borrows the elements of its nutrition.

Organization presupposes parts, organs, and hence structure; and you have just seen that dictionaries call the matter that is organized organic.

I have to draw your attention to the amphibology to which the word organic lends.

... <P. 567>...

But you know that, since Lavoisier, organic matter is no longer considered to be of special essence. It is mineral by its components. The immediate principles of animal or plant origin are combinations of carbon, hydrogen, oxygen, nitrogen, united 2 to 2, 3 to 3, 4 to 4, the carbon always present. They are called organic matter because of their origin, and they are studied in that part of science called organic chemistry by the processes and methods of inorganic chemistry. The immediate principles can be acids, bases, alkaloids, amides, salts.... Far from defining them by their origin, we should call them not organic compounds but combinations of carbon, because this simple body is the constant and necessary element of the composition of any immediate principle.

There is therefore no organic matter by essence: all matter is mineral by its components....

... No doubt, the matter of organized beings, as a whole, contains several of these immediate principles, but associated with immediate purely mineral principles: a lot of water, ...

... <Quotes from J. Muller and Liégeois p.569-570>...

Thus, organization, that is to say the state of an organized body, results from the competition of immediate organic principles, I mean more or less complex combinations of carbon, and immediate mineral principles. This is the matter which can live, which lives and which, without the help of any other factor, will generate an epithelial cell, a fiber, any anatomical element and, consequently, an ovum, a sperm cell, a spermatozoon. , an egg, a man! Because, weigh carefully the terms used by J. Muller and Liégeois, and you will recognize that the consequence is ineluctable.

Is it true, is it experimental? Organic matter, conceived according to these systems that I have just mentioned, and with the scientific notion of the exact nature of what is called the immediate principle, can it be considered a living substance? No, certainly, since each of the terms of which it is composed is mineral in essence and we do not say that there is living mineral matter. Let's make it obvious ...

... Let's go back to Mr. Pasteur's experiment on blood ...

Blood is one of the most complex mixtures of immediate carbonaceous ingredients and mineral compounds that the body provides. By the arrangement of his experience, M. Pasteur did not destroy there the virtues of transformation which by hypothesis he concealed, because he did not apply heat to it, and he put it in the presence of pure air. , that is to say in the conditions most favorable to the life of the blood.... Well, this mixture left at physiological temperature, what happened to it? ... He's dead, in that the red blood cells and white blood cells are gone and nothing has replaced them. In short, Mr. Pasteur's experience goes straight against the hypothesis that protoplasm generates anatomical elements. Quite the opposite has happened; I explained to you that the microzymas of the globules and those which originally existed in the blood destroyed these globules and produced the observed transformations. I add, for having carried out the experiment, that if one takes care to dilute the blood in the water and that by a careful filtration one removes all the microzymas, after a

sufficient addition of creosote or carbolic acid, the materials of the blood are preserved indefinitely.

Here is a second example: it concerns the materials of the chicken egg.

The fertilized chicken egg, to be sure, contains everything needed to produce not only a chicken, but at least the cells and other anatomical elements of that bird; provided it is provided with sufficient clean air and a determined and substantially invariable degree of heat, the bird will be born!

If one comes, with strong enough shaking, to mix everything in this egg and then subject it to incubation, what will happen? Chicken will never come out again, and the most knowledgeable man will not be able to give it its first texture. ... You even need less than that: let the incubator let the unscrambled egg cool a little, it's over, there will be no birds. All the necessary material is there, however. So what goes on in the scrambled egg that is incubated? Was what was alive in him killed? No, but he acted under other conditions: instead of forming tissues and determining the chemical reactions necessary for the formation of the substances which must take place during the further development of the animal, he acted on his own behalf, Selfishly: he fed himself, multiplied, and other combinations were engendered. In short, the microzymas of the yolk of the egg acted as the ferments act and we have seen, something very worthy of attention, the alcohol, acetic acid, carbonic acid, hydrogen released or formed. , were at the expense of glucogenic materials and egg glucose; the albuminoid substances are found substantially intact.

... *<Continued on p. 572 to 574>...*

Composition of microzymas

The microzyma is organized, structured; it is morphologically defined, to speak like Cl. Bernard; it is endowed with multiple activities: chemical, physiological and histological. In the 7th conference, p. 372, I let you know their basic composition ...

... the elemental composition of the microzyma in the egg, in the liver, in the pancreas is more or less similar to that of brewer's yeast and albuminoid substances. Immediate analysis reveals fatty substances and minerals. And the more careful analysis of the microzymas of the chicken egg yolk has revealed several albuminoid materials, one of which is a zymase ...

... The composition of microzymas in their physiological state admits 80% water in their tissue. They therefore satisfy by their composition all the conditions of life.

MM. Nencki and Schaffer cultured the microzymas of the pancreas in semi-fine gelatin, that is, impure and containing salts. They have multiplied and partially transformed into bacteria ...

.... <analysis p.577>...

.... <more -> p.590>...

11th conference

A microzyma, if he could speak, parodying the poet, would be written: I am organized and I am alive; nothing that is organization and life can be foreign to me! Indeed, you must be convinced, the microzyma is really organized; and it is living from a triple chemical, physiological and histogenic point of view; in it are summarized all the notions that we possess concerning matter. The protoplasm, the blastema, considered as essential living matter, are alive only by the microzymas they contain; the cell itself, constituted in the state of organ or independent organism, is the fruit of the life and of the energies of the microzymas which formed it: it is transitory and, when it is destroyed, or when it is destroyed, its microzymas reappear with the ability to reproduce or evolve into bacteria, depending on the conditions in which they are placed; and these free microzymas summarize certain activities of the cell. The postulate which I formulated at the beginning of the tenth conference is demonstrated by a series of decisive experiments, which have been verified by several scientists, even those whose minds steeped in current scientific prejudices, balked the most against the evidence! ...

... <series of considerations on the organization according to the different theories p. 592 - 593>...

... The transformation virtues which are not linked to the morphologically defined organization are nothing, and Mr. Pasteur may defend himself against them, he is just as good as Mr. Joly and Mr. Pouchet, a sponteparist without knowing it !

... These are no longer the somewhat vague questions that Needham and closer to us Pouchet were asking! It is the spontaneous birth of the microzyma that must be demonstrated. It is at this point that my research has reduced the problem of tissue genesis of higher beings as well as infusoria, ciliates and non-ciliates and microphytes. Without microzymas, no organization, and without structured organization, no life: this is what must be accepted today as the expression of absolute truth.

... *<another fermentation experiment from Méhay, taken up by J. Béchamp showing the activity of air microzymas p.596> ...*

Yes, the atmospheric microzymas which fell into M. Méhay's almost mineral medium adapted to it and, pass me the expression, using the materials they had on hand, they carried out the synthesis of cellulose and nitrogenous matter, etc., which they needed to multiply and to evolve into vibrios, then into bacteria ...

Yes, this wonderful virtue of adaptation to environments, microzymas, their vital resistance, their durability, I would say gladly, explains how and why they are rot-proof how we meet them in chalk, in many limestones and other rocks , in several mineral waters, in the soil and even, as M. Le Ricque de Monchy has demonstrated, in commercially available baking soda.

Here we are brought back to the solution of the problem of the origin of microzymas, since this experience, like so many others, shows us them possessing an independent existence with a powerful physiological activity.

And on this original question, I don't want to raise a metaphysical discussion. I will remain in the realm of observation and experience by researching with you where atmospheric microzymas come from.

These are proven, verified, controlled facts: Yes, there are atmospheric microzymas, and there are geological ones:...; and all living beings contain it, not accidentally in this or that point of their organism, but necessarily since they are the agents of the chemical actions which take place there, the factors of cells, the builders of their anatomical elements and of all their fabrics. And these microzymas, which were confused under the name of molecular granulations, amorphous material supposed to be without structure and without life...; which scholars only cared about to declare its insignificance; who had no place in their doctrinal theory; Yes, these microzymas have their place today, a very large place, in the sun of science! They even impose themselves on those whose preconceived systems they interfere with!

And all these microzymas of such diverse origin, endowed with variable chemical activity, have a common ability: that of evolving to appear in the form of bacteria and all the morphological states, vibrios, amylobacter, which precede the bacterial form. Finally, it is thanks to these microzymas that I was able to explain the experiences of the sponteperists, which Mr. Pasteur left without explanation ...

... *<Long talk about Pasteur's false talk about microzymas in order to ridicule A.'s theory. Bechamp p. 598 to 605>...*

Origin of atmospheric microzymas

It is very important to know whether those in the atmosphere are of special species made on purpose and unrelated to the microzymas of organized beings, plants and animals of all kinds?

.... <P. 607>...

By researching the origin of atmospheric microzymas, I will perhaps be able to dispel the misunderstanding that is in the minds of many scientists who, unlike Mr. Pasteur, seek truth without bias.

... <Explanations on researchers' confusions between microzymas and Hallier's miccrococcus p. 608 to 613>...

The micrococci are ultimately only plant productions which, far from being the necessary anatomical elements of animal organization, are only accidentally hosts and harmful hosts: indeed in his Parasitologic research (Parasitologische untersuchungen) M. Hallier claims to find them in smallpox, vaccinia, scarlet fever, cholera, typhus, etc.

... <P. 613 to 616> ...

Synthesis of organic matter

Thanks to Lavoisier's immortals and especially to the work of M. Dumas, who made them known to us and who demonstrated their experimental reality, we know that, in the general system of the living world, plants are, thanks to a marvelous activity , the place where mineral matter becomes organic and gets organized. Animals feed immediately or directly on the organic and organized matter of plants, assimilate it after having subjected it to some modifications by digestion and constitute their tissues by appropriating it. Plants therefore have the final function of synthesizing the organic matter that animals consume. Plants are therefore synthesis devices which, during a phase of their life, feed on mineral matter which they draw from the air, water and soil.

During their life, animals constantly return from the atmosphere the organic matter they have borrowed from plants: carbon in the form of carbonic acid, hydrogen in the form of water vapor, free nitrogen or combined with hydrogen, or with hydrogen and oxygen in the form of ammonia or its derivatives, etc. ; on the ground, purely mineral matter, in the form of sulfates, chlorides, fluorides, phosphates, carbonates, silicates of the various metals of the organization.

Without animals, plant matter would constantly accumulate, and plants would sooner or later perish for lack of food, by clutter or otherwise. But without plants, animals would soon all perish from a terrible famine; organic nature itself would disappear entirely in a few seasons.

For the harmony of the organized world, it is therefore necessary for all organic matter to become mineral again.

Animals burn a large part of organic matter, by a completely physiological phenomenon. They operate as if they were analytical devices: just unlike plants.

But it takes after death; animal matter, in turn, disappears and returns to the atmosphere and the earth. What is the agent of this necessary and total destruction?

Destruction of organic matter

During life, the agents of respiratory combustion are the anatomical elements of the organization and in vertebrates especially the blood cell. With their help, oxygen constantly burns organic matter in body tissues and fluids. But, after death, what is the agent capable of communicating to oxygen, without the aid of a high temperature, its oxidizing properties and, thanks to its help, of returning to the elements the organic and mineral matter of animals? , which, otherwise, would accumulate and make life impossible?

Lavoisier supposed that fermentation was responsible for bringing about, in part, the return of organic matter to the mineral state, and, in speaking to you of the physiological alterations of urine and of the fermentation of urea, I will tell you I would say that M. Dumas admitted very clearly that it was a ferment supplied by the organism itself!

The total destruction of living beings

You know that there are two opinions on the subject of the ferment or the ferments which bring about total destruction.

• One, that of Mr. Pasteur, wants that after death, there is nothing more living in the body. The cause of the return of organic matter to the mineral state is external to the animal and, moreover, he recognizes that this cause is discontinuous; it is to deliver such a necessary phenomenon to the chance of panspermia!

• The other, mine, you know it: the animal, like any organized being, carries with it the initial cause of organization, of life, in the physiological and chemical sense, of disease and total destruction. after death. It recognizes that the Creator did not leave anything to chance in the admirable system of the circulation of matter in the living world.

It is by studying the transformations, histological and chemical which take place in a tissue withdrawn from the airborne germs, that I was able to definitively demonstrate this great law and discover the microzymas that remain after the total destruction of an organism. . I will briefly summarize what is scattered in these lectures; we will then discover that atmospheric microzymas are nothing other than the microzymas of destroyed organisms.

... The "air germs removed" fermentation of the eggs and that of the liver is accompanied by the release of gas: it is a mixture of carbonic acid and hydrogen; the law of this release is as follows: carbonic acid predominates first, then becomes roughly equal in volume to hydrogen, then predominates again, hydrogen decreasing.

The eggs and the liver provide alcohol and acetic acid, and the phenomenon, for the eggs at least, is prolonged, some butyric acid. In the fermentation of the liver, there is also lactic acid.

Glucose and organic matter disappear.

The albuminoid substances and the fatty substances apparently remain unaltered or little modified.

The cause of fermentation for eggs was none other than normal microzymas, which were found unprocessed. For the liver, there were no other organized forms than microzymas, strings of microzymas and the bacteria that result from their evolution.

For meat things are the same; ...

These facts have been fully confirmed by MM. A. Gautier and A. Etard. These chemists operating on several hundred kg of horse and beef meat ...

.. After this first phase coinciding with the release of nitrogen, other products appear, characterizing the putrid fermentation. Then all gas evolution stops, the work of decomposition ceases, the muscle partly retains its color and shape, and seems to have passed to a rot-proof state.

I would add that MM. Gautier and Etard noticed that the large bacteria at the start disappear, replaced by very small bacteria, often tremulous, and with a refractive head, straight or sinuous, mixed with punctiform ferments (microzymas).

So the liver and muscle, separated from the bulk of the animal to which they belonged, are therefore not listed in the order of dead substances, since bacteria appear there, which are living organisms; their essence is not completely changed, since the microzymas that produced alcohol there during life, produce the same alcohol and acetic acid there for a while. But why do these microzymas become bacteria under these conditions when they are not found in the same organs and in any tissue of a healthy organism? And why do the bacteria of the first phase disappear to be replaced by new ones and by punctate ferments (microzymas)? The question will be examined later. Beforehand, it is necessary to cite another experience of MM. Gautier and Etard. They also studied the fermentation of fish flesh. The phenomenon is a little different.

The learned chemists, by operating on 60 kg of flesh of scomber scrombus, noticed that the mass became alkaline from the start; very little hydrogen was given off 4 to 5% and 96 to 95% carbonic acid; then on the 16th day, almost pure carbonic acid: and the muscle mass continued to transform more and more.

It is unfortunate that the authors of these important observations did not say anything about the organisms involved during the fermentation of fish flesh; but we must be grateful to them for recognizing that the transformations… are due to a ferment of its own. It is in this way that the truth will gradually come to light, that we will no longer believe in spontaneous transformations, in the doctrine of alteration, and in the essential necessity of the germs of the air to explain putrefaction. meat, etc.

.. <p. 621> ...

It is about understanding that under the conditions of my experiences, as in those of MM. Gautier and Etard, a complete return to mineral matter is impossible. Consider alcoholic fermentation in a vacuum, not allowing the intervention of airborne germs ...

… <Explanation of chemical reactions p. 622 - 623>…

So, to return definitively to the mineral state, organic matter needs several successive fermentations, as M. Dumas had so clearly expressed, and I add that it is necessary to intervene several fermentations, in various conditions. Animal matter after death destroys itself by itself, thanks to the microzymas of its tissues, violently placed in a new situation. But this destruction, which annihilates the organization, only results at first in the transformation of a small quantity of its carbon and its hydrogen, into carbonic acid, into water and into free hydrogen, coming from the glucogenic material. or substances called carbohydrates. At the same time, other still organic combinations are born which remain with the albuminoid matters, which one said, with Liebig, to be so alterable and which are then more or less transformed themselves, without changing in their essence, by the microzymas which have become bacteria. In order for the albuminoid substances to be burned in their turn, they will undergo new transformations by other ferments, but in short, as in alcoholic fermentation, the new substances and the ferments would remain in the state they have reached if one new influence intervened: what is this influence? It is none other than oxygen, as I just told you about the destruction of acetic acid!

Everyone knows that, from a corpse buried in the ground, most generally, only a little dust remains: ... from the coffin itself, soon nothing remains! And what resists the longest are the bones, the organs least rich in microzymas, or those whose microzymas are endowed with the least activity!

But if the corpse has been embalmed or has been kept at a very low temperature, the microzymas are silenced, and the organic matter is conserved somehow indefinitely.

So let's just deal with the case where the destruction actually took place and note what remains of the corpse material. This will be the way for us to show you that the microzyma is the only element of the organization whose life persists after the death of the individual that it served to build, and also to discover the source of the atmospheric microzymas.

... <"burial of animal and extracted organs" experiments in carbonate lime, remains analyzed after several years p. 624 to 628>...

So let's conclude all these facts so well linked:

1. That the only non-transient anatomical elements of the body which persist after death and which evolve to form bacteria are microzymas.

2. That it occurs in the organism of all living beings, at a given time, in some part, even of man: alcohol, acetic acid and other compounds which are the normal products of the activity of what are called organized ferments, and that for this production there is no other natural cause than the normal microzymas of this organism. And this presence of alcohol, acetic acid, etc. in the tissues, reveals to us one of the causes, independent of the phenomenon of oxidation, of the disappearance of sugar in the body, of glucogenic materials and of what Mr. Dumas so aptly called respiratory foods.

3. That, spontaneously, that is to say without the help of any external influence other than a suitable degree of heat, a part withdrawn from an animal: eggs, milk, liver, muscle, urine; or to a plant: a seed which germinates, a fruit which ripens being detached from the tree, etc. ferment. The first fermentable material that disappears in an organ after death is glucose, glucogenic material, or some other compound called a carbohydrate, which is respiratory food! And the new compounds which appear, are the same which occur in alcoholic, lactic, butyric, laboratory fermentations or during life ... _ I have demonstrated that brewer's yeast, while it is destroyed by autophagy, produces leucine, tyrosine, etc. However, MM. Gautier and Etard have proven that analogous products are formed during spontaneous putrefaction of meat, demonstrating the functional analogy, at one point in time, of microzymas in yeast and animal microzymas evolved into bacteria, etc.

4. That it is thus shown once more that the cause of decomposition after death is, in the organism, the same one which acts under other conditions during life: Know: microzymas capable of becoming bacteria by evolution.

5. That the microzymas, before or after their bacterial development, do not attack albuminoid or gelatinogenic materials until after the destruction of the so-called carbohydrate materials.

6. That the microzymas and bacteria that have effected the transformations we have discussed, in closed devices, in the absence of oxygen, do not die; they return to rest, like brewer's yeast in the products of the decomposition of sugar that it has produced.

7. That it is only under certain conditions, and thanks to the intervention of oxygen, as in the experiments of the little cat buried in carbonate of lime or under other conditions, following new fermentations, that the microzymas or bacteria operate the final destruction of plant or animal matter, reducing it to carbonic acid, water, nitrogen or very simple nitrogen compounds, or even nitric acid, that is to say nitrates!

8. That it is thus that the necessary destruction of the organic matter of an organism is not left to the hazards of causes foreign to this organism and that, when everything has disappeared, the bacteria and finally the microzymas result from their regression , remain as witnesses that there was nothing originally alive except them in the destroyed organism. And these microzymas which appear to us as residues of what has lived, certainly still possess something of the activity, of the sort of specificity, which they possessed during the life of the being destroyed: this is how microzymas and bacteria residues of the cadaver of the kitten, were not absolutely identical to those of the liver or heart, lung or kidney.

And so that this theory does not take on the appearance of a preconceived system in your eyes, let me assure you that I do not mean by that that, in the destruction carried out in the open air, on the surface of the ground , other causes do not contribute to hasten them. I have not denied that what are called air germs or other causes are at work; I'm just saying that these causes weren't made on purpose for that; what we call germs in atmospheric dust are nothing other than the microzymas resulting from organisms destroyed by the mechanism that I have just exposed and whose destructive influence is added to that of the microzymas specific to being endangered! But it's not just microzymas in atmospheric dust; spores of all the microscopic flora can intervene, as well as all the molds that can arise from these spores; and that's not all: M. Dumas drew the following striking picture of the thousand causes which disperse and destroy organic matter: ... *<p. 630> ...*

... <Pasteur's theory, putrefaction: only causes germs in the air, then he asserts that it starts with vibrios in the intestinal canal p.632-633> ...

We can see that Mr. Pasteur did not do any medical studies or an autopsy, otherwise he would not have written something so obviously inaccurate… Mr. Ch. Robin has no trouble either. to show M. Pasteur's error: he expresses himself like this:

"... because if after death, gases begin to develop, as in living organisms, as a result of continued chemical modifications of the intestinal contents, it is quite certain that the presence of bile prevents the putrefaction of this content and of its container. The blood in the vessels, the spleen, the stomach, the liver, and even sometimes the lung and heart, putrefy before the intestine itself, both in the case of death from disease and from submersion ... *<p. 634>...* ”.

So it is exactly the opposite of what Mr. Pasteur thinks that is true. Moreover, Mr. Pasteur is wrong to attribute exclusively to the germs of the air the presence of infusoria in the

intestine; we know that, if there are any of this origin, the greatest number come from the microzymas of the oral mucosa, the stomach and the intestine itself, as will be more fully demonstrated by looking at microzymas in diseases....

Oxidation phenomena

... I have been led to wonder why oxygen acquires such great oxidative energy in the human body, or in animals with red blood.

We know that the red blood cell absorbs oxygen and condenses it; I have admitted that the oxygen thus condensed acquires the oxidizing property in the blood cell, in the same way as it acquires it through the sponge or platinum black. So the blood cell is the necessary apparatus for respiratory function.

... <Pasteur's hypotheses refuted by M. Berthelot p. 636 - 637>...

M. Berthelot's assertion relating to the fact that fermentation by brewer's yeast takes place very well in the presence of free oxygen, resulted from a work in which I had proved that fermentation, other things being equal elsewhere, lasts longer when, from the beginning, the air is eliminated from the apparatus by a current of carbonic acid, and the quantity of acetic acid decreases on contact with air and increases, on the contrary when from the beginning, we remove the air. And to make the demonstration indisputable, I performed fermentations, while, by a current of the pile, I decomposed the water in the presence of the sugar and the yeast. Oxygen from the decomposed water was absorbed and carbonic acid was given off along with hydrogen. And I have proven that sugary water absorbs oxygen just as well as yeast.

But the higher organisms are all so made, that all the functions of their tissues are accomplished within liquids impregnated with oxygen: there is oxygen in the milk, there is in the liver, in the liquid. muscle and into the urine. The cells, the microzymas of all these parts are therefore, to use the expression of M. Pasteur, aerobic: despite this, there is alcohol in the milk, in the liver, in the meat, in the brain and even in the urine, and alcohol is indeed a product of fermentation. But after death, while putrefaction is taking place, in closed vessels, the oxygen disappears, it is given off with the carbonic acid of the hydrogen, a little hydrogen sulphide, and combinations are formed which can directly like the latter, absorb the oxygen that may have remained there: it is therefore the aerobic microzymas that started the fermentation!

... Let's get to the bottom of it.

What M. Pasteur does not yet see are those admirable harmonies, the astonishing reality of which an attentive study of the phenomena reveals to us every day; the learned chemist always appears to me as an indiscriminate finalist, when he persists in considering organisms, such as brewer's yeast, bacteria, microzymas which he calls microbes or micrococci, as beings created for a specific purpose , forming a separate category among living beings! Possessed as he is by his system, he cannot imagine that any organized being exists for itself first. ...

We have considered in beings that are improperly called ferments,

• The chemical function through the zymase that it can secrete, and which it uses to prepare its environment;

• And the function of nutrition which is the condition for the formation of this zymase as well as for the conservation of its being, of the individual it constitutes.

... In beings reduced to the state of cells ... as well as in the cells of more complicated organisms, where the division of labor reaches its final limits, as in man, we can consider 2 higher functions: the function of conservation and the multiplication function, which are laws. These functions are purely physiological ... of all beings without exception.

... The conservation function

But in the functions of preservation and multiplication, the function of nutrition is understood as a means, and it is here that chemistry can help physiology.

The spirit of the system admits for each species of fermentation a special ferment: there would be an alcoholic ferment, a lactic ferment ... and I only hear about organized ferments here; what if I wanted to add the unorganized ferments or zymases, which were believed to be independent of these? ...

The first time that I spoke out against the system of specific ferments, it was in a letter to Mr. Dumas of December 2, 1867, on the occasion of the fermentation of alcohol by the microzymas of chalk.... In this action these microzymas did not change appearance ... they formed caproic acid and acetic acid! However, the ferments resulting from one of these operations, having been mixed with a cane sugar solution,... formed in 3 months 340 g of lime lactate, a little butyrate and acetate; and the ferments resulting from this operation just as easily operated the fermentation of the starch poison, producing butyric acid and acetic acid! ...

... <Example in which Pasteur could have made this observation p.640>...

So it is very precisely that I could write ...: "We have proof that the microzymas in chalk are not specific ferments; usually there are none; what there is are organisms that cause or effect transformations dependent on the food provided to them. "

In short, an organized ferment is a living device, the chemical function of which can change correlatively with the species of fermentable material that it is forced to consume, and the environmental conditions in which it is forced to act.

... <examples of adaptation to conditions p.641-642> ...

Vital Resistance

But the faculty of adapting to environments is all the more accentuated, as the organism is of a lower order, simpler in its organization, closer to the microzyma, so that there are some which are not even killed by desiccation.

... <Examples of drying - high temperature - extreme cold p.643-645>...

Let us therefore conclude from all these facts that lower beings have a very great ability to adapt to environments; that those who are at the bottom of the scale can dry out, undergo very wide variations in temperature without perishing, that is, without losing the faculty of manifesting again all the attributes of life. This explains very simply why microzymas are found alive in chalk, in street dust and in the air.

I spoke to you mainly about the total destruction of an animal organism; but this theory is applicable to plants, since they are also formed by microzymas that can evolve into bacteria, which are able to act as ferments: there is no exception. And we must not imagine that the return of bacteria to microzymas can only happen with the help of oxygen. There are other conditions for this regression. I have more than once made sure that the best characterized bacteria, leptothrix itself, developed in a given medium, with the devices remaining closed, after a few weeks or a few months, were reduced to microzymas. But we will come back to these facts from a pathological point of view.

... Animal and plant microzymas have other properties in common.

Action of organic and organized matter on oxygenated water

...< p. 646 à 656 > ...

Careful study of these interesting phenomena has enabled us recognize:

1. That all organized matter does not give off oxygen in hydrogen peroxide;

2. That organized matter which possesses this property owes it to its microzymas, which at the same time undergo some alteration in their substance;

3. That organized matter or microzymas lose the property of liberating oxygen from hydrogen dioxide by the action of a rather high temperature and, perhaps, by the influence of certain to agents, of acid. hydrocyanic, for example;

4. That the cause of the release is not the same in a microzyma or an organized substance, and in a metal or certain oxides;

5. That organic matter, the immediate principle, operates the release, even when it has been heated to a temperature capable of effecting some modification in it, as happens with hemoglobin which coagulates and becomes insoluble;

6. That among the characteristics of certain organized substances and certain microzymas, we must count their property of releasing oxygen from hydrogen peroxide.

Fibrin and its microzymas, after having exhausted their decomposing activity, no longer fluidify poison and no longer give rise to bacteria. Could it be because the microzyma was killed there, that the zymase, which in the microzyma thins the poison, has been destroyed? We should not rush to conclude.

Indeed, I made sure that the sialozymase and saliva, mixed with hydrogen peroxide, saccharifies the starchy matter with as much intensity as without this addition, and that the

oral organisms, well washed with a large excess of the same water oxygenated, are almost as active as before this treatment.

On the other hand, the yeast that has undergone the action of hydrogen peroxide inverts the cane sugar.

... <Experience p.657>...

You see the yeast is not killed; and here we have new proof that alcoholic fermentation is not life without air. Yeast is neither aerobic nor anaerobic since it also copes with life with oxygen and without oxygen.

...

What is the origin of atmospheric microzymas?

It has been shown that all the organs of all currently known living beings, plant or animal, without exception, including those referred to as ferments, bacteria and others, are, by regression, reducible into microzymas.

Since I discovered microzymas: in my experiments on the inversion, which was thought to be spontaneous, of sugar water; in the air, in the molecular granulations of fermentations and various natural liquids, such as wine, milk, urine, etc. ; in the tissues and organs of animals and plants; I looked for them wherever it was rational to do so as a consequence of the theory, namely: in rocks other than chalk, in cultivated land and compost, in the virgin land of the scrubland of the Hérault department, in the mud of the marshes, in the dust of the streets of our cities! I have found them in several mineral waters, either isolated or in masses believed to be anhist, as in Molitg's glairine; and I am convinced that if we looked well, we would find it in the waters and mud of geysers and muddy salzes or volcanoes: the nature and origin of glairine guarantees me the validity of this opinion.

In the rocks of Quaternary, Tertiary, secondary and transitional grounds included in the periods of formation called Homozoic, Neozoic and Paleozoic, they represent the living remains, of various beings which lived in these remote times. I have even been able to meet real living bacteria in some fairly modern freshwater and marine limestones!

In the cultivated land and in the soil studied on site in the mountains around St Pons in the Hérault, where it is not uncommon to discover bacteria with microzymas, they come from fertilizers, plant detritus that s' develop there and perish there every year.

In the mud of the marshes, they are, in the same way, the result of the decomposition of the vegetable and animal matters of the plants and animals which live there and die there. And in these swamps, they operate fermentations resulting in swamp gas or methyl hydride, alcohol and acetic acid that I have distilled from it.

In the dust of the streets, they come from animal and vegetable detritus of all kinds spread everywhere, but above all from the droppings of horses and other animals that roam them! In the streets of Montpellier, especially these macadamized boulevards with limestone rocks, and the roads which lead to it, microzymas are so abundant that this limestone dust

constitutes one of the best lactic and butyric ferments; diluted in water, these dusts ferment directly and provide alcohol, etc. !

To the microzymas of the current total destruction, we must add the microzymas of the total destruction of the geological ages which come today from the natural and incessant degradation of certain rocks in the depths of the earth, which are brought to the surface by the water. source; as well as those made free by the crushing of these rocks in their applications in art, industry, agriculture.

Finally, we must not neglect the microzymas that are set free during the incessant desquamation that takes place on the surface of the bodies of all living beings!

These are the microzymas from all these diverse origins that the wind spreads, by the billions, at every moment, on the surface of the earth and in the air around us!

These microzymas are associated with the spores of the microscopic flora: algae, fungi, etc., and the microzymas which can emerge from them. But, as I have already noted, the number of these spores is negligible compared to that of microzymas; as for the eggs of ciliated infusoria, you don't even have to worry about it.

It is not without interest to point out to you, right now, that among these microzymas are necessarily those of all beings who have died from the most diverse pathologies!

The free microzymas of the atmosphere, the water, the earth, therefore come from animals and plants of all kinds, healthy and sick, dead or alive; from the various organic centers of these beings; having already passed to the state of bacteria or not; it is conceived after that that there are several chemical functions and unequally capable of evolving into bacteria or of producing cells under various conditions. But all have the characteristics of physiological indestructibility, of adaptation to environments, of vital resistance that we have recognized in the most inferior organisms.

Undoubtedly the microzymas, while passing by various intermediate forms can evolve into bacteria; but it must also be remembered that this singular property, the microzymas of the different organic centers, at different ages, do not possess it to the same degree; which will lead us to recognize that the microzymas, morphologically similar, differentiate over time, changing function or acquiring new ones in the different organic centers.

...

Are microzymas plants or animals?

... I have always responded by saying that "Microzymas are plant in plants; animals in animals; since they constitute what is originally alive in each other, ... "

... <Reflections of Pasteur, Robin, Dumas, Bichat p. 661 to 669>...

Certainly M. Bichat was right. And things are so, because in animals, as well as in plants, the microzymas are, ab ovo, the living units per se, without which the chemical, physiological, histological functions which are manifested in them, would not be . We have recognized that

there are in animals and in plants organic centers which are irreducible as to function; however, as many organic centers as many distinct microzymas, not morphologically, but functionally! In short, the microzymas constitute the links of the two kingdoms. Certainly there is unity of plan and functional differentiation by the microzyma. Theoretically, there is only one living kingdom: and, as in an organized being a new function manifests itself, a new apparatus is constituted by microzymas which acquire new properties therein: a consideration on which I will insist in the next conference by developing the notion of change of function in microzymas, a notion of which I have already made you feel the importance.

12th conference

Everyone has the idea of what is called a living being. But few have the idea of what the organization is in its essence. We have the vague notion of the thing, without being able to specify which are, in the living organism, the parts "from which the vital action starts", as Mr. Virchow puts it. Likewise, we have the idea of health or illness, without being able to define exactly what both consist of.

... <Doctrines solidism and humor, etc. on the disease p.670 to 677>...

... We must conclude that it is in something which is not simply chemical matter, but which is organized, living, that we must seek what can become sick, that is to say who can suffer some modification in its way of being and its function.

Yes, if we were formed only of purely chemical matter, we would be imperishable as well as all matter, because in nature, materially, nothing is created nothing is lost: the substance of a crystal which is destroyed is not is not destroyed, it can always reform the crystal, identically, individually what it was before. What disappears when destruction takes hold of us is more than matter, which of indestructible essence will never identically reproduce the same individual, to whose organism it had only been lent. It is as organized and living individuals that we fall prey to disease and death. But to be the prey of death, isn't it physiologically still to be the prey of life? since total destruction, of course, is only possible thanks to the help of what is physiologically and chemically alive in us and which persists after death! Yes, everything being organized is destined to be the prey of life!

... <P. 677 to 679>...

Change in function of microzymas

I insisted on the fact that in the egg the microzymas are endowed with certain determined properties and that they acquire new ones during the embryonic development itself, while they build the cells which proceed to the construction of the principal systems. of organization... From this set of facts obviously results the notion of change of function of microzymas, notion to which I now want to draw your attention in a very particular way, because it will make us understand, which is of capital importance in pathology, that the microzyma can become morbid, capable of acting morbidly, of communicating the morbid state which is in it and, what is more serious, of keeping it for a longer or shorter time.

... in the healthy and living organism, we never see the bacterial evolution of microzyma; I say in the body, that is to say, in the privacy of its tissues. ... in the pathological state, one can understand all the phases of the bacterial evolution of microzyma.

We already have the experimental notion of the fact of the conservation of the function; we have already learned this by noting that the microzymas of the pancreas, stomach, etc., act, in the free state, in exactly the same way as in the gland. Finally, oral microzymas evolved into bacteria act on poison as before evolution! But the function can also be exhausted and lost,

without causing the bacteria or the microzyma to cease to live and to show some activity in another direction.

...

But the whole history of microzymas, such as it results from these conferences, does it not lead us to regard as demonstrated 2 propositions that can be formulated like this, namely:

"Microzymas, morphologically identical and personally organized ferments, have, in each natural group of beings and for the same organism in each center of activity, something specific which is characterized by function. "

“Since in the organized being everything proceeds from the egg from the point of view of histological elements, it seems obvious that, parallel to the anatomical evolution, there is a functional evolution which results for the pancreas, for example, in the very remarkable properties of these microzymas in adults. "

These 2 propositions should be regarded as fundamental; to make them obvious, we are going to retrace our steps for a moment.

It is obvious that the egg and the seed can be studied as the starting point of the organization ...

... *<reminder on the development of the embryo from microzymas alone (if the development conditions are met) p.681 - 682>* ...

These are the first facts that show us microzymas changing first of all in property and even in function. And as these changes are accomplished in them, the organic centers are constituted more and more, and the new being, from the embryonic state, passes into the fetal state and later little by little becomes adult while all organic centers acquire the fullness of their function and activity; so that, the functions being all definitively established, the new apparatus will in its turn produce an ovum and an egg which will reproduce the same phenomena under the same conditions and the same order, so that the circle of organic development is perfect!

Now compare the microzymas of the different centers of organic activity with each other and with those of the egg. You know how considerable their differences are when it comes to hydrogen peroxide: the microzymas of the yolk only release oxygen extremely slowly; those of the lung, blood, liver possess this property to the maximum; it is less in those of the pancreas; still less in those of the nervous glands; none in those of the gastric glands, bone, periosteum, cartilage, etc. I'll tell you more.

The microzymas of the pancreas are among those which most firmly establish the notion of change of function.

These microzymas do not acquire their full properties and functions until quite late. Now, since they are in the pancreas from the fetal state and they do not have the activity there that they will have later, we can say that there are fetal pancreatic microzymas and that there has adults. These are the ones I want to tell you about to complete their story.

Their elemental composition is more or less the same as that of the microzymas of the liver, only a little less rich in carbon; but while these are white or faintly colored, their centers containing only traces of iron, the microzymas of the pancreas are brown, and leave highly ferruginous ash upon incineration. That this difference in the elementary composition explains the differences in properties, it is possible, but does not go against the notion of change of function, since the one and the others have for common origin those of the yolk!

Microzymas in the liver differ from those in the pancreas functionally in their action on both starch and albuminoid material. This is their slightest difference; the largest is due above all to a physiological phenomenon of very great importance: the pancreatic microzymas, introduced into the circulatory current, exert a harmful influence that those of the liver do not have.

Microzymas in intravenous injections

MM. E. Baltus and J. Béchamp injected dogs with pure pancreatic microzymas, of those which had been used for my experiments; they had been washed with ether to get rid of all traces of fatty substances and again with water, and enjoyed all their digestive power with regard to albuminoid matters. From 5 very consistent experiments, it was found that death occurs almost immediately when the proportion of microzymas reaches 1 mg per kg of animal. The only lesions observed were congestion of the digestive mucosa mainly, congestion which can, in some cases, lead to blood suffusion. It could be objected that death had occurred, as happens when we inject purulent bodies into the veins: cells, leukocytes, etc., by agglutinating, can produce capillary emboli in the lung, brain, etc. Therefore, death, instead of being the result of the specific influence of the pancreatic microzymas, would only be due to mechanical effects.

...

To establish that the action of the pancreatic microzymas is personal, they performed the same operations under the same conditions, with liver microzymas. These had been isolated in the same way as thoseof the pancreas,…. But at the same dose and even a little higher, their injection was perfectly harmless!

Here then are the microzymas of 2 neighboring glands which, in this new respect, differ prodigiously.

However, they have a common origin, since they were originally in the same egg. Yet there they are absolutely formidable, here absolutely harmless.

But here is a counter-proof extremely worthy of attention; the pancreatic microzymas, of such great harmful potency, are capable of losing it in a very remarkable circumstance.

Influence of the bacterial evolution of pancreatic microzymas on their harmful action in intravenous injections

The pure pancreatic microzymas having digested a certain quantity of fibrin, the mixture was left in the oven until the nutritive fermentation developed; hydrogen sulfide was released, putrefaction products appeared, and microzymas in fibrin and those in the pancreas evolved into bacteria. Microzymas and bacteria, having been separated and washed, were found to be deprived of their normal transforming power with respect to albuminoid matter. However, this mixture of microzymas and bacteria, injected into the veins, in equal or even higher doses, produced no incidents.

We must therefore rule out the hypothesis of a mechanical action to explain death by normal microzymas. It was not as a foreign body that they hurt and killed. But, since after the phenomenon of fermentation they ceased both to operate the digestion of albuminoid matters and to be harmful, cannot we suppose that they acted, in the normal state, precisely by virtue of of the force that is in them to produce pancreasymase with the blood materials. Let's try to figure this out.

Intravenous injections of albuminoid material, gelatin, diastase and pancreasymase

... <Experiments p.686 to 688>...

I have said that intravenous injections of normal albuminoid materials are harmless: yes, within the limits of the amounts employed in the experiments by the authors. But if the dose significantly exceeds a certain ratio with the kg of animal, death may result from the injection, as well with the blood serum, the casein, as with the milk, because, in short, these substances constitute for the animal, matters foreign to its blood which lead to a certain dyscrasia which can only be tolerated within certain limits. Unable to eliminate the excess foreign matter that it cannot assimilate, the animal succumbs. Gelatin itself, which however is not excreted in the urine, may not lead to death when the dose is not too much greater than 0.55g / kg dog; there is discomfort, vomiting, diarrheal stools, but the animal is recovering. It is because there is in him a certain power of resistance, of tolerance as the doctors say, which allows his microzymas to adapt, for a time at least, to the environments that are made up of them.

Certainly, one should be cautious in interpreting the results obtained by experiments of this kind; but the harmful activity, in such a small dose, of diastase and pancreasymase is certainly due to their particular nature and not to a mechanical cause. Is it not visible that the morbific and chemical functions, to the nearest intensity, are the same in the pancreatic microzyma, and in the pancreasymase that it secretes, so that it is difficult to distinguish what comes back specific to the producing agent and the product? For my part, I am struck with astonishment when I see 1 mg of pancreatic microzymas per kg of dog, bringing about death, when it takes 15 centigrams, that is to say 150 times more pancreasymase, to produce the same fatal result! Why this difference? Isn't this because the microzymas, acting on the materials in the blood, exerted the activity they manifest in the original gland on the same materials, thus producing a sufficient amount of pancreasymase to cause death?

...

In the meantime, these facts oblige to recognize that the most serious disorders, even fatal, can be caused by living organisms, pre-existing in the living organism, where, normally, they perform necessary and beneficial chemical and physiological acts, but which introduced into the blood, in a medium which is not intended for them, provoke the formidable manifestations of the most serious morbid phenomena.

It has now been demonstrated that microzymas can acquire new properties, exercise new functions, in the very organism that originally contained them, in the egg from which they came. It is thus understood that the microzymas are morphologically identical and functionally different, and that it is possible that the microzymas of a given center of activity, cannot be introduced with impunity into a living environment which is not intended for them.

And it is also shown that a harmful microzyma can become harmless under certain conditions by changing its function ... And we will have the opportunity to show that it is so in other circumstances, for other microzymas. ...

… And in order to proceed from the known to the unknown, from the simple to the compound, we are going to study a subject that I have already indicated to you when speaking to you, about the formation of zymases, the ammoniacal fermentation of urea and urine. (*See 7th conference, p.333*)

On ferments and fermentations of urine, in the physiological state and in the pathological state

... I will only deal with human urine. The history of urine assumes an exact knowledge of the entire urinary tract, from the renal veins and arteries, the kidneys, the ureters, the bladder, to the urethra and its meatus as well as that of the function itself….

But from the point of view of microzyma theory, you need to get a clear idea of what urine is.

According to all the facts that I have quoted to you in the course of these conferences, and the doctrine which connects them, the human organism is constituted by an aggregate of anatomical elements arranged in centers of more or less activity. complexes, in which each group, each cell, each microzyma, lives, nourishes, develops, or separates and wears out in a particular way. Each group, each cell, each microzyma constitute as many devices where matter is transformed by a phenomenon comparable to fermentation. Each cell, each microzyma, in the general aggregate, has an independent existence, and its environment. It is in this environment that each one draws the elements of his nutrition after having prepared them by means of his zymase, as if he made his environment with the aid of the materials which the blood brings to it. But the elements that each cell or microzyma absorbs, after having been used, are returned, transformed, to the surrounding environment. But these transformed materials would accumulate around these cells and microzymas and interfere with their normal functioning, things would happen as with brewer's yeast in alcoholic fermentation: at the start of such fermentation, the phenomenon is accomplished with intensity; but alcohol, carbonic acid, etc. accumulating in the mixture, it slows down, although the amount of glucose to consume is still plenty! If we could take away the alcohol and

carbon dioxide, etc. as they occur, and providing air to the yeast, it would work smoother! Well, what we cannot do for the yeast, admirable dispositions realize it in the animal aggregate: the used products are immediately removed, while the blood brings, with new materials to be transformed, the necessary oxygen. to the regularity of the function! It is in fact in an environment which is constantly oxygenated, that the cells and microzymas take up the complex organic materials that the blood brings to them, and they break them down suddenly or little by little and bring them back, by splitting them or by oxidizing them by simpler compounds or even in the state of carbonic acid, water, urea, & c. ; That is to say, more and more, in the mineral state.

This is how the chemical acts that take place in the privacy of the being are reduced to the phenomena of fermentation! This is why the glucogenic materials and the glucose can disappear from the organism other than by a phenomenon of oxidation ... As for the albuminoid materials ... they undergo there splits as a result of oxidation which give rise to a crowd of compounds less and less rich in carbon and more and more oxygenated ...

... <Table of products in carbon equivalent p. 693>...

... At the same time... part of the mineral matter is released. Regardless of the explanation, that is the general phenomenon of disassimilation. But the disassimilated products, in a given center of activity, obviously no longer able to serve as food for the cells and microzymas of the center, or to be transformed by them ..., are taken up by the blood, which carries them to other centers. where the simplification is accomplished more and more.... This is how bile acids, after having undergone a first doubling during intestinal digestion, are reabsorbed to be used for new reactions, and to be reduced to simpler compounds, less carbonaceous. It is after all these simplifications that the blood carries the products definitively unfit for the maintenance of any of the anatomical elements of the organism, towards an admirable apparatus which, by an elective filtration, leads them into a reservoir which collects them for throw them out.

... <4-step description of the urination function defined by Ch. Robin p. 694> ...

Urine is necessarily a very complex mixture,.... Urine also contains the products of the proper function of the kidneys, adrenal capsules, bladder lining, prostate, and urethral canal. Among these products there is one that cannot be considered, strictly speaking, as a product of disassimilation; it is nefrozymase, which does not exist in the blood and is probably a secretion product of the microzymas of the kidneys. Finally there is the bladder mucus, on which we will have to dwell.

About the very complex composition of urine and its history, I want to tell you only what is necessary to know to explain to you the causes of its ammoniacal fermentation in the bladder. This will be an opportunity for us to show that this internal fermentation is linked to the change in function of the microzymas of the urinary tract, and this will lead us to the study of microzymas that have become morbid.

... Urine's characteristic and most abundant immediate organic principle is urea.

... <History p.696>...

But the origin of urea in the body was not explained and, therefore, something was missing from the theory of respiration. Following a lesson from Küss in which this learned professor showed us the shortcomings of this theory about urea fermentation, I undertook the research which led to the solution of the problem. As a result, albuminoid and gelatinogenic materials, that is to say all plastic nitrogenous materials in the body, produce urea when oxidized under the influence of potassium hypermanganate ...

... <Experience p. 697> ...

When one abandons, as I have done, for a very long time even, an albuminoid substance in contact with oxygen or air, it does not oxidize appreciably, that is to say very little oxygen is absorbed. So it is not oxygen, in its ordinary state, that is the oxidizing agent. In the body, it is thanks to special anatomical elements, that is, microzymas, that oxygen becomes able to act like that of potassium hypermanganate.

... <Urea in the chemical sense p.698 - 699>...

Human urine, in its physiological state, has an acid reaction ...; its odor is special, only becoming repulsive, ammoniacal, urinous when altered.

Urea is the most abundant nitrogenous compound in urine ..., apart from the many other nitrogenous bodies it contains, hippuric acid and coloring matters must be specified.

... <P. 700 - 701>...

The authors believed for a long time that the urine contained some albuminoid matter only in the pathological state; It is a mistake that has caused a lot of confusion. But I have shown that the most normal physiological urine, of all ages, contains an albuminoid substance which is in the order of zymases.

In fact, human urine thins the poison and saccharifies the starchy matter; and if the filtered urine, well separated from its mucus, is precipitated by a sufficient quantity of concentrated alcohol, it forms a precipitate which, washed with alcohol and wrung out, largely dissolves in water. The aqueous solution contains the active ingredient, because although neutral, it acts on poison like urine itself; this material which I named nefrozymasis, because various considerations, now irrelevant, as I will tell you, made me admit that it is formed in the kidney. The blood of a general bleeding, venous and arterial blood therefore, does not contain zymase capable of saccharifying poison. It is therefore when passing through the kidney that the urine becomes loaded with nefrozymase. ...

... <Control: dog urine collected from the ureter p. 701> ...

... Nefrozymase does not interfere with cane sugar.

Nefrozymase has the general properties of albuminoid materials ...

The amount of nefrozymase varies greatly even in the most normal physiological state;

... <Physiological variations p. 702>...

But it is in the pathological state that its variations are most significant. Pregnancy, all other things being equal, increases the dose.

...

Regardless of the nefrozymase and accompanying materials, it contains what is called urine mucus ...

… *<Study by Berzélius p.703>…*

Debris from the bladder lining has been noted in the mucus of normal urine, and that is it; we will see that there is still more.

But before telling you about the microzymas that can be found there, it is necessary to tell you what we knew about the cause of the ammoniacal fermentation of urine!

On the ammoniacal fermentation of urine

Urine has been known to putrefy from time immemorial, and Fourcroy had seen urea turn into ammonium carbonate in it. As to fermentation, it was unknown;

...

Pure urea, dissolved in pure water, is no more spontaneously spoiled than aqueous cane sugar solution.

The fact that the transformation of urea into carbonate of ammonia is due to the action of a special ferment proceeding from the urine itself, has been demonstrated by M. Jacquemart in the laboratory of M. Dumas, by going according to the views which the illustrious chemist had communicated to him.

… <Experience p.704>…

The notion that mucus converts to ferment has been retained in science, but with the vague notion of spontaneous spoilage.

… <This theory has been replaced by those of atmospheric germs p. 705> ...

... <research on Pasteur putrefaction attributed to air germs p. 706 to 708>…

Yes, germs in the air can play their part in decaying urine, but they are not necessary!

Mr. Pasteur neglected "of course" the mucous deposit of urine, did not pay attention that the composition of the urination fluid, necessarily, is extremely variable ...

I have several times observed that urine of the same sex or of different sex, collected under the same conditions, exposed to the air under the same circumstances, on the same day, one undergoes ammoniacal fermentation, while the other remains acidic and, in appearance at least, has not deteriorated. With the benefit of this general observation, I will tell you what happens when we study the alterations of urine in the physiological state and in the pathological state. ...

Mucus and microzymas from urine

… *<Implementation p. 708>* ...

To examine mucus that is still wet, use the microscope armed with the obj combination. 7, ocul. 1 from Nachet. We discover, in the normal state of health, whether it is the urine of men or women, more or less large cells of mucus, the bladder epithelium or the urethra, and sometimes granular nuclei and isolated molecular granulations, of which only a few motives are seen, because they are hampered by the viscosity of the mucus. The amount of this mass of mucus and organized elements is very minimal…. The quantity normally increases after a certain time, because outside the bladder, that is to say in new conditions, the urine, thanks to nefrozymase, constitutes an excellent nutrient medium, or as we say , culture, for microzymas!

When we want to study with fruit what becomes of the microzymas of the urine, we must proceed as we have always done until now: the urine slightly creosote or carbolic, at one or 2 drops per 200 cc, at the end of the urethra, is examined 1 or 2 days apart, or more often. We then see the microzymas appear as 2 contiguous spheres, appearing as an 8; then the number of grains increases, and we have straight or sinuous strings of 3, 4 and a greater number of grains: the torulaceae of M. Pasteur and M. Van tieghem; rarely under these conditions, we see the bacteria appear. If the urine has not been carbolic, it should be observed more often. We see the same evolutionary phenomena: the microzymas come together, multiplying, under the appearance of a string of grains; then they lie down, and the bacteria appear. Sometimes it's a kind of little vibrio that precedes the bacteria. It has often happened to me to see all the isolated microzymas disappear and to obtain only chains. ... Finally, if we leave urine that has become ammoniacal to itself, a little earlier, a little later, depending on the case, there comes a time when all the associated microzymas and bacteria have become isolated microzymas again.

Fermentations of physiological urine, in contact with air

It has long been observed that certain urine does not become ammoniacal on contact with air, I have observed similar facts several times; the urine remaining acidic, it was concluded that it remained unaltered: it was a mistake, it deteriorates otherwise, that is all. It was further assumed that urea was broken down, there was no further transformation in the urine; that was another mistake.

When fermentation takes place with or without M. Pasteur's torulacea, decomposition takes place in accordance with M. Dumas' equation: ... But at the same time that urea is destroyed, another fermentation takes place in parallel or consecutively.

... Let me remind you that the urine of men who have abstained from fermented liquors may contain alcohol and acetic acid.

… <P. 710>…

Fermentation in contact with air

That said, here is a series of several experiments that I published in 1865 to prove that several forms of bacteria can ferment urine, without necessarily producing ammonium carbonate.

… *<Experiences p. 711 - 712>…*

Also, although no excessive precautions have been taken against airborne germs, we only find the normal forms of microzyma evolution.

Fermentation of urine in the presence of creosote

We know that creosote, or carbolic acid, moderates bacterial growth in microzymas. What would happen if we left the urine on its own after having properly carbolicated it? ... 10 days after the last urine collection, the mucus is completely deposited ...

The urine remained decidedly acidic and no more colored than at the beginning. It does not give off gas by the addition of an acid ...

The urine, even from the point of view of these products, could be considered as unaltered. But what had happened to the microzymas?

The mucus deposit at the start of the experiment contained only normal microzymas, mucus globules and epithelial cells. At the end of the experiment, the microscopic observation shows what we see in the drawing of this figure *<p. 714>* which shows that we no longer saw isolated microzymas; they have become microzymas in strings of 2, 3 ... and a greater number of grains, representing Mr. Pasteur's torulacea, which is ultimately only one phase in the evolution of microzyma. As you can see, there are no bacteria. You hardly find any more mucus globules; but there are still bladder epithelium nuclei ... oxalate crystals that lime.

And note that, despite the small torulacea which is given as the specific ammoniacal ferment of urea, it has not been broken down at all ...

What happens to nefrozymase in putrefied urine

… <Experiments on pregnancy urine p.715 to 717>…

So there is no question that urine ferments in many ways, and that infusoria can consume the nefrozymase it contains. You must have been struck by the role of creosote which prevents any alteration of filtered urine, which also prevents ammoniacal fermentation of urine, but not the evolution of microzymas to produce strings…. And notice again that Mr. Pasteur does not show any surprise, that his torulaceae develops in an acidic environment, he who claims to explain by the alkalinity of the medium the appearance of bacteria in the yeast broth mixed with chalk! No, acidity is not a cause of preventing bacterial development of microzymas, although to some degree it is an unfavorable condition, and alkalinity promotes it.

Let’s draw immediately from the facts about carbolic acid, a practical application.

Storage of urine to be analyzed

When a doctor, for a diagnosis to be made, needs to analyze a urine, moreover collected with care, he must always be concerned about its possible fermentation. Whenever the analysis cannot be done immediately ... he will add 2 to 3 drops of pure, liquid carbolic acid. And to be on the safe side, if it does not stick to the analysis of the deposit and its microscopic examination, there will be even more guarantees, if it can filter the urine to keep ...

Microzymas in urine as alcoholic and acetic ferments

... <Experiences p. 718 to 722>...

However, these experiments demonstrate that the ammoniacal ferment, torula, microzyma or bacteria is not specific, since it is able to act as an acetic, butyric and alcoholic ferment. And these facts prove once again the ability of this order of organized beings to adapt to the most diverse environments.

It is also not correct to think that the function of the soluble ferment of urea merges with that of the organized ferment which produces it; because, certainly, the soluble ferment will never be a producer of alcohol and acetic acid.

Theory of ammoniacal fermentation of urea

M. Pasteur assures us that urea is a fermentable matter both with regard to soluble ferment and organized ferment. Weigh carefully the terms he used: "Soluble ferment and organized ferment act in the same way on their fermentable matter, that is, on urea! "

In physiological theory, the fermentable matter of an organized ferment is an organic substance which can serve as food; this matter ferment assimilates it in a certain way, and returns it, by disassimilation, after having transformed it. However, we cannot say that a soluble ferment, which is not organized, not alive, assimilates and disassimilates. Therefore, organized ferment and soluble ferment cannot act in the same way on fermentable matter! on the other hand, it is not permissible for urea to serve as food for organized ferment, unless it is assumed that these organisms can use carbonic acid and ammonia, or urea itself. , to constitute their tissues: but then the equation which results from the experience would not be verified as it was, and the organized ferments would not be beings functioning like animals!

In physiological theory, as I have explained it to you, the fermentable matter of an organized ferment is an organic substance which can serve as food! Fermentation under these conditions is a phenomenon of nutrition: which implies assimilation and correlative disassimilation! ...

... In short, the fermentation of urea is the result of a zymatic action, that is to say purely chemical, and not a physiological act of nutrition taking place in the organized being. The evolving microzymas secrete the zymase which binds the elements of water to urea, just as sulfuric acid or caustic potash determine it, to transform it, as an amide, into ammonium carbonate ...

The urinary microzymas in the physiological and healthy state, in the bladder, do not secrete the zymase necessary to fix the elements of water on the urea, and the latter leaves it unaltered. But outside the bladder, in their new situation, they can change their function and become able to produce the zymase called soluble urea ferment. By virtue of the law of adaptation to the environment, they adapt to the circumstances and, with the help of inactive ambient materials, produce the necessary transforming zymase. This is why bladder microzymas as well as air microzymas need more or less time to start fermentation of urine: function has to be acquired! and we have seen that it can be prevented from establishing itself in those of the bladder as well as in the air. But it is still necessary that the favorable conditions for this are met. Remember experiment II, on the urine of an 18-year-old young man who, placed under the same conditions as the other 3, did not ferment ammonia, but produced acetic acid and benzoic acid ! and the authors have noted a large number of cases where urine remains acidic in contact with air!

... From this study will result the proof that normal microzymas in the body can become morbid, acquire transmissible morbidity and can keep it, but also lose it ...

Ferments of pathological urine and their origin

... <Explanation for pathological urine according to M. Gubler p.724>...

Doctors have noted a number of conditions in which the urine is alkaline from the bladder. Alkalescence always coincides with an alteration or lesion, probably correlative, of some part of the urinary tract: kidneys, ureters, bladder or prostate. Urine becomes ammoniacal before urination:

- In severe cases of Bright's disease, where the kidneys are damaged in some part;
- In acute nephritis and in chronic nephritis;
- In inflammations of the pelvis and ureters;
- In diseases of the spinal cord where the functions of the bladder are impaired;
- In urine retention where, following a prolonged stay, the urine causes inflammation of the bladder mucosa;
- In chronic cystitis;
- In some particular diathesis.

However, whenever I have happened to examine such urine, immediately after urination, I have found the microzymas increased and largely evolved into strings of grains (the so-called specific torulacea), and even in bacteria, mobile or immobile; sometimes we also find the other forms that I have described in the urine that has become ammoniacal outside the bladder.

... <Analysis of different cases p. 725> ...

... <interpretation of Pasteur, recounting among other things all the adventures of the journey of the germ going up the urethra to implant in the bladder p. 726 - 728>...

… If therefore the germs cannot penetrate by the way of the urethral canal, as it is constant that the urine can become ammoniacal in the bladder, in the cases where there is no wound on any part of the body, nor of lesion in the intestinal canal, the cause must be sought elsewhere.

Let us take it for certain and demonstrated that, normally, urine contains microzymas which can evolve into bacteria and all the forms which precede their completed development. This being said, it is possible to wonder if the ammoniacal fermentation in the bladder, would not recognize an internal and natural cause, depending on a morbid functional deviation, or not, of the microzymas, manifesting, in the cystic cavity, not only by the fermentation of urea, but by a determined histological evolution!

I repeat this every time I have examined ammoniacal urine, immediately after urination, I found the microzymas there more numerous than in healthy urine, and largely transformed into strings (torulas), bacteria and the other forms which precede these. Now, if the germs of the air have nothing to do with the phenomenon of cystic ammoniacal fermentation, if moreover one never meets bacteria in healthy urine, where only microzymas exist compared to what the 'we find in putrefied urine, it must be admitted that the microzymas generating the different organized forms that we find in alkaline urine from the bladder, had changed something, since their chemical function had deviated. I'm saying these microzymas have become morbid.

… <Study of different pathological cases p. 732 to 741>…

Conclusions regarding bladder microzymas and urine fermentation

1. Airborne germs cannot enter the bladder through the urethra canal: this is anatomically impossible;

2. Assuming that, through catheterism, germs of ferments enter the bladder, they are not the cause of the ammoniacal fermentation of the urine;

3. Without denying, but affirming the existence of atmospheric microzymas and their ability to evolve into bacteria, it is certain that they are not the immediate cause of the ammoniacal fermentation of urine;

4. Bacteria can exist in the urine, from the bladder, without undergoing ammoniacal fermentation;

5. When the urine becomes ammoniacal in the bladder, the phenomenon is correlated with the injury or disease state of some part of the urinary tract, or a diathetic state, etc. ;

6. The fact that the urine can be ammoniacal in the bladder and that this state is correlated with the presence of infusoria (bacteria, bacteridia, vibrios, free or string microzymas), tends to show that it is necessary to functionally distinguish microzymas in the state of health from microzymas which have become morbid as a result of any deterioration in one of the parts of the urinary tract or of a general characterized condition;

7. The zymase which ferments urea is the result of the morbid alteration of the function of microzymas, because any soluble ferment is secreted by something organized, cell or microzyma;

8. The ferments from the ammoniacal fermentation of urine can ferment sugar and starch;

9. There is acid fermentation of urine, and the ferments of this fermentation are similar to those of ammoniacal fermentation. These ferments also act on starch and cane sugar;

10. It is always possible, with the help of carbolic acid or creosote, to prevent the development of microzymas in normal urine, and therefore its ammoniacal alteration;

11. Surgeons can safely operate as in the past with the cleanliness they usually take. However, the most practical advice, as it emerges from these studies, is to operate in a carbolic atmosphere and to wash the instruments in slightly creosote or carbolic water, as much to annihilate the influence of ambient microzymas as to prevent the evolution of microzymas of the operated person;

12. Bladder microzymas, like all microzymas, can evolve and become bacteria; but these bacteria, by regression, can reproduce microzymas.

13. Surgeons should be more concerned with the microzymas of their patients, if they are diathesic, than with the influence of microzymas in the air. It is especially in hospital wards that there is a need to operate in a creosote atmosphere, because there, more than elsewhere, morbid microzymas can exist.

14. It is fair to proclaim that in 1843, M. Dumas was right to place the bladder mucus, which is converted into ferment, the next cause of the ammoniacal fermentation of the urine. This was the fruit of a wonderful intuition, for we had not even suspected, then, that the organism concealed in the privacy of its tissues agents as powerful as microzymas.

13th conference

Microzymas and disease

The last conference let foresee the possibility of founding a physiological theory of the disease of which the theory of microzyma would be the basis.

To achieve this, I will first bring together, in the form of propositions, the experimental truths that we have acquired in the course of previous conferences;

I will then draw the main idea which will be the basis of the pathology.

Here are these proposals:

1. All matter is essentially mineral, for its components are the simple bodies of Lavoisier.

2. Organic matter should not be defined by its origin, but by its composition: it is nothing more than a more or less complex combination of carbon.

3. What is called ambient organic matter, in the heterogenous system, is something more than a compound of carbon, and than matter in the chemical sense.

4. There is no spontaneous generation. A mixture, in whatever proportions, of immediate principles as numerous as one wishes, and of necessary mineral matters, all the other conditions which the physiologist and the chemist will be able to unite as the most favorable being present, cannot itself be organize and come alive.

5. If what, in the school, one calls living matter not morphologically defined, unstructured, endowed only with physico-chemical properties, protoplasm, blastema, was what one says and thinks, everything in the living organism, organs, tissues, cells, microzymas, would be the fruit of spontaneous generation.

6. What we call germs, in the air, in the water, in the earth, are essentially microzymas.

7. Milk, blood, urine, all tissues contain microzymas.

8. Vibrionians can develop, even in tissues and humors, in any part of an organism, animal or plant. Age has some influence on this development.

9. Microzymas are what evolve into bacteria. Microzymas are not germs in the embryological sense, but they are the previous state of vibrio, amylobacter, bacteria, bacteridium, etc.

10. Microzymas are, personally, what are called ferments.

11. Microzymas are also cell factors.

12. Microzymas are what the protoplasm, the blastema, are endowed with the formative power of the living organism.

13. Microzyma is the living organism per se "in itself". An organism, ab ovo <from the egg>, is reducible to microzyma.

14. Certain natural productions, certain tissues in organisms, are formed only of microzymas.

15. An organism, a tissue, a cell, a vibrio can, by physiological regression, be reduced into microzymas.

16. From the total physiological destruction of an organism, there remain the microzymas.

17. What we call germs in the air, in the water, in the earth, are essentially just microzymas from extinct organs.

18. Microzymas, in their normal environment, remain identical to themselves.

19. Microzymas change their function during the development of the organism: they are functionally different in the different centers of activity, and they retain their acquired activity, when separated from their center.

20. We do not say, and we cannot say, that a chemical compound, or a mixture of such compounds, becomes sick or dies.

21. Only that which is organized and endowed with life is susceptible of disease or death.

22. Microzymas being that which is originally alive in the organized being, that in which life persists after death; it is they who can become the starting point of the disease. Primarily, therefore, disease germs cannot exist in the atmosphere.

23. Microzymas, which can change functionally, can become morbid and transmit acquired morbidity; a morbid microzyma can become healthy again.

24. Therapeutics is the science which seeks the means capable of bringing morbid microzymas back to normal functional mode.

It is important to remember that the fact is certain, demonstrated, verified: bacteria can appear, multiply, in a hidden part of an animal, without one being able to invoke the intervention of an external germ to explain their appearance. .

… Despite the confirmations of so many scientists, MM. Servel, Nencki and Tiegel, among others, it is in other interests not to take this into account ... *<Pasteur separated from the Hippocratic school and posed as a reformer of pathology p.747 to 750> ...*

However, these etiological systems did not prevail, physicians in general continued to place the cause of our illnesses in the body itself. I have spent a large part of my life in medical schools, and I assure you that none of my teachers or colleagues have made it the starting point of their teaching, while leaving no stone unturned. information to make an informed diagnosis. However, these illustrious physicians knew perfectly well that man and animals could be afflicted with parasitic diseases; but they knew how to distinguish the part which goes to the parasite and the organism in the development of the parasitic disease; they did not allow themselves to be imposed by words and appearances.

… <Continuation on the interpretations of the bad observations of Pasteur and on his vision of the disease p. 751 to 757>…

… <Diseases of Pasteur / Béchamp silkworms p. 757 to 765>…

… <Vaccine - Chauveau p. 765 to 767>…

... <Anthrax disease - Davaine p. 768>...

Inoculations of bacteria to plants - *Davaine p.769*

... To make these inoculations, he borrowed small bacteria of 0.005 mm, stirred with a very rapid movement, more or less similar to bacterium termo, which can exist in certain plant substances reduced to putridness. He arranged for the inoculated infusoria to be retained in the wound. This is what Davaine observed:

1. Inoculated with Opuntia cylindrica, Aloe translucens, etc., the small bacteria, he says, "spread, retaining their original characters. "

2. "In Aloe variegata they gave rise to filaments which reached up to 0.03 mm and which were divided into 2, 3 or 4 segments. "

3. "The long filaments (from the previous experiment) inoculated with Aloe spiralis produced infinitely smaller corpuscles, which at higher magnifications presented themselves as very fine dust. "

4. “Finally, these long or short bacteria, inoculated into the plants mentioned above, resumed their original characters, namely those of bacterium termo. "

5. “These alternative transports on various plants have been performed a great number of times with similar results. "

Davaine was astonished to reap something other than what he had sown, but instead of wondering if the inoculated plant is not active in the inoculations, he goes after the classification of bacteria ...

… He's upset that he can't see the bacteria he inoculated reproducing! It was because he did not know that the jelly alone, without any inoculation, was enough to cause bacteria to appear in a plant after thawing; it was because he did not know that a bacterium, vibrio, amylobacter and other forms are only what a given microzyma can become.

... In the theory of microzyma, the inoculated bacteria do not multiply; but by its introduction into the wound made to the plant, it determines a change of environment at the inoculated point, and it is thanks to this change that the plant's own microzymas evolve to give bacteria, each according to its species; but as a result of this change, the foreign bacterium undergoes the law of regression and can become microzyma again and then evolve in another form....

In posting my experiments on bacteria in frozen plants, I said:

"... it is the same for the inoculation of bacteria into animals, or the injection of a putrefying substance into the blood: this causes dyscrasia favorable to the evolution of microzymas specific to the animal into bacteria. , and the disorders which are the consequences. "

I cannot cite all the inoculation experiments that have been carried out since Davaine, nor the confirmations, unconscious, it is true, of which the theory of microzyma has been the object, even in pathology, on the part of several observers. But it is necessary to point out that these

confirmations were made under the empire of the common assumption that there is nothing primitively structured, endowed with independent vitality in a living organism; and that the authors invariably imagine that the microorganisms they discover in diseases are parasites which originate from germs coming from outside, ... in accordance with a common opinion taken up by Mr. Pasteur! ...

The belief in the primitively morbid germs of the air, the water and the place, as Hippocrates would have said, has become almost superstitious. Recently (1882) a scientist, Mr. Klebs, described a kitchen appliance intended to preserve milk from the germs of bacteria, without suspecting that this liquid is filled with them; .... We imagine that the slightest crack is enough for an animal to fall prey to these morbid germs.

I have already disillusioned you with regard to the primitively morbid germs of the air; but it is necessary that, by certain proofs, founded on large-scale experiments, you must be convinced that all the assertions of the authors are purely imaginary.

The air normally does not contain disease germs.

In fact, no direct experience has been produced to establish that a germ caught in the air has communicated disease. We have been able to prove that a properly prepared fermentable material begins to ferment of a desired species when exposed to air. And this is easily understood, if we consider that the air germs contain microzymas, these conidia, spores of an infinite number of destroyed organisms. However, in a given fermentable mixture, only those for whom this mixture is suitable develop: the others remain sterile. But the organism that has grown in the mixture that has fermented, we can isolate it, study it and cultivate it; we can make it act on whatever matter we like and see the uniqueness or the multiplicity of its functions! These are doubtful facts; has the same work been done for the diseases? No, and everything proves that you can't.

To demonstrate that an airborne germ causes disease, you need 4 things:

1. Introduce this germ, taken far from the earth, into an organism, and find it multiplied there;

2. Isolate it from the diseased organism, study it thus isolated, and prove that it is itself or a form of its evolution

3. After isolating it, inoculate it again into the animal, and prove that it is still multiplying there by reproducing the same disease;

4. Show that under its influence the microzymas specific to the sick organism have remained indifferent.

However, none of this has been done; Whenever morbid microorganisms have been inoculated into a given animal, they have been taken from an already sick animal, and, as with anthrax, the disease produced has not been the same in sheep and in sheep. 'man.

I am going to prove to you, now, that enormous wounds can remain unpunished in contact with the air, without its absorbed germs producing diseases similar to those attributed to them for free.

Healing of a wound

... <A. Guérin's thick bandage did not in some cases prevent the development of bacteria and the wounds healed - a way of seeing wounds according to Pasteur p.773 to 776> ...

... My intention is not to present to you the work of the most learned surgeons on pus, and the theory of its formation. … But M. Pasteur made very cheap the work of scientists such as Küss, Virchow, Robin, Cohnheim who all applied the experimental method to explain its appearance in wounds; whatever the theory, all of them make the pus of the body itself proceed, without invoking anything foreign. What is indisputable, however, is that all of these scientists neglected microzymas as they neglected molecular granulations in general histology. However, whatever we do we will always find microzymas in the pus; they will not be able to change shape, they will be able to evolve and produce associated microzymas, vibrios or bacteria, and wound healing nonetheless work, as results from the report by M. Gosselin and all the surgeons who were able to observe.

Pyogenesis

In a remarkable thesis, M. E. Baltus examined all the theories proposed; finally he investigated the role of microzymas in pyogenesis.

Mr. Baltus first saw that there are constantly in pus microzymas similar to those found in various humors, and he observed that they were personally ferments. This fact noted, he sought what was their part in the mechanism of pyogenesis. Numerous experiments carried out on the mesentery and the cornea of the frog led him to reject Mr. Cohnheim's theory, the result of an optical error and substitute the notion of the microzyma factor of leukocytes. However, clinical observation agrees with experimentation to show that at the start of the formation of pus, the microzymas contained in the cells or distributed in the intercellular spaces, become compacted and coated with membranes, which surround by small islands. These nuclei or thrombocytes serve as a call point for new microzymas which also secrete a membrane around them; finally, proliferation continues inside the granular leukocyte thus formed. And it would be wrong to consider this formula just a figment of the imagination. Either we carefully examine the inflamed tissues under the experimental conditions of which I have spoken to you, or we limit ourselves to the study of surface wounds, particularly in the budding state, we will easily recognize the phenomenal succession that most observers, Lebert and M. Follin, among others, had already pointed out, but without penetrating its nature, for lack of a guiding idea. And it is very worthy of attention that the dressings made with strongly carbolic water do not remove the microzymas in the pus, nor more often the associated microzymas and sometimes the bacteria: but if these microzymas had germs as their starting point air, they would not be found in the pus.

...

When there is a purulent infection, it is not the germs in the air that are to blame; but the morbid evolution, always possible, of the microzymas of the organism of the operated person, whether they evolve or do not evolve.

It has therefore been shown that huge gaping wounds, such as amputation wounds, can be exposed to the air without danger of death or disease itself: yet it is in these conditions that germs would play well.

…

Air and water in burns

How many times would we not be exposed to the invasion of disease germs if those of the atmosphere and water were what Mr. Pasteur thinks? I cannot help reproducing here a burning observation that I asked Professor Baltus to write up for you.

… <Severe burn case - Baltus p. 779>…

Certainly the young child, the subject of this observation, was in the most favorable conditions for the invasion of morbid germs; the long duration of treatment and the extent of the lesion do not allow us to invoke morbid discontinuous panspermia. The poor victim of this terrible accident was very happy to find herself in the hands of such an educated and dedicated doctor! Mr. Pasteur allegedly invoked the germs of the air to explain the delay in final healing: Mr. Baltus fed the internal microzymas well, while treating the wound, and the little patient was saved.

The air and putrid abscess microorganisms injected into the blood

Mr. Pasteur complacently invokes an experience of Mr. Chauveau ... to support his assertion that there are no germs of microorganisms in the economy.

… <Chauveau experiment bistournage coupled with a large injection of pus p.780 and analysis from the point of view of the theory of microzyma p.781 - 782>…

Air and transfusion

We know that the transfusion can be done by reinjecting defibrinated blood into the veins; now the blood is beaten in the air; germs have time to fall into them, both during the bleeding of the subject providing the blood and during the threshing of the blood. So if airborne germs were what we think, this operation would still be dangerous.

M. Pasteur considers that the instantaneous contact of the air with a bare portion of the body, the slightest fissure, may be sufficient to cause death, or at least to allow the introduction of a germ which produces the disease which is caused by it. the cause. Everything contradicts his system, until the disease he puts at the top of the parasitic diseases: scabies. Certainly the acarus, by opening a furrow under the skin, digging its burrows there, brings with it, under the human epidermis, not only the germs of the air, but all the filth of the scabies and the germs of the surface of the skin when, during the night, in

bed, it changes from contagious to contaminated. The scabies therefore realize, as best as possible, the conditions of the germs imagined by M. Pasteur: however the scabies remain scabies until they have been rid of the acarus, and do not contract the diseases of which the famous scientist claims to find germs in the air.

Here then is demonstrated, in another way, the general harmlessness of the air, not only during the normal acts of life in society, but also in the case where the interior of the organism is brought into contact with these germs, not only in the most violent surgical trauma, but in the most varied circumstances. And we have found that in these different cases it can happen that the microzymas evolve to give not only associated microzymas, but bacteria, although we take precautions against atmospheric germs.

I remind you that it is irrevocably established that a separate part of the animal, tissue or humor, can give rise to bacteria in the absolute shelter of the air.

There is a need to demonstrate now that the microzymas of the living organism, during life, can give rise to the evolutionary phenomena that we have observed in the tissues detached from the animal.

Evolution of microzymas in the living organism

The pulmonary tubercle in the Cretaceous state

The same year we had the opportunity to examine the lungs of consumptives who had just died, pulmonary tubercles in the Cretaceous state. Reminding me of the teachings of Küss

... <according to Küss: the pulmonary tubercle is the result of the disorganization of a normal histological element p.785-786> ...

Hey! well, we investigated what the material of the pulmonary tubercle was formed from in the cretaceous state, that is, when everything disappeared from the epithelial globule of the alveoli.

The Cretaceous material was contained in cysts with fibrous walls; it was white, opaque and hard, though crumbly. Under the microscope (obj. 7, oc. 1, Nachet) we could distinguish a crowd of mobile molecular granulations, isolated or coupled 2 to 2 (what we call today microbe in 8, microbe in double point, diplococcus) , remarkably resembling the microzymas of chalk; like them they were insoluble in potash to the tenth ...

... <detail of the analysis p. 787>...

The demonstration was complete, and we concluded that these microzymas are the remnants of the dead epithelium that first produced the raw tuber, and then the softened tuber or the Cretaceous.

So the epithelium becoming sick and dying, not everything in it dies; what, in the cell, had resisted death, it was microzyma! Once again, the cell is transient; what is most alive in her, most resistant to death, is the microzyma that formed her.

Let us dwell on this observation for a moment to understand its significance.

The cell theory which served as his guide, made Küss recognize that the pulmonary tubercle is not a heteromorphic product. It is the result of excessive proliferation of the globular epithelium of the alveoli. But, he observes: “the tuber and its varieties, resembling cancer in that it develops in the same organic system, in the same normal clusters of globules, it differs from it essentially in that, instead of 'a hypertrophy of the elements with all its consequences, it is only an accumulation of these same elements, soon followed by atrophy, necrosis, and decomposition; but in pneumonia too, there is an accumulation of epithelial globules! What are these differences due to? Why does the pulmonary tubercle, in phthisis, come to be formed only of microzymas? The explanation can only be given by the change in function to which the microzyma is susceptible and whose morbidity is different in cancer, pneumonia and tuberculosis. Indeed, the cell being, by hypothesis, what is alive per se, should not be able to destroy itself; for what is, by virtue of inertia, must continue to be. Just as matter does not organize itself, what is organized must not destroy itself. Again, any physiological or chemical change requires a cause. In accordance with the data of these conferences, let's try to understand this.

In his learned and delicate analysis, Küss showed us the epithelial cell invading and filling the cavity of the pulmonary alveoli; thereby, access to air in the alveolus is eliminated, there is no longer a right of domicile. However, the cells of the alveolus were intended to live in an environment where the air is constantly renewed: they are therefore in an abnormal situation and their microzymas too. Now these, being originally alive, cannot physiologically destroy themselves; they lived in a renewed air which is denied to them; they will not perish, but changing their function, they will devour the substance of their cell and, gradually becoming free, the very substance of the alveoli; In the end, therefore, only a mass of molecular granulations will remain which will encyst, forming what has been called heteromorphic tissue, in which the microzymas will continue to live and feed.

You can see how the 2 notions of change of function and change of environment apply to pathology as well as to our laboratory experiments. This very natural and physiological way of understanding a phenomenon which had hitherto been very obscure, will not be accepted any time soon. We will invoke, we already invoke, the germs of the air to explain tuberculosis, since these germs are everywhere present and constantly in contact with the pulmonary alveoli, why is not everyone consumptive? Ah! no doubt, and unfortunately, the pulmonary microzymas of phthisics have undergone some change, have become morbid and inoculable! but the real doctors seek the cause elsewhere!

… <Bacteria in acute pleurisy fluid terminated by suppuration p.789-790>…

… <Changes undergone by bacteria in the intestinal canal p. 790 to 792>…

… <Regression of a mycelium in microzymas p. 793>…

Parasitism and disease

… <P. 794 to 800>…

... There is no doubt that there are diseases in which we find beings that are found in herbal teas for a long time. Yes, certain microscopic, clearly specified lower plants live and proliferate on or in the substance of animals where they find suitable soil. Achorion Schoenleinii produces the favus; powdery mildew albicans thrush on the mucous membranes; it is sometimes found in the interior of fairly distant hollow organs. The mentagre, the sycosis, the ringworm are parasitic diseases caused or accompanied by determined mucedinals. Silkworm muscardin is produced by Botrytis bassiana, pebrin by the vibrating corpuscle, which has been recognized as a plant species, psorospermia. I could multiply the examples of this harmful flora: each animal species has its particular enemies. These diseases, like scabies and verminous diseases, are undoubtedly parasitic. But from the fact that these facts cannot be disputed, does it follow that diseases where only the evolving forms of microzyma are seen are also?

In all cases of parasitism, the parasite is clearly distinguished; it is described as something which has nothing in common with the organism at the expense of which it is nourishes. In trichinosis, the autopsy inevitably reveals the trichin in the muscles. The vibrating corpuscle is found in the pebrin, at the most severe degree of evil, in all parts of the silkworm, and even in the egg! Is it the same with the alleged parasitic diseases according to Davaine, M. Pasteur and others?

But, real doctors don't pay for themselves so easily. They wonder if the true parasites, including acarus, tenia, ascarid, are the cause or effect of the disease? Yes, we must ask ourselves whether the economy, in order to allow the parasite to take hold, has not first undergone some general or local modification which constitutes for the germ of the parasite a favorable ground for its development; what if, for example, a dilapidated constitution does not create an environment in which the parasite finds the elements of its life?

"It is recognized," says Micé, "that parasitism is the consequence of a sickly state leading to weakness in subjects; some serious general change precedes and provokes it. Thus thrush, decalvating and tonsurizing ringworm are present preferably in children or in malnourished adults. ... There is therefore a general disease state which precedes: the parasite completes the exhaustion of the subjects. It is therefore necessary to fight the parasite, while instituting a general treatment. "

Yes, this is how real doctors see it; because they know it: only what is organized and endowed with life is susceptible to disease. The body must be in pain for the parasite to get there.

14th conference

Health and morbidity

… “Sickness arises from us and in us; Is the formula of true medicine.

... "only what is organized and endowed with life is susceptible to disease and death."

... We must boldly support as things demonstrated:

1. That the animal organism is not impenetrable to atmospheric microzymas;

2. That bare and very large areas of the human body can be exposed, bathed in ordinary air and water without contracting disease;

3. That, in large surgical operations, the presence in the pus of crowded microzymas, evolved or associated microzymas in 8, vibrios or bacteria, is not harmful;

4. That probes can be introduced into the bladder, without special care for several years, without making the urine ammoniacal, although as a result of violent trauma the bladder microzymas have evolved to produce associated microzymas, torulas, bacteria;

5. That microzymas of a given part of an organism, even during life, can evolve to become vibrio, without being morbid;

6. That in the diseased organism, the microzymas, by a new change of function, can become morbid; but that the microzymas being morphologically identical in the various centers of activity, and functionally different from the morbid microzymas, may appear in various centers without being able to be distinguished micrographically;

7. That morbid microzymas, by virtue of the conservation of the acquired function, may be found in a determined place of the atmosphere, water or earth, in the excreta or in the remains of the being who has them. products;

8. And consequently that, initially, germs of disease which cannot exist in the air which we breathe, in the water which we drink, in the food which we eat, these germs necessarily come from an organism sick of an acquired disease.

… Yes any morbid microzyma is a microzyma that has ordinarily belonged to a healthy organism, but has become sick, I do not say spontaneously, but sick with a disease born in it under the influence of various causes which determine a functional change in the microzymas of a given activity center. It is in this induced change that the notion of morbid spontaneity consists.

And these propositions, which must be considered as the consequence and the complement of those which I recalled at the beginning of the last conference, constitute, in my opinion, the true basis of pathology.

The medical doctrine that stems from the theory of microzyma has been confirmed since we formulated it, Mr. Estor and I, from the start of our research by several observers in France and abroad. Since that time, a large number of experience confirms:

1. That what are called germs of disease, under various names, are only microzymas or the organized products of their evolution;

2. That these microzymas primarily exist in the cells of the diseased organism, and that they are endowed with morbidity in the cell itself;

3. That those which are free in the tissues, in pustules, in phlegmons, cysts, etc., arise from the melting of cells;

4. That morbid microzymas of a given morbidity, rather belong to one group of cells or tissues, than to another;

5. That the morbid microzyma can enter the body through the respiratory and gastrointestinal surfaces;

6. That morbid microzymas can be cultivated just like normal microzymas;

7. That the microzymas of two more or less similar animal species are not necessarily identical, neither generally nor in the various centers of activity of their organism;

8. That morbid microzymas or the products of their evolution, by a new change of function, can cease to be harmful, either spontaneously or under certain experimental circumstances.

... <P. 806>...

What in medicine is called constitution, complexion, temperament, are states of the organism which necessarily derive from the properties of microzymas, since a cell, a tissue is what their microzymas make them, ...

A physiologically healthy organism is one whose microzymas, in all centers of activity, are the most conformable to an ideal type, having undergone no morbid change or extra-physiological influence.

It is because the microzymas of neighboring species, and even more so of distant species, are functionally different in certain organic centers, that each animal, according to its current physiological state, has its own diseases, and that certain diseases do not are not transmissible from one species to another, and often to individuals of different races. What am I saying, childhood, middle age, old age, the sexes have their share of influence in morbid receptivity.

...

There are degrees in the morbidity of the microzymas of a given center of activity, and this morbidity may occur only at one point in the body, in that center of activity. Morbid microzyma is not only that of this or that infectious, virulent, contagious disease, etc. Morbidity consists of any functional deviation of the microzyma, whether its histogenic activity increases as in hypertrophy, or remains stationary, or decreases as in atrophy.

However, a morbid microzyma of any order has not ceased to be endowed with chemical activity. Morbidity is an added property, dependent, no doubt, on some material change; ...

Morbid microzyma, as well as normal microzyma, can have a dual activity that I have defined: zymatic activity, outside of it, and fermentation activity, within it. Both are exerted, simultaneously or successively, in the organism: in the state of health, according to the normal mode, and in the state of disease, according to the abnormal mode. In the physiological state, the products of their activity are weighted and such that they are useful

for the whole organism; in the pathological state, they constitute the blood in a dyscratic state, and the latter brings, more or less, in all the centers of organic activity, a correlative dyscratic state, which creates, for the anatomical elements and, by following, for the microzymas, new conditions of existence. Now, you know how sensitive microzymas are to variations in the composition of environments: the very forms which are the fruit of their evolution suffer the consequences. Without doubt, they are endowed with a great ability to adapt to environments; but they do not suffer less; and this discomfort results in a functional disorder, dependent on other centers of activity; it can affect even the functioning of microzymas of the nervous centers, from which the various phenomenal manifestations of diseases: fever, rashes, etc.

Of course, an organism should not become sick, since, in it, in the air, etc. there are no morbid microzymas. But, as a result of various influences, depending on the environment (not infected) and of all individual causes, a state of physiological misery can be created which constitutes a general dyscrasia from which results, for the microzymas, an abnormal situation which, prolonged , can result in the most serious disease and situation imaginable.

… *<Scrofulous case p. 809>…*

… There are a host of cases where an insignificant cause becomes the starting point of dyscrasia…

… <Histological changes in the kidneys p. 810>…

… There are many cases where dyscrasia can be produced naturally, even without trauma…

… <Case of serosa: hydrothorax, ascites, hydrocele p. 810>…

...

In the physiological state, the microzyma may be so small or so transparent that it is not visible, or mistaken for a fat granulation. This is what I told you from the start. Several authors, among others MM. Balzer and Fournier, were quite surprised to find microbes in the liver, to see them being insoluble in the solvents of fatty substances, and coloring by certain reagents: naturally, they took them for parasites of the diseases they observed. In the blood, it is possible not to see them if we do not help some artifice: Mr. Pasteur could not see them. This is because their transparency is the same as that of the middle; but remember what I told you about the lens: it is absolutely transparent, yet it is almost made up of tubes and microzymas. The morbid evolution of the microzyma, especially when it is accompanied by some morphological change, gives it the property of being easily visible by a variation of refringence ... In diseases of silkworms, especially in the eggs of dead flats , I have often seen them whose smallness was such that they certainly measured less than 0.0001mm; so that M. Pasteur, in spite of my having pointed them out to him, declared that he had not seen them. But since then he has learned to recognize them, as have other scientists: but they insist on seeing only parasites ...

I will now review the observations and research of some diseases. The consequences of the theory will become evident. One of this research is contemporaneous with my research on

silkworm diseases; it is of exceptional importance, because it is purely medical and made without preconceived ideas; we will find there the demonstration of almost all the propositions that I formulated at the beginning. These are phthisis and tuberculosis in general.

Tuberculosis and the inoculability of tuberculous microzymas

… <P. 812 to 814>…

Let us therefore conclude that the free tuberculous microzyma results from the pathological destruction of an epithelial globule, or cell, of specific tissues; that it is the ferment and that it is cultivable, capable of multiplying in suitable media. It does not originally exist in the air, it is the product of the diseased organism. Phthisis, tuberculosis, is not a parasitic disease. No, no, there is not a microzyma created to make people and animals consumptive. Despite M. Pasteur and his followers, doctors will continue to regard phthisis as developed by causes other than a parasite: the usual stay in a place where the air is not sufficiently renewed, untimely temperature variations, habitual humidity, insufficient diet, poor quality food and, above all, misconduct and certain vices, or cohabitation with consumptives.

And now apply the notion that the cell is a transient anatomical element, and this other, that a microzyma is likely to become morbid, and you will recognize that the microzymas of tuberculosis are only the ultimate term in the regression of a cell. or a group of cells, but microzymas that have become morbid. When we inoculate this microzyma, it does not multiply, but it produces dyscrasia which modifies the conditions of existence of certain groups of cells, resulting in their regression, with morbid evolution of their microzymas.

Ordinary pus and virulent pus

… <P. 815 to 816>…

From the point of view of the theory of microzyma, the study of pus should be repeated; indeed, since it is shown that the microzymas are not identically the same in the various centers of activity, it is easy to understand that the changes which they undergo in suppuration are not identically the same either.

Pus is characterized by the presence of white blood cells similar to leukocytes in the blood, so closely resembling, micrographically, that the former have been claimed to be only the latter, which emerge by diapedesis from the capillaries. It necessarily varies according to the nature of the diseased organ, the degree and nature of the inflammation, the character of the wound, and the time of suppuration. The authors were very concerned with the form of the leukocytes of the pus, the qualities of the pus, the disappearance of the globules, but before my research no attention was paid to the microzymas, neither to normal pus, nor to virulent pus.

You have seen that M. Chauveau, applying the theory of microzyma, demonstrated that virulent pus owe their virulence to the free microzymas they contain, and, moreover, as he

noted later, that this virulence, they possess it before the cell which contains them is, by regression, reduced to its microzymas.

Suppuration can be caused either by trauma or by an internal cause: in either case, the cells of the tissue are placed in an abnormal situation, which determines an exaggerated proliferation and then as we have seen with regard to the pulmonary tubercle, the death of the cell by its regression into microzymas.

A first point is therefore acquired: the pus is or is not virulent, and there is no essential histological difference between the leukocytes of the pus of such or such origin; the presence of such or such a vibrionian, free microzyma or associated with an 8 digit, does not mean anything. Hence it follows that virulence, of such and such a nature, can only be attributed to a morbid change in the subject's microzymas.

Usually it is in a pustule that the virulence of the pus occurs. ...

... <P. 818> ...

It is in these foci of this kind that the virulent pus develop. Regression follows cell proliferation; cells become deformed, and soon, as in all kinds of pus, microzymas swarm, evolving or not; morbid dyscrasia... is concentrated in the microzyma which has acquired a new function. However, the function, acquired under the influence of the morbid state, is closely related to the animal species that has become ill. It is therefore physiology as much as histology and chemistry that we must resort to shed light on the pathogenesis of virulence. It is based on these observations that that I am going to show you that, in all the experiments tried in recent years, it is the microzyma, specific to an animal species, and not a germ in the air, that has been found the seat of virulence. We have never been able to produce, with germs caught in the atmosphere, the so-called parasitic diseases; whenever, by inoculation, we have been able to reproduce a known typical disease, we have been obliged to take the alleged parasite from a sick animal; just as to inoculate tuberculosis, a tuber was taken from a subject who had been initially or secondarily affected.

I have faithfully presented the work and opinions of the authors. The work proves in its own way that what is considered to be a parasite comes from the diseased organism, is the effect of the disease, far from being the cause.

...

The theory of microzyma and the parasitist system p. 865

What the parasitic disease system lacks most is an experimental basis; in fact, it is based on a preconceived opinion. It has not been shown that a specific microbe for any particular disease originally existed in the air. We looked for him, but in vain. The system is fishing at the base.

The fact is undeniable: yes, there are microscopic organisms, from microzyma to the most developed bacteria that evolve from it, that are capable of communicating disease. To deny it is to deny the obvious. But they only meet in the air, in the water, in the ground by accident, and then we know where they come from. ... In fact, when we were able, with an earth microbe, to give spleen blood, we had to go and find it in the one where the body of an animal, which died of anthrax, had been buried. This fact, considered in itself, firmly establishes the notion of morbid spontaneity, not spontaneity without a cause, understand the good, but the physiological spontaneity provoked ...

In the first place, of the total destruction of a corpse or of any part withdrawn from the body during life, at the end only microzymas remain, which from the earth are disseminated in the air, in the waters , and the morbid microzymas remain mixed with the others. Now, and this is certainly providential and, therefore marvelous, this total destruction is the result of what is called fermentation, putrefaction, accompanied or followed by phenomena of oxidation; the consequence of this fact, as you have seen, is the disappearance without return of virulence in the microzyma, in the vibrio and the bacteria, whether they regress or not; It is the same phenomenon that allows pancreatic microzyma to be safely introduced into the blood after it has putrefied the albuminoids it has first transformed. So generally, normally, there can be no morbid microzymas in the air; it is only exceptionally, accidentally that they can be found there.

Second, it bears repeating, it has never been shown that such a disease, spleen blood for example, was produced by a germ taken from any point in the outside atmosphere. ...

Third, again, it has not been proven that it is the inoculated microbe that really multiplies ...

... <P. 869 to 875>...

Natural or induced dyscrasias

I have repeatedly invoked dyscrasia to explain certain facts of the parasitists. …. I remind you that the microzymas change their function, undergoing a kind of maturation, from the ovum, fertilization, embryonic and fetal development until the age when the being can reproduce; that they are endowed with properties, charged with various functions in the various centers of organic activity and capable, in the tissues of the animal, or withdrawn from the animal, in the tissue itself and in various culture media, of 'evolve to become one of the forms of bacterial evolution; finally, that we can act on them to prevent them from evolving, and on the cells to stop their destruction by regression.

And the influences that we can bring into play in this way, to be small in appearance, still produce considerable effects. Yes, a very slight change, in the environment where a microzyma and a cell live, is often enough to modify their way of being, to the point that the cell is destroyed or conserved, a microzyma evolves or does not evolve, produces or does not produce cells.

…

The fluids in which our cells and tissues live and function in a normal and natural state are ... "crass". After death, the environment quickly becomes dyscratic; the cell is destroyed and bacteria appear.

And, notice it well, as, through fermentation, the yeast modifies its environment, its functioning is more or less hampered. This is because the products of disassimilation which remain in the ambient liquid constitute it in a dyscrasical state for the yeast.

It is no different for each of the anatomical elements of our tissues. They are placed and operate in media (Bichat's fluids) which, through admirable arrangements naturally made, retain a substantially constant composition; they vary without ceasing, no doubt, but they are incessantly brought back to the same type of composition. This state of constant composition is what in medicine is called the crushing of moods and blood. Dyscrasia is the deviation of the physiological state in the composition of humours, either by increase or decrease of some essential component, or by addition of a foreign element. ...

Overwork as a cause of morbid development ... p. 878

Freezing as a cause of dyscrasia… p. 879

The influence of the nervous system ... p. 880

... But it would be wrong to imagine that the morbid microzyma, whether or not it evolved into a bacterial one that has reached a healthy organism, multiplies there, as parasitists claim,

to make it sick. It is limited, and this is enough, to creating a dyscrasia which leads to the morbid course, corresponding to its own morbidity, to microzymas or to a group of microzymas of the affected organism. I say corresponding, and I am wrong, because the disease caused can be very different: it depends on the species of animal that is being inoculated.

Spontaneous disease is therefore that which occurs naturally under the influence of various provocative causes, but without the help of a morbid microzyma or an external cause of another order, directly harmful, as would be a poison, a trauma, etc.

The very diseases which are characterized by true parasites or by certain lesions do not primarily have these parasites or lesions for causes. Cl. Bernard formally recognized this: "In a large number of cases, anatomical lesions are the effects of the disease state, rather than being the latent causes which gave rise to it. "

The same scientist recalled that frogs, long held in captivity, whose health is weakening ... in this case they succumb to parasitic affections with the greatest ease ... "Or yes, in a jar containing frogs already invaded by the parasite (microscopic fungus ...), you introduce a perfectly healthy frog, it will not suffer the effects of contagion; but an already sick frog with ulcers will be immediately affected by the parasite. In short, the disease had prepared the favorable ground for the development of the parasite; This worsens the situation in 2 ways:

• By appropriating the substances produced by the animal for its benefit and

• By producing, through its own transformative activity, a dyscrasia which is added to that produced by the disease.

… A new morbidity is the consequence…

Only what is organized and endowed with life <Bichat> is susceptible to disease. This proposal should be repeated at this time. The parasitist who imagines that a parasite called a microbe is primarily the cause of disease, is required to tell us what he communicates the disease to, what he is an unnatural stimulant? ...

Normally, microzymas, released by the regression of cells or the dissociation of tissue, are not morbid; they are as healthy as the cell itself. Microzymas in one gland can be morbid without those in another gland. When medicine locates a condition, one can almost certainly predict that a corresponding tissue damage will occur, more or less rapidly, with the duration and progress of the disease. This is how we see free or more or less advanced microzymas in diseases of the liver, kidneys, blood, spleen, skin, bladder mucosa etc. These microzymas are invariably mistaken for parasites, and sometimes they may not even be morbid. The physiological functional specificity of microzymas, in homologous tissues and cells, explains the corresponding morbid specificity: it explains it so well that, according to Mr. Duboué's observations, it is the microzymas of the nerve centers that become rabid. In an apoplectic scar on the brain, Mr. Virchow observed the presence of granulations in the red corpuscles of the blood which were in process of discoloration. A parasitist, like M. Pasteur, would have considered these granulations as being parasites having invaded the globules. What am I saying, they really regarded as being parasites these free or more or less evolved microzymas,

saying that they penetrated from the outside into the cell, into a tissue, into the blood, to destroy them!

But, I repeat, under no circumstances has direct evidence been given that any of the diseases that parasitists claim to be parasitic has been determined by a parasite that spontaneously entered the body of the sick animal from the outside. Even when they directly inoculate an isolated or more or less evolved microzyma, they have never demonstrated that it is the inoculated object that multiplies in the body and invades it in colonies, as they say ... <p. 883>…

Application of the concept of natural and induced dyscrasias to morbid spontaneity ...

… <Case of subcutaneous surgical operations p. 884> ...

… <Epidemics of typhoid fever, smallpox, cholera in the trenches p. 884 to 887>…

The real causes of our diseases

… We should only die of old age.

There have been, there are energetic wills which know how to resist the degrading passions of our species; these noble and beautiful natures engender healthy races of body and mind which resist the causes of disease and which only die of old age. Alas! there are too many whose faltering wills falter, who let themselves be carried away by their inclinations and succumb….

Anatomical analysis would not reveal anything particularly characteristic in these dilapidated organisms; she would find the cells in their ordinary shape; physico-chemically they are formed from the same material as physiologically healthy ones. Their functions are being carried out normally, at least in appearance. Doctors, however, know how to recognize them. In them a dyscrasia can quickly be produced, because their microzymas, overworked to the excess, easily tend to change function at this or that point of the economy; as dyscrasia becomes generalized, the morbid evolution of another category of microzymas can be the consequence, and the first case of an epidemic is created, without there being any harmful microbe around ...

Virulence in the parasitist system and in the theory of microzyma

The opposition between the parasitic system and the theory of the microzyma is so absolute, that the former believing the cause of our diseases outside of us, the latter asserts that it is in us, and primarily only in us…. The fact being demonstrated, as I believe it, the system of the parasitists is ruined to the base: there are no specific microbes created for such disease; it is only accidentally, in the air, etc., microzymas that have become morbid in a physiologically constituted organism which becomes sick by a physiological modification of its way of being ...

According to Mr. Pasteur, a non-virulent microbe can become virulent by passing through several organisms of the same species: it is therefore this organism that produces virulence. In the hypothesis, is this really parasitism? But what is virulence? We do not know anything ! Sometimes it's a narcotic; sometimes a struggle for existence, between the bacteria and the blood cell competing for oxygen; between any microbe and the anatomical elements, the former diverting for its own benefit certain nutrient materials from the fluids of the economy…. As to the question of knowing why such a virulent microbe for a species and in this species for a race, is not for another species or a race, the system imagines other equally fanciful hypotheses.

The microzyma theory does not know what virulence is either, for sure ; but she has indicated the path one must follow to find out. For this research, she has a solid basis in the notion of change of function; it can provide conclusive proof that this change is physiologically determined ...

… *<Reminder of the pancreatic microzyma becoming harmful when it is injected into the blood p.891>…* But the pancreatic microzyma,…, can lose what we can call its septicity: it suffices for the materials to be putrefied of the fibrin he has digested; and this makes us understand that, under certain physiological conditions, a morbid microzyma can cease to be ...

The parasitist system, healing and preventive inoculations

... What happens to the bacteridium that invades the sick animal by the billions, when the disease ends in recovery? ... What happens to the parasite in inoculations intended to provide immunity?

… <P. 893>…

The theory of microzyma is able to explain all the difficulties. Indeed, the microzyma is nothing other than the organized substance itself; he is what every part of the organism is alive through: he is what makes the egg and all of its becoming. The (experimental) notion of the change of function explains how it can become morbid and take away the acquired morbidity; the same concept accounts for the loss of morbidity. The microzyma does not leave the body, because it is its very living substance, during health as well as during illness: healing is therefore easy to imagine. The same is inherited: it is tuberculous, scrofulous, syphilitic, etc. Throughout embryonic development, histological faculties predominate in microzymas; morbidity, because of the specialty of the environment, is there, if not attenuated, at least temporarily masked. It is even possible during this time and during the young age, by dint of appropriate care and treatment, to cause the microzymas to lose their morbidity, to return to the normal mode and to thus provide healing. Otherwise, on the slightest occasion the evil can burst with intensity.

...

In the theory of microzyma, it is not the vaccine or smallpox microzyma that multiplies to produce the disease, as I explained to you when talking about the experiments of Mr. Chauveau on vaccinations by pulmonary or gastrointestinal route ; but under their influence a

dyscrasia occurs which determines a change, more or less lasting, in the homologous microzymas of the organism, which prevents them from undergoing a new development and which provides immunity. It is because microzymas become morbid of a given morbidity, are modified in some way which has little or no influence on their essential physiological and chemical properties, that the disease which is cured does not recur. The preventive or preservative inoculation brings about a similar modification by a dyscrasia of the same order, without it being possible to say, for example, that there is identity between the vaccine or smallpox microzyma ...

... <Remote consequences of arm-to-arm vaccinations p. 897 to 899>...

The consequences of vaccinations

... Certain observations concerning the cholera microbe in chickens do not stop worrying me for the future of Mr. Pasteur's preventive inoculations. No, this scientist knows nothing else about attenuated bacteridia, except that they are still inoculable and provide immunity! But distant sequels, what? Parasitists seem to me to act like empirics, and when I say they don't know what they're doing, I have a right to say it; because they neglect the clean, independent, physiologically indestructible and modifiable vitality of the microzymas of the organism. They don't even know what happens to their so-called germs during the process of providing immunity ...

Imagine inoculating microzymas of specific morbidity and inoculating the unknown.

Ah! Let us not imitate Prussia, let us not impose the obligation to vaccinate. Read in Gintrac the adventure of Dr. Hubner, who communicated syphilis with vaccine! I know very well that all the young subjects vaccinated by Dr. Hubner did not show the symptom of constitutional syphilis, but that 8 were reached who communicated it to 9 adults! Isn't that dreadful? It was observed in this connection, that children from another locality, vaccinated with the same virus, were free from any other contagion: but this only proves one thing, and that is that not everything depends on the vaccine, but above all microzymas, that is to say of the diathetic state, of the vaccinated, to which vaccination imprints or does not imprint a given morbid course.

... Everything is dangerous in these kinds of experiments, because we do not act on something inert, but because we modify in a certain way, more or less harmful, the microzymas of the inoculated. ...

Agreement of the theory of microzyma with real medicine

... A pathological theory which would take its point of support on that of the microzyma would be able to satisfy the medical philosophers who are almost all attached to the doctrine of Hippocrates. This learned medicine, in fact, which knows so well how to take account of all the circumstances which can alter health: places, airs, waters, food, all the hygienic conditions of life, medical constitutions; who studies the sick subject in himself as a whole which reacts, tends to its conservation, is susceptible to being affected by purely moral influences; which affirms that the first cause of the disease is in us and that if the external influences have some

share in the production of the affection, it is only because they put this cause in action by producing some modification in the be alive ; yes this medicine, which has the clear idea of all this having deduced it from the observation of the healthy and sick man, who has the idea of diathesis and disease without resorting to a producing microbe, is the true one medicine….

… <Therapy and microzyma theory p.904 to 920>…

… <General conclusions p. 920 to 926>…