years of age. I was first called to his house upon Sept. 5, 1892, the person (his wife) coming after me stating that he had a "bad case of rheumatism." Upon catechising both the patient and his wife, I elicited the following history: About four years previously he suffered his first attack in left knee, but not in a very severe form. He recovered entirely in four or five days, but has been having similar attacks every twenty-four days since. He said each attack would last from three to five days, the knee become swollen and very painful. He has always had good health with the exception of this trouble. I have now seen him have twenty-five attacks since the first one. The left knee becomes very much swollen and edematous and he suffers excruciating pain. Upon each and every examination I have found fluid in the joint by fluctuations and a floating patella. During three days of each attack he is compelled to lie in bed, and every movement of the knee causes an exacerbation of pain. The effusion is intra-capsular. Each attack now lasts exactly five days, being worst on the third day and gradually subsiding by the fifth. He has a similar attack just twenty-four days from the last day of the previous attack, and they now recur regularly every twenty-four days. During the twenty-four days' intermission he is absolutely free from any trouble with the knee and attends to his work of ditching regularly, except during his attacks.

During the time I have had charge of the case he has had no trouble with any joint except the one mentioned. He can foretell the approach of an attack to the day and almost to the hour, but he says it is by means of sensations that are impossible to describe.

Regarding treatment, I might say he has taken quinia, iron, strychnia, cod-liver oil, ergotin, carbolic acid, electricity, sodium salicylate, sulphur baths and other remedies too numerous to mention, but all with no apparent benefit. Soon after making my diagnosis, I informed the patient of the nature of the affection, and that it would probably take several years to cure him, if at all, and by this means I have been able to keep the case under close surveillance. So far as I am able to learn, there is no trace of syphilis in this case.

In closing this report, I desire to say that I shall try and keep the case under observation and report to you any progress, if any is noted.

79 East Franklin Street.

A CONTRIBUTION TO THE KNOWLEDGE OF BACTERIOLOGIC CHEMISTRY.

Read in the Section on Materia Medica and Pharmacy, at the Forty-fifth Annual Meeting of the American Medical Association, held at San Francisco, June 5-8, 1894.

BY W. T. WENZELL, M.D.

SAN FRANCISCO, CAL.

In the year 1865 a German chemist named Marquardt made the discovery that during the putrefaction of animal matter, a substance was formed which bore a close resemblance to an organic base or alkaloid known to reside in the leaves of the spotted hemlock (*conium maculatum*) known by the name of coniine.

Schwanert, found very soon after, while pursuing a similar investigation of the intestines, liver and spleen of a child who had died suddenly, an organic base which he separated by the Stas-Otto process, and also by a similar search in the human cadaver, a sufficient amount of the alkaloid to enable him to determine its nature. He found that it possessed strongly basic properties, that it blued reddened litmus paper, that it was neutralized by muriatic acid, and that it was precipitated by alkaloidal reagents such as chlorid of platinum, chlorid of gold, iodo-iodid of potassium, phospho-molybdic acid, etc.

To these organic bases Marquardt gave the name septicines, the name indicating their source, being derived from the Greek, "septicos," the literal meaning of the word being to make putrid. In 1869, Bergmann and Dragendorff conjointly confirmed the discovery of Marquardt, but also announced the existence of a second alkaloid in putrid flesh, which was not volatile as the alkaloid first discovered by Marquardt, but was a solid substance crystallizing in the form of needle-shaped crystals. It also responded to the usual properties and tests for organic bases, and physiologic tests instituted with it demonstrated a decided mydriatic effect on the eye, and when introduced into the circulation an increase in the action of the heart was observed, and also a cessation of the peristaltic action of the bowels was noted.

In 1869 two cases of suspected poisoning occurred in Italy, where chemic experts claimed to have found morphin in the body of a lady and delphinin in that of a man. The authorities not being altogether satisfied with the results of the analysis referred the matter to Professor Selmi, an eminent chemist in Turin, by whom it was shown that the alkaloids in question were neither morphin nor delphinin, but that they were cadaver alkaloids analogous to those announced by Marquardt ten years before. Ignoring the claims of priority by Marquardt, Professor Selmi saw fit to change the name of the bases formed during the decomposition or putrefaction of flesh, to ptomaines, the Greek for a dead body or cadaver, a name which has since been exclusively used, for all organic bases derived from this source.

The relations which are at the present time known to exist between bacteria and cadaver alkaloids may be considered as fully established, much of which is owing to the indefatigable researches of Dr. Brieger, who announced that poisonous ptomaines were generated during the growth of pathogenic bacteria. He divided the ptomaines into two classes, toxins and non-toxins accordingly as he considered them derived from pathogenic or non-pathogenic organisms.

Without entering into the subject of the various ptomaines found by Brieger, Selmi, Gautier and others in decomposing animal tissues and animal fluids, it may be well to say that although the bacilli of anthrax, tetanus, tuberculosis, septicemia, the streptococcus of erysipelas, and the gonococcus of gonorrhea, etc., have been thoroughly studied by bacteriologists, and propagated, yet ptomaines and other products generated during their growth, have not received the share of investigation which their importance demand.

So far as this subject has come to my knowledge, the isolation of ptomaines, has been effected principally, if not altogether from the animal body and putrefying organic substances, and no attempt has been made to ascertain if an organic base is invariably a concomitant of bacteriologic culture. Not only this, but we should also direct our researches, in order to determine, if possible, whether the product of such culture will always give rise to the same identical ptomaine.

The writer must admit the difficulties by which he is confronted, arising in a great measure from the fact that, according to the present state of our knowledge, it is a difficult matter to distinguish even between the ptomaines obtained from well-known pathogenic bacteria. However, we should not be discouraged by these drawbacks, which are inseparable from all

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newly developed sciences; but rather hopefully and trustfully look forward for future success. It has been the good fortune of the writer to enlist the coöperation of Dr. Silas Mouser, of San Francisco, whose superior ability and unswerving enthusiasm as a bacteriologist stand unquestioned, to obtain from him such pure cultures as may be required for these investigations. The products of these cultures as usually obtained from tube-cultures, are exceedingly small as to quantity, therefore the work must necessarily be both microchemic and microscopic in its character.

Tube-culture of the Fungus Actinomyces Pathogenic—found in the animal body and course of analysis.—The culture was carefully removed from the culture medium and macerated in water at a temperature of 50 degrees E., to remove adhering particles of the gelatinous culture medium. This process was repeated until the water ceased to give a precipitate on the addition of tannic acid. To this water which held the spores of this fungus in suspension, some sulphate of barium was added and the mixture passed through a filter. The spores with the sulphate of barium remained on the filter, the barium salt being used to stop up the pores of filter to prevent the spores from passing through. The filtered liquid was then tested with the usual reagents for the detection of alkaloids, but with negative results.

The fungus after its treatment with water, was then macerated in ether-alcohol (2 parts ether and 1 part alcohol) for twenty-four hours. The yellow color of the fungus was mostly taken up by this menstruum communicating to it anorange color. On concentrating this solution by the aid of a gentle heat; on cooling, nearly the entire amount of yellow coloring matter separated as an orange-colored flaky substance which was collected on a filter and washed with a small quantity of alcohol. The yellow coloring matter thus obtained proved insoluble in water, sparingly soluble in alcohol, but very soluble in ether and in chloroform. Attempts to obtain crystals from its etherial or chloroformic solution met with failure. The substance was insoluble in 10 per cent. solution of caustic potassium. When treated with strong nitric acid the yellow color was changed to a blue; exposure to day-light caused the yellow color to fade in a short time.

The etherial solution of this coloring principle is yellow, while its chloroformic solution presents an orange color. In all of the above stated properties, this coloring agrees with luteïn, the coloring matter of the *yolk of eggs*, and which is also found according to Hahn and Staedeler in the *corpora lutea*. On making a spectroscopic examination of this yellow coloring matter, it was found that its absorption spectrum exceeded that of the luteïn of yolk in length, and while the chloroformic solution showed only one absorption band, beginning at the Frauenhofer line *b*, causing the absorption of a part of the green, the blue and the purple rays of the spectrum, the spectrum of luteïn will be seen to have three absorption bands, one covering the line F, another band situated nearly midway between the lines F and G, and the third band commencing with the line G, and continuing to the end of the spectrum. However, there is no question but that the yellow coloring principle of the actinomycetes is a physical isomere of luteïn. (See accompanying spectroscopic illustration.)

The alcoholic filtrate, separated from the yellow coloring matter, was concentrated, water being added to replace the evaporated alcohol, acidulated with muriatic acid filtered from the yellow coloring matter which had separated. The colorless solution thus obtained was tested for alkaloids as follows:

Mercuric chlorid gave no precipitate.
Platinic chlorid gave an orange precipitate.
Potassium ferrocyanid gave a whitish precipitate.
Tannic acid gave a whitish solution in alcohol.
Iodo-iodid potassium, a brown precipitate, soluble in an excess of the reagent.
Potassium iodo-hydrargyrate a white precipitate.
Palladium chlorid, no precipitate, but on evaporation a double salt in the form of a Maltese cross and square plates was obtained.
Potassium ferricyanid with ferric chlorid gave rise to the production of Prussian blue.

The filter which contained the spores of this fungus, together with barium sulphate, was incinerated with nitric acid to get rid of all of the carbonaceous residue and finally heated to a dull red heat. On dissolving the residue in dilute nitric acid, filtering and adding the concentrated solution to the molybdic solution, a comparatively large amount of the yellow precipitate indicating phosphoric acid was obtained.

From the foregoing analysis it will be seen that the fungus actinomyces contains a ptomaïne, a yellow coloring principle isomeric with luteïn. And that the spores contain a relatively large amount of phosphorus in an undetermined state of combination, a fact which the author desires to place on record, pending future research on phosphorus and its relation to organic life.

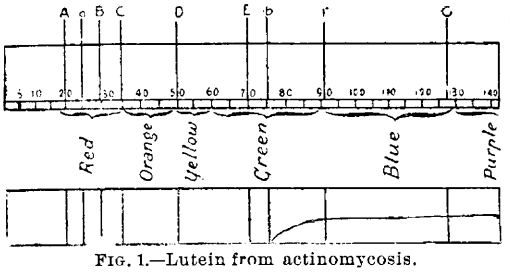


FIG. 1.—Lutein from actinomycosis.



FIG. 2.—Lutein from yolk of eggs.

Bacterium of Green Pus—A Pure Tube Culture.—The culture was carefully removed from the culture medium. On examination the culture was found to consist of a mass of microscopic fibrous crystals, mixed with the bacteria of pus. The crystals were found to be insoluble in water but readily soluble in alcohol. The preliminary examination furnished the means to determine a procedure for conducting the analysis. The entire culture was treated with water in a similar way as the actinomyces, and for a similar purpose, and aside from testing the filtrates with tannic acid, testing was also made for phosphoric acid by evaporating a portion of filtrate, igniting, re-dissolving in dilute nitric acid and testing with molybdic solution. This last testing was adopted to remove all traces of any substance from the bacteria that might contain phosphorus as a phosphate or in some other organic combination, the ultimate object being a search for phosphorus in the bacteria.

The residue on the filter left after the exhaustion by water of everything soluble in it, was then subjected to the action of ether-alcohol by which a solution was obtained, which when a drop of it was allowed to evaporate on a glass slide and examined with a

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microscope was found to leave a residue composed of transparent colorless acicular crystals arranged in stellar aggregations. When platinic chlorid was added to the ether-alcoholic solution, a precipitate appeared, which changed in a short time to yellow octohedral crystals; evidently a double salt of the ptomaine generated during the growth of the bacteria of pus.

The entire bulk of the ether-alcoholic solution was evaporated to dryness and re-dissolved in alcohol for further investigation, when the accidental loss of the solution prevented further work in this direction.

The filter containing the bacteria together with barium sulphate was incinerated and finally ignited and dissolved in dilute nitric acid, the process being conducted similarly as in the case of actinomyces. On applying the molybdic test a sufficient amount of the yellow ammonium molybdic phosphate was obtained to show conclusively that phosphorus in some form is a normal constituent of the bacterium of pus.

THE RELATIONS OF MATTER AND MIND.

Read at the Annual Meeting of the Indiana State Medical Society, May 16, 1894.

BY JAS. F. HIBBERD, M.D., LL.D.
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In the near future the most important and useful progress in medicine will be along biologic lines. Biology is the science of living things; in the broader sense covering all vital processes; teaches the phenomena concerning the genesis, the development, decline and death of all vital organisms.

To my mind it is a self-evident proposition that a physician should fully understand the cytogenesis, the morphology, the histology, the anatomy, the physiology and the pathology of man, and as man is a microcosm of animated nature it is but a corollary that a perfect physician must be a thorough biologist.

In the matter of the biology of the human mind there is abroad a great popular misunderstanding, and I am apt to believe that physicians have not given such attention to the relations of matter and mind as to leave no shadow of dubiety in the premises in their own minds.

No student of current mental conditions has failed to recognize the difficulty of accounting for the incongruities of mental manifestations met with in all classes of people, and certainly no physician of experience but has been puzzled in many instances to draw the line between physical disease and so-called mind disorders. Much of the uncertainty in these cases is due to the fact that we have not sufficiently mastered the physics or the functions of the nervous organization in which the mind originates. In this state of knowledge it has been beyond our ability to point out definitely the true relation to hypnotism, to spiritualism, clairvoyance, Christian science, faith cures and a long list of similar disturbances to ordinary normal mental operations. It is my contention that all these are understandable erratic operations of the mind as emanating from the nervous organization, and it is the intent of this dissertation to indicate how I arrive at this conclusion. I beg to premise that in this study the definition of psychology is restricted to its etymologic signification, to-wit, the science of the soul, quite a distinct thing from the somatic mind as herein elucidated, and that in this discussion I do not enter the realm of psychology.

When one attempts the analysis of the relation of matter and mind by a study of it, as it exists in the human adult, one fails of success most signally. The relation here is so involved, its manifestations so diverse, so extensive and apparently so mysterious that its essential nature can not be made out by such a study, and yet this has been almost the exclusive field cultivated by investigators of metaphysics since the time of Aristotle with the constant result of endless disagreements and confounding confusion. Accordingly, for a satisfactory elucidation of this relation we must pass the schoolmen, depart from scholasticism, and make use of modern scientific methods of investigating involved problems, devoting ourselves to seeking the simplest form in which the relation of matter and mind exhibits itself and following its development, step by step, in its ascending scale until it reaches its maximum in enlightened man.

The amœba is the lowest organism that exhibits the essential characteristics of animal life and its genesis is in protoplasm. The amœba is conceded on all hands to be an animal, and I will seek in it the first link of the chain of nervous energy that extends through all forms of animal development up to man, and still continues to extend in man as witnessed in his expanding knowledge and increasing enlightenment. The amœba is a single cell whose habitat is water containing protoplasm, and at rest and not under pressure, is globular. If it desires food it projects from its surface a pseudopod, a finger-like process, from its general substance. If this feeler finds nothing the animal wants, the pseudopod is retracted into the general mass of the amœba. This may be repeated indefinitely and from any part of the cell, and when the pseudopod finds something seemingly suitable to its needs the body of the amœba follows up the pseudopod, and if the something, on examination, turns out to be a morsel of food, laps itself about the morsel, secretes a digestive juice, dissolves and absorbs the nutritious part of it, then unwraps its body and releases the indigestible refuse. When sufficiently developed to procreate its species the amœba divides by fission, making two organisms with identical structure and functions, each of which follows precisely the same career as the parent and has posterity in like manner to continue the family.

Here, then, is an animal of low degree, representing in minature all the essential phenomena of the most exalted animal creation; *e. g.*, it has volition—it wills to move and at once projects a pseudopod; it has judgment—it meets a morsel of something, seizes and examines it; if found to be food appropriates it, if not food discards it; it has secretion and absorption—it pours out a digestive fluid, dissolves its food into a peptone which it absorbs and assimilates; it has growth and reproduction—it develops by appropriating food, and reaching the procreative stage, divides, creating two amœba. Are not these functions of the amœba all of the essential functions of human beings? Are not the differences between the amœba and man, differences of degree and mode of manifestation and not of kind? Does not the amœba, a single microscopic cell of undifferentiated protoplasm, exhibit in every part of its organism all the attributes that promote the life and perpetuate the species of man who is but a community of untold billions of cells differentiated into departments and organs, such that each function has its assigned cells

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