The Origin of Bacterio-Therapeutics.

Soured or curdled milk in one form or another has from time immemorial played an important part in the diet of human beings, in races as far apart as Turkey and Africa, China and the Caucasus, a special ferment, varying in different countries, being employed for the purpose. The prepared milk is known under various names — yahourt, leben, kefir, koumiss, varenetz, etc.

The best known of these ferments, says the *Journal of Practical Dietetics and Bacterio-Therapeutics*, in the following article, republished from that journal, is the Bulgarian "maya," with which is produced the article of food called yahourt or yoghourt. This ferment contains several yeasts and bacteria, but from it, by careful selection, Professor Metchnikoff succeeded in isolating a pure culture which, in association with certain paralactic organisms, constitutes lactobacilline.

Acids in general exert a preservative action. Vinegar, *qua* acetic acid, is largely employed for the purpose of preserving vegetables, etc., from decomposition. Milk itself turns sour spontaneously owing to the formation of lactic acid, the presence of which protects it against the agents of putrefaction. Sugar is a powerful preservative simply on account of the ease with which it undergoes acid fermentation. Lactic acid itself, however prepared, is an active antiseptic, a property that has been utilised in the treatment of the gastro-intestinal disorders of infancy, but, administered as such, it is rapidly absorbed and burnt up, so that its local, *e.g.*, intestinal action, is necessarily very circumscribed.

The merit of the lactic acid ferments just described is that they set free lactic acid in small quantities, but continuously, throughout the whole length of the intestine, in which, after a few days, they become acclimatised and continue to multiply.

Then, too, lactic acid, in common with many other substances, is vastly more active when brought to bear in a nascent state, as when produced by these lactic germs.

The lactic acid organisms comprised in lactobacilline have been shown to be absolutely innocuous; moreover, they are very robust, and soon create a "*milieu*," which is unsuitable for the multiplication of the butyric and putrefactive organisms, and these disappear from the digestive tract, leaving the lactic germs in possession of the field. This is doubtless due to the lactic acid which they evolve, but, however caused, the fact affords convincing evidence of their activity.

The existence of putrefactive fermentations in the intestine is manifested by the presence of an excessive amount of indican in the urine; indeed, the reaction provides an easy means of gauging the degree of alimentary intoxication.* Under the influence of the lactic acid treatment the proportion of indican rapidly returns to normal, as shown by periodical analysis, a point that was worked out by Dr. Pochon in the laboratory of Professor Combe, of Lausanne.

The consumption of lactic acid cultures in the shape of yahourt, leben, kefir, koumiss, and other fermented drinks was purely empirical, but Professor Metchnikoff has elucidated their *modus operandi*, so that the treatment has now been placed on a sound scientific basis.

The essential thing is to employ only pure cultures, and this has now been rendered possible. Hitherto the lactic germs have only been employed in the form of fermented or curdled milk, but under existing circumstances they can be utilised in various forms; directly in the form of "broth," or in the form of a powder or tablets, so that their administration offers no difficulty. Obviously it is more economical to make use of milk that has been curdled by the aid of lactobacilline, because we obtain not only a partially digested milk with a slight degree of acidity, which is particularly grateful to the palate in the subjects of acute disease, but this curdled milk contains many times the number of the original germs, so that the therapeutical effects are correspondingly enhanced.

The curdled or soured milk constitutes a valuable addition to the invalid diet, but in addition to its nourishing qualities it renders great service by inhibiting all forms of irregular fermentation in the alimentary canal. This is of extreme importance in the treatment of infantile and summer diarrhœa, in entero-colitis, muco-membranous colitis, flatulent dyspepsia, tropical diarrhœa, and even in typhoid fever and dysentery. Cases in which all the usual methods of treatment have failed to relieve promptly yield to a diet mainly composed of curdled milk.

* Test for indican: To 10 cc. of urine in a test tube add an equal quantity of hydrochloric acid (pure), shake up, and add a few drops of peroxide of hydrogen. Mix thoroughly; let stand until maximum colour is developed, then add 2 cc. of chloroform and thoroughly mix together. The chloroform is allowed to settle at the bottom of the tube. In normal urine it is of a bluish-white colour, but in the presence of indican in excess it is more or less deeply tinged with blue or even indigo.

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