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FIBRINE AND BACTERIA.

—BY—

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FIBRINE AND BACTERIA.

REPLY TO DR. GREGG.

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On page 438 of your interesting monthly of February last, I find what is called a reply to my short paper on Dr. Rollin R. Gregg's views relating to Fibrine and Bacteria. I judge from his reply that the Doctor rides a high horse and ignores the modest professional buggy, but I hope nevertheless to convert him to more accurate views than he at present entertains.

It will be remembered by your readers that I stated in my few remarks of Dr. Greggs' experiments that fibrine is soluble in the alkalies and that cellulose, the external cell-covering of bacteria, is not, thus giving a test for bacteria as distinguished from fibrine. I also said that "fibrine is a muscle forming substance and cellulose is not." Dr. Gregg in his answer denies that fibrine is soluble in the alkalies or that it is muscle forming and quotes Liebig as saying that, "fibrine relates chemically more to coagulated albumen than it does to the fibrine of the blood." Suppose it does. Both are soluble in the alkalies. "Digested at the temperature of the living body in dilute solutions of ammonia or of potassium or sodium-hydrate, fibrine dissolves." Arthur Gamgee, p. 36. Edition 1880.

"Coagulated albumen is soluble in caustic potassa." Dalton's physiology, p. 84. Edition 1861.

"It is highly probable that the animal organism possesses power to transform albumen into fibrine or caseine or vice versa. * * * The principal bulk of an egg is albumen * * * yet from these are produced the fibrine in the chick's muscles, also the horny tissues and feathers. In suckling a young animal, it is evident that caseine must be similarly transformed, or if we reverse the examination, the

parent gets her milk (so rich in caseine) from blood which contains none." Symington, Brown's Chemistry, Boston, 1855.

"When fibrine is subject to a solution of nitrate of potash at a high temperature it becomes soluble and very much resembles albumen." Johnson, Thurner's Chemistry, Revised Edition.

"Fibrine is soluble in a six per cent. solution of potassium nitrate if digested with it for some time at a temperature of 30° or 40°. It is similarly soluble in sodium chloride and in a ten per cent. solution of magnesium sulphate." "In water containing one part hydrochloric acid per 1,000, fibrine dissolves in a few hours at a temperature of 40° * * * and is converted into acid—albumen." Physiological Chemistry of Arthur Gamgee, M. D., F. R. S. Published by McMillan & Co., London, 1880.

"Fibrine * * * sparingly soluble in dilute acids and *alkalies* and in neutral solutions. * *" Fowne's Manual of Chemistry, 1873.

"Fibrine is soluble in water at ordinary temperature, passing into *solution* only *at very high temperature, or after a great length of time*, and then becoming totally changed in character."

"In *dilute alkalies* it swells up * * * and *is more soluble* than in dilute acids. In neutral saline solutions * * it swells up * * and gradually dissolves."

"Suspended in distilled water at 70° it becomes more opaque and loses its elasticity. Its solubilities are thus identical with those of coagulated albumen."

"Fibrine—Gluten.—Fibrine receives its name from the circumstance that it enters largely into the composition of the muscular fibre of the animal." "It is best obtained by whipping a quantity of fresh drawn blood with a bunch of twigs * *. It is not soluble in the acids, but dissolves readily in dilute solutions of the alkalies. Fibrine obtained in the above manner from either venous or arterial blood appears to possess essentially the same properties, and when turbinated with solution of nitrate of *potash* at a high tem-

perature, it becomes soluble and very much resembles albumen." Fowne's Manual of Chemistry, p. 491, 1873.

"Muscular fiber properly consists of a substance which is soluble both in potash and acetic acid. Page 584, Mulder's Physiology, 1849.

"If we dissolve coagulated albumen in dilute potash lye, digest the solution some time at 60° to 70°, and then precipitate with acetic acid we obtain a snow-white precipitate." "Fibrine * * * in coagulated state forms the principal constituent of muscle." * * * "In fresh condition it is easily dissolved in acetic acid and in alkalies." Lôwig's Organic Chemistry, 1853. Philadelphia, A. Hart, publisher.

I might quote Foster and fifty others but enough has been given to prove that Fibrine and coagulated albumen are soluble in the alkalies and are muscle forming.

The Doctor says that "If he will read authors he will find that fibrine is almost the only food of the serous membranes and their allied structures; while albumen is the only food * * * * of the muscles or muscular cells."

"Muscles—* * * Their structure is always fibrous." * * * "The chief substances contained in them are fibrine, albumen and gelatine. *The two latter substances* are contained chiefly in the *membranes which* envelope the fibers." Johnston, Turner's Chemistry, p. 498, edition 1867. The Doctor in writing of his experiments says: "If he watches fibrine of rotted blood go through all sorts of net-work, cellular and other formations * * * he will learn much of the secret of all-development which has already been seen and another great point gained." Are we to understand from this, that Dr. Gregg is the first to make the observation, that the substance of living fibrine conforms to a law common to every form of protoplasm, (there is no dead protoplasm)? "Blood rotted for six months" cannot on any known principle produce living cellular fibrine. The forms therefore which he observed in rotted blood are not living cell formations. The motions of fibres or granules is no positive indication of life. The openings he sees may be simply holes such as are com-

mon to baker's bread. But the Doctor has discovered that the granules of fibrine no matter how treated with acids and fire are always present, the same size, the same color, the same everything, even to motion in many of them, and he infers that when I have seen such granules in disease that I have called them micrococci. This is the conclusion the Doctor arrives at after twenty years study in his special branch and discovery! Dear Doctor I am sorry that you have spent twenty years in your fibrine studies. It has narrowed your vision, ruffled your temper, and prevented you from reading up the most common place experiments relating to bacterian culture.

Did you even try to cultivate fibrine granules —*your bacteria*—either before or after you burnt them to test their powers of reproduction? Had you done so, you would have saved your midnight gas and may be an aching head. Since you are gifted in giving advice, please take a little and read up Mulder's Physiology, where you will find your little granules and fibre depicted, and even the cells of fibrine portrayed in picture form. How different a thing are bacteria proper from your fibres and granules. The simplest of all the forms of bacteria—spherical bacteria, an agent which from the very inception of life upon the earth, has continuously performed a function without which the successive generations of plants and animals could not have existed; and stupendous as is its work, it is an agent so minute that twenty million individuals of its class might be inclosed within a globe small enough to pass through the eye of a cambric needle.

Let us theoretically put the Doctor's discovery to a common test. Let a portion of his fibrine and granules be subjected to a sufficiently high temperature in water to sterilize the mass, and place a portion of his wigglers thus treated in a properly, sterilized, clear, nutrient fluid (after the fashion of Pasteur) for a sufficient length of time, to give his fibres and granules a chance to reproduce their kind. At the same time put a drop of water containing real bacteria into another sterilized fluid as above. It will be found after the lapse of a

few days, that the fluid containing the *Doctor's bacteria* will not cloud the water or his bacteria be increased in numbers. Whereas in the second experiment the real bacteria will have clouded the nutrient fluid and the bacteria greatly increased in numbers, thus demonstrating the erroneous character of Dr. Rollin R. Gregg's philosophy. It will be remembered that the Doctor's bacteria are not affected by boiling or burning, or the action of nitric acid.

With regard to cellulose, a substance destitute of nitrogen, convertible by nature or art into starch, dextrine or glucose, a very different substance from fibrine, the latter contains the elements of bacteria, but the former does not. Now since I have shown that fibrine is soluble even in water under the conditions stated, the soluble parts however small, would supply sufficient food for the propagation of bacteria, and when we take into consideration Dr. Gregg's exceedingly loose method of conducting his experiments, the presence of real bacteria in his solution is easily accounted for. Scientific men who conduct bacterian experiments, would not give his methods a moment's consideration, well knowing that any watery solution of protides would supply food for bacteria.

The Doctor desires me to test his experiments; such experiments generally considered are a common place matter with me but not for the purpose of entering into competition with nature in creating living things. The most we can do is to supply suitable food to the ever present spores, and in this way admit of the possibility of their reproduction.