

and anything that assists in their diagnosis is welcome and helpful.

DR. L. H. METTLER, Chicago: We still find that clinical differentiations between this and the tics and certain choreiform manifestations are based to a considerable degree on the localization of the symptoms. We are told often that chorea minor involves especially the peripheral extremities, whereas the tics are more obvious about the face and head, as though that were an important element of distinction. In some old definitions and even in some modern definitions we are informed that chorea minor implicates the voluntary muscles; and the movements are spoken of as remarkable for being involuntary, yet associated with the voluntary parts of the body. The suggestions of Dr. Graves as to the respiratory movements show that the disease is a much wider affection than these clinical differentiations would lead us to suppose.

I have long been teaching that the sensory manifestations, the mental manifestations, as well as the more prominent motor manifestations involving the different parts of the body, point to the fact that chorea minor is something more than a mere cortical trouble, and that the clinical physiopathology of the disease carries us back to what most of us are beginning to recognize, and which ere long all of us will recognize, that we have here a generalized infective process, whether rheumatic or otherwise, and that this infection involves more or less all of the functions of the body, manifesting itself only more prominently in certain ways, as Dr. Graves has brought out. I think that these investigations clearly show us that in this infective process we have a disease which involves more or less the entire nervous system in all of its various functions, and not alone the mere motor areas. Particular parts of the motor function we have, even to the present time, been regarding too narrowly because they were merely most prominent clinically.

DR. WILLIAM W. GRAVES, St. Louis: I fully agree with Dr. Mettler that in chorea minor we are dealing with a disease of rather widespread irritative nature. I believe a study of its respiratory phenomena will emphasize that which now is generally recognized, that chorea minor is really a disease, due to an infectious agent, though not definitely known, as measles, smallpox, scarlet fever or other infectious disease. The entire clinical history of the disease points to this conclusion.

### LACTIC ACID AS AN AGENT TO REDUCE INTESTINAL PUTREFACTION

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In a book recently published and entitled "The Prolongation of Life," Optimistic Studies by Elie Metchnikoff, the author has made an attempt to analyze the causes of premature senility. The origin and uses of the large intestine are discussed and an attempt made to account for its purpose. The author argues that protection is afforded to animals which are frequently compelled to make a hasty escape from enemies by allowing the waste products of digestion to accumulate without the necessity of immediate discharge. He seeks to prove this theorem by a number of examples. Birds have neither a large intestine nor a bladder and therefore are unable to retain waste products. Exception to this rule is the ostrich, which, not being able to fly, has developed a large intestine so as to be enabled to continue a lengthy flight. Mammals have, as a rule, a large intestine because their terrestrial habits of life make it expedient for them to protect themselves by flight from some sudden enemy.

#### THE COLON AND LONGEVITY

Metchnikoff then quotes examples of short-lived mammals. The horse, for instance, has a huge large intestine

in which waste products accumulate and the discharges are often the results of food taken several days previously. The same applies to sheep and cattle. All these animals, according to their size, seem entitled to longer lives than they actually possess. On the other hand, birds of prey which live largely on putrefying meat show a small intestinal flora of bacteria, because, as Metchnikoff reasons, there is no intestinal sac in which food wastes accumulate and these animals have consequently long lives. It has been supposed by some authors that an exclusive vegetable diet is not productive of intestinal putrefaction and that putrefaction is due to a meat diet. This may be true in a measure and under certain conditions. Metchnikoff thinks, however, that intestinal putrefaction is primarily due to the presence of a large intestine, and that premature senility is the result of the accumulation of waste products which remain for varying lengths of time in the colon and are there subject to the activity of putrefactive bacteria.

Herter agrees with the view that premature senility is due to putrefaction caused by the activity of anaërobes, chiefly *B. aërogenes capsulatus* (*B. Welchii*). The character of the food influences the intestinal flora, causing differences not only in number but in kind. In infants fed exclusively on human milk an anaërobic bacterium described by Tissier (*B. bifidus*) is present in large numbers, especially in the upper part of the intestinal canal. This organism produces too much acid for most bacteria to live in and affords protection against bacteria in general, and especially against pathogenic and putrefactive bacteria, which thrive best in alkaline media.

In the intestines of infants fed on cow's milk, on the other hand, several species of anaërobic bacteria find suitable conditions for development. These bacteria break down proteins with the production of substances which may become injurious to the system, especially if they are allowed to accumulate by large amounts of protein-containing food reaching the colon.

#### INTESTINAL FLORA

In adult life few bacteria of any kind are found in the normal stomach, being promptly killed by the hydrochloric acid of the gastric juice. In the duodenum there are few, in the jejunum more, and in the colon almost countless numbers. The distribution of species also varies according to locality. Aërobes and streptococci are chiefly found in the upper parts of the intestines, but in the colon we find in addition large numbers of anaërobes which are practically absent in the higher intestine. The anaërobes can only thrive after the free oxygen is used up by the aërobes, and if undigested protein reaches the colon they find there favorable opportunity to elaborate from it the poisonous products of putrefaction.

The presence of acid is unfavorable to the growth of putrefaction bacteria, and it is believed that streptococci and bacteria of the colon aërogenes group serve a useful purpose by the acid they produce and by using up material on which the anaërobic bacteria might thrive. The streptococci exercise an inhibiting influence on bacteria of the colon aërogenes group. The whole question of the usefulness or uselessness of bacteria in the digestive tract is still debated, though most authorities seem to agree that the production of acids in the digestive tract is of distinct value.

A proper balance of carbohydrates and proteins, the use of only a moderate amount of protein, the avoid-

ance of imperfectly-cooked meat, and thorough mastication tend to prevent putrefaction. Acids have been employed as remedies for intestinal putrefaction, but it is difficult to administer them in sufficient amounts to serve the purpose without causing injury by the neutralization of alkali. Intestinal antiseptics are of doubtful efficacy.

#### LACTIC ACID AND INTESTINAL PUTREFACTION

In his book on the prolongation of life Metchnikoff advises strongly the ingestion of lactic acid bacteria for the prevention of intestinal putrefaction. Food has been preserved empirically from remote times by various means, one of these being the use of sour milk. The introduction of lactic acid bacteria has been attempted by various authors, some claim with eminent success. Thus Cohendy took cultures of a bacillus isolated from the Bulgarian fermented milk Yhourth or Yoghurt and reduced intestinal putrefaction materially. He found the Bulgarian bacillus in the feces for several weeks after discontinuing ingestion. Tissier employed cultures of Kozai's *B. acidi paralactici* with success. Herter has fed dogs with cultures of *B. coli* and *proteus* and found that putrefactive products increased in the urine. When feeding cultures of lactic acid bacilli, however, he found a reduction. Professor Herter has kindly informed me in a private communication that the lactic acid bacilli used in these experiments were not of the Leishmann type (*Strept. lacticus*) but probably Hueppe's *B. acidi lactici*.

The bacillus recommended by Metchnikoff and named by him *B. bulgaricus* has been studied in his laboratory by Bertrand and Weisweiler. They found that it produces an unusual amount of lactic acid, more in fact than is pleasant to taste. Metchnikoff's bacillus also digests the casein somewhat and decomposes some fat so that the taste is disagreeable. Therefore Metchnikoff advises the use of the paralactic bacillus (*Strept. lacticus*) in combination with the Bulgarian bacillus.

Recently Herter and Kendall have investigated the fate of *B. bulgaricus* in a monkey. They fed a monkey with bacillac, a beverage produced from milk with *B. bulgaricus* and a yeast. By feeding them this milk exclusively they were able to maintain an acid reaction throughout the digestive tract. They failed, however, in establishing the predominance of the Bulgarian bacillus in the ileocecal region. In the large intestine the number of these bacilli was relatively small. "Thus in the region characterized by most active putrefaction the lactic acid bacilli failed to establish themselves in relatively large numbers." The authors assume that the introduction of lactic acid bacteria appears to reinforce the enfeebled action of the normal intestinal lactic acid bacteria and to increase the amount of acid produced where it is insufficient or to reintroduce it where it is absent, thus assisting the host to throw off "wild races" of bacteria that may have become habituated in the intestinal tract.

Wegele has obtained good results by the use of Metchnikoff's sour milk. He thinks that the production of lactic acid *in statu nascendi* in the digestive tract is of importance more than the mere presence of lactic acid after consuming sour milk.

Wejnert claims that the number of bacteria in the feces is markedly reduced by the use of sour milk prepared with lactobacilline (*B. bulgaricus*, *Strept. lacticus* and a yeast). He stated that this reduction is more marked by using this milk than by using ordinary sour

milk. The evidence is not convincing, and since anaërobic bacteria were not searched for in his experiments the benefit claimed has not been sufficiently substantiated. He found *B. bulgaricus* in the feces but did not state what relation the numbers bear to the number of other bacteria in the feces.

We have seen that in order to produce lactic acid it is necessary to have carbohydrates present. We must remember that many bacteria are able to produce lactic acid from sugars, some species producing but small amounts, others larger amounts and some produce other acids than lactic acid. Lactic acid up to 1 per cent. in milk is palatable and pleasant, but if mixed with volatile acids, such as acetic, formic acid, etc., the taste becomes unpleasant. It is of importance, therefore, to select the kind of lactic acid bacteria with care. *Strept. lacticus*, the organism responsible for the natural souring of milk, produces about the right amount of palatability. In fact milk which has reached the stage of extreme activity of this organism is eaten by many people as a delicacy. When milk has solidified from the coagulation of the casein brought about by *Strept. lacticus* it contains these bacteria in almost pure culture and the lactic acid present is almost pure lactic acid. If milk is kept longer than this, molds decompose the casein, bringing about an alkaline reaction, so that putrefactive bacteria can multiply and putrefy the milk.

#### BUTTERMILK AND ITS MANUFACTURE

Buttermilk as we procure it in the market may contain various degrees of acidity and fat. If butter is made from sweet cream the buttermilk contains very little acid. Usually butter is made from cream containing 0.6 per cent. or more acid. The amount of fat in buttermilk depends largely on the thoroughness with which the churning process is carried on. The souring of the cream previous to churning is either the natural process or is brought about by the use of starters. In the natural process *Strept. lacticus* is the usual agent producing acidity, but may fail to give good results if excessive numbers of other bacteria are present. If starters are used unpleasant flavors are avoided, especially if commercial starters are used. These consist chiefly of cultures of *Strept. lacticus*, some being actually pure cultures. The cream may be pasteurized previous to inoculation with these cultures and thus the injurious influence of foreign bacteria avoided.

Buttermilk, therefore, is sour milk from which the butterfat has been partially removed. The churning process which breaks up the coagulated casein into extremely fine particles may influence the taste and aroma somewhat. A large proportion of buttermilk is manufactured by inoculating separator milk or skimmed milk with starters and churning after coagulation. During the investigation to be discussed presently ordinary sour milk was tasted by a number of persons who knew nothing of the origin and they invariably declared that they were drinking first class buttermilk. If milk is allowed to remain at room temperature for two to three days, then thoroughly shaken, a pleasant and wholesome beverage results, if proper care is taken to obtain a good grade of milk, as personal experiments have shown.

Should milk be pasteurized or boiled if sour milk is to be prepared by introduction of pure cultures? Our experiments have shown that the cooked taste is not eliminated by bacteria and is often quite prominent if the milk has been boiled. This certainly is a disad-

vantage. Pasteurization will furnish a more palatable product than boiling. Raw milk, however, is the most palatable. Since pathogenic bacteria are often found in milk it may be safer to pasteurize the milk previous to inoculation. Pasteurization and boiling kills vegetative forms of bacteria so that pathogenic bacteria are killed, but lactic acid bacteria are killed also and have to be supplanted by artificial cultures. Pasteurized and boiled milk also contain the spores of putrefactive bacteria, which, however, are suppressed if lactic acid bacteria are inoculated in sufficient numbers. On the whole, pasteurization is to be recommended unless the milk is produced under strict hygienic precautions.

#### PREPARATIONS INVESTIGATED

Of late years a number of firms have manufactured and marketed preparations for the home production of soured milk. At the suggestion of the editor of THE JOURNAL of the American Medical Association, I, assisted by Mr. T. H. Glenn,<sup>1</sup> have investigated some of these preparations with a view of determining their relative value as starters for sour milk beverages. The preparations were purchased in the open market and samples also were obtained from the manufacturers, in order to determine their stability. Bacteriologic examinations were made from the tablet or capsule directly and also from sterilized milk inoculated with the tablet or capsule. Sour milk was prepared with the respective preparations, following the directions given in the printed pamphlets accompanying the packages. In all, six series of experiments were made by inoculation of flasks containing 500 c.c. milk with the commercial preparation:

1. Inoculation of ordinary raw milk.
2. Inoculation of certified milk, containing 1,000 to 5,000 bacteria per c.c.
3. Inoculation of boiled ordinary milk.
4. Inoculation of boiled certified milk.
5. Inoculation of milk sterilized at 120 C. (248 F.) for twenty minutes.
6. Plating in glucose agar of the commercial preparations.

The amount of acid was determined daily for three successive days of each preparation, excepting the series inoculated into sterilized milk. This series was examined on the third day only. The acidity was determined by titration with a solution of Farrington's alkaline tablets. This method is perhaps not quite as accurate as titration with normal alkali, but for comparative purposes is sufficiently reliable. The sterilized milk was titrated but once in order to avoid every possible chance of contamination. Plates were prepared in 1 per cent. glucose agar from all flasks and a number of colonies transferred from each plate to slant agar, litmus milk and glucose agar. A series of butterfat determinations were made by the Babcock method in order to determine whether any fat was lost during the fermentation. Notes in general were made as to the appearance, consistency, taste and odor of each of the flasks. All fermentations were allowed to proceed at an average temperature of approximately 21 C. (70 F.).

In order to eliminate the personal equation a series of samples were tasted by three physicians independently. The samples prepared for this test were sent in 200 c.c. bottles and each bottle numbered, so that the experimenter did not know what he was tasting. Numerous similar tests were made by asking persons working in

the laboratory to give their opinions, all of these tests being made with the same precaution, viz., keeping them in ignorance of what they were tasting.

In addition to the above described experiments I prepared three capsules, one from sour milk, another from a pure culture of *Strept. lacticus*, and a third from a mixture of *Strept. lacticus* with a yeast isolated from one of the market preparations. These capsules were subjected to the same tests as the others. The results of these experiments will be given by taking up a discussion of the findings of each separate preparation first and then by discussing the results as a whole.

The following account of the investigation of commercial preparations is a summary of detailed results of the experiments. Since there was no marked difference between the samples bought in the open market and those obtained from the manufacturers, only one of each will be described. The numbers refer to the various persons who have given their opinions as to taste, etc. When there is no mention of butterfat no change in percentage was noted.

#### LACTOBACILLINE

This preparation (made by the Franco-American Ferment Co., New York) is put up in small brownish tablets, forty-eight in a box, and also in powder form. It has a decidedly acid taste. Micro-organisms found in the tablets: *B. bulgaricus*, *Strept. lacticus*, an acid-forming staphylococcus, *B. subtilis*, and a yeast. Boiled milk inoculated showed *Strept. lacticus* in overwhelming numbers and large numbers of the yeast cells. *B. bulgaricus* was in relatively small numbers. The degree of acid formed in three days was 0.82 to 0.85 per cent. (lactic acid). The final product had a generally good taste and consistency.

Samples tasted from a preparation made with raw certified milk were commented on as follows:

1. Taste good and creamy.
2. Rather unpleasant, slightly bitter.
3. Disagreeable; not due to acid.
4. Too acid, disagreeable.

The same prepared with boiled certified milk:

1. Generally good, boiled taste.
2. Sweet and somewhat nutty flavor, also like boiled milk.
3. Slight acidity, slight sweetish flavor.
4. Milk scorched, sweetish flavor, not at all like buttermilk.

With inoculated sterilized milk: Taste was not pleasant. The predominating micro-organisms were *Strept. lacticus* and a yeast.

#### FERMENLACTYL

This preparation (made by the Anglo-American Pharmaceutical Co., Ltd., London, Paris and New York) comes in small yellowish tablets which taste like malted milk, six tablets in a bottle and eight bottles in a box. The organisms found in original preparation: *B. bulgaricus*, *Strept. lacticus*, a yeast and alkali forming bacteria probably *B. subtilis*. Boiled milk inoculated showed *Strept. lacticus* and yeast cells in large numbers. In sterilized milk a staphylococcus, *B. bulgaricus* (not in large numbers), *Strept. lacticus* and yeasts were found. The degree of acid after three days varied from 0.80 to 0.89 per cent.

In certified milk, both raw and boiled, the taste and appearance were good on the whole.

In ordinary raw milk: "Sweet, creamy and pleasant acid" was the verdict of three individuals.

In boiled milk the opinions as to its flavor were unanimous, that it was pleasant but the boiled milk taste was present.

In sterilized milk the acidity after three days was only 0.48 per cent. Micro-organisms present were: *B. bulgaricus*, *Strept. lacticus*, a staphylococcus, and yeast cells, *Strept. lacticus* was the most prevalent.

1. This work was done in the Bacteriologic Laboratory of the University of Chicago. I acknowledge my indebtedness to Prof. E. O. Jordan for permission to use laboratory facilities freely.

## KEFILAC

This preparation (made by the Keflac Co., Atlanta, Ga.) comes in large white oval tablets, sixteen in a tin box. Almost tasteless. Micro-organisms in the tablets: *Strept. lacticus*, *B. aerogenes*, a chromogenic torula, alkali forming bacilli (*B. subtilis*), a yellow pigment forming bacterium and a few organisms resembling *B. bulgaricus*. Acid formed after three days, 0.79 to 0.88 per cent. The final product had a generally pleasant taste and consistency. Some gas was formed in the curd.

Opinions as to taste, etc., in ordinary raw milk: Sweet, creamy and pleasantly acid; the verdict of three individuals.

In boiled milk the opinions as to its flavor were the same as in raw milk except that the cooked taste was noticeable.

In sterilized milk *Strept. lacticus* and yeasts were prevalent.

## YOGURT

This (made by the Yogurt Co., Battle Creek, Mich.) is put up in both capsule and tablet form. The tablets are soft and crumble readily, are light brown and of a floury taste. The capsules are tasteless. The original preparation contains large numbers of bacteria, among which *Strept. lacticus* was found in large numbers, also *B. subtilis*, *B. aerogenes*, *Oidium lactis* and a yeast. The amount of acid formed after three days was 0.64 to 0.90 per cent. The final product varied considerably, in some cases being quite pleasant and creamy, in others rather disagreeable. Gas was found frequently in the curd.

Opinions as to taste, etc., in certified milk, both raw and boiled, the taste was disagreeable, much gas formed and a great deal of whey separated after three days. Sometimes a bitter taste was noticeable.

In ordinary raw milk:

1. Sweet, creamy and slightly acid flavor.
2. Slight acid flavor, not as palatable as some others.
3. Pleasant acid flavor, tastes like buttermilk.

In ordinary boiled milk:

1. Least acidity of all samples tasted, quite strong, of a peculiar nutty (boiled) flavor.
2. Least acid, somewhat sweetish and disagreeable taste.
3. Boiled milk flavor, not acid, sweetish, disagreeable.

In sterilized milk: Here the taste was quite pleasant and *Strept. lacticus* and yeasts were predominant.

## LACTONE

This preparation (made by Parke, Davis & Co., Detroit, Mich.) comes in small white tablets in a bottle. Organisms found in the original preparation: *Strept. lacticus*, a gas-forming bacillus (*B. aerogenes*) was found occasionally, not in all tablets examined, and a non-gas-forming bacillus. According to directions one-third of a quart of water was added in all experiments excepting those in which sterilized milk was used. The butter was consequently reduced to about 75 per cent. of the original content (in one case from 3.4 in the milk to 2.5 in the buttermilk). The amount of acid formed was from 0.69 to 0.92 per cent. Whey separated readily, always on the third day and mostly on the second day. In certified milk, both raw and boiled, the taste was plainly sour, with little flavor.

Opinions as to taste, etc., in raw ordinary milk:

1. Weakly acid, less flavor than any.
2. Weakly acid, no other flavor.
3. Slightly acid, no particular flavor, not at all like buttermilk.

In ordinary boiled milk:

1. Creamy, slightly acid, the peculiar nutty (boiled) flavor.
2. Acid flavor, with slight sweet flavor.
3. Peculiar acid flavor, not like buttermilk at all.

In sterilized milk: Only 0.31 per cent. acid was formed after three days, few bacteria, bitter taste. *B. subtilis*, *Strept. lacticus* (not numerous) and staphylococci.

## PREPARATION "X"

This consisted of the dried curd of milk, which had soured by the natural process for four days at room temperature. After being put up in capsules the appearance was yellowish like Yogurt capsules and the taste was somewhat cheesy. The

acid formed in milk after three days was from 0.80 to 0.91 per cent. In certified milk, both boiled and raw, the taste and consistency were good and whey separated only in one sample on the third day.

Opinions as to taste, etc., in boiled certified milk:

1. Slightly acid flavor, nutty (boiled) flavor.
2. Purely acid, not unpleasant.
3. Sweetish flavor, too thick.

In sterilized milk: Taste good, like buttermilk. Acidity, 0.85 per cent. Micro-organisms, *Strept. lacticus* and yeasts.

## PREPARATION "XX"

This was made by inoculating sterilized milk with a pure culture of *Strept. lacticus* isolated from market milk and a yeast from Lactobacilline. This preparation produced a fine buttermilk taste with an exceptionally delicate flavor and was favorably commented on by five persons. The curd was smooth, no whey separated for three days and the acidity was extremely pleasant. This preparation was substituted for fermentlactyl by a gentleman who had used the latter for several weeks. According to his judgment "XX" was preferable.

## NATURALLY SOURED MILK

A sample of this was also tested by three persons, with the following results:

1. Pleasant and creamy with palatable acidity.
2. A little too much acid to be pleasant.
3. Pleasant acid flavor. Tastes like buttermilk.

This preparation was ranked among the four best samples out of twelve by one experimenter. *Strept. lacticus* was present in almost pure culture.

## STERILIZED MILK

This was inoculated with a pure culture of *Strept. lacticus*. A good smooth curd was formed and five out of six persons tasting this thought it was genuine buttermilk.

It was interesting to note the varying rapidity of acid formation in these experiments. If certified milk or boiled milk was inoculated the acidity developed more slowly than if raw ordinary milk was used. In raw ordinary milk the high point was reached on the second day or nearly so and then remained stationary. In certified and boiled milk the high point was reached on the third day, while on the second the acid was either little more than on the first day or but slightly higher.

It is evident also that there is a parallelism between the process of fermentation of milk inoculated with the preparations discussed and the natural process. The products in both cases are quite similar. The great prevalence of *Strept. lacticus* is a leading feature. The amount of acid produced by this organism in pure culture is about the same as the amount produced by the use of these preparations.

The preparation of milk by the use of Fermentlactyl and Lactobacilline is rather a difficult matter in the household. In hospitals and laboratories there is little difficulty, but since the use is chiefly intended for the house it seems rather difficult to observe directions closely. The temperature for the successful growth of *B. bulgaricus* is higher than ordinary room temperature so that the benefits claimed for the use of this organism are hard to obtain. In Bulgaria, where the original Yehourth or Yogurt is largely prepared, great care is taken to keep the inoculated milk warm. Previous to inoculation with the Bulgarian ferment (Mava) the milk is boiled down to half its volume and inoculated at a temperature of about 45 C. (113 F.).

## SUMMARY

The usefulness of lactic acid or lactic ferments as curative agents for intestinal putrefaction is still problematical. Much evidence in its favor has accumulated of late years and it is to be desired that exact scientific

investigations of a decisive character will be undertaken.

The evidence in favor of the use of *B. bulgaricus* as a lactic acid producing organism for the purpose of arresting intestinal putrefaction is not convincing. The association of *Strept. lacticus* with the Bulgarian bacillus leaves doubt which one of the two organisms is the one responsible for the beneficial effects claimed. The Bulgarian bacillus produces a disagreeable taste in milk by decomposing some of the fat and the addition of *Strept. lacticus* is universally practiced to overcome this difficulty.

The experiments which have been reported in regard to finding the Bulgarian bacillus in the feces are incomplete in so far as no statements are made in regard to the number of these bacilli found in relation to other intestinal bacteria, especially in relation to intestinal streptococci.<sup>2</sup>

Assuming that the presence of free lactic acid in the digestive tract is beneficial, it has not been definitely shown that lactic acid is actually produced in considerable quantity by the presence of lactic acid bacteria in the intestines. The evidence is decidedly in favor of the introduction of sour milk, or pure cultures of lactic acid bacteria in connection with a diet in which milk is a prominent feature. Lactic acid forming bacteria are constantly present in the digestive tract, and we have no convincing evidence that the additional introduction of lactic acid bacteria is of benefit.

There is so far no convincing evidence that sour milk prepared with commercial cultures is preferable to naturally sour milk, as far as the therapeutic effect is concerned. It seems advisable, however, to boil or pasteurize milk if good reliable "certified" milk is not obtainable, and if this is done an artificial starter is necessary. For this purpose either one of the above discussed preparations may be used, or one of the commercial butter starters. In those countries where sour milk is generally used the starter consists in a small amount of the previously prepared milk. This can be done with any other starter. A small amount of the prepared sour milk may be used for inoculation of the next lot after this has been boiled or pasteurized.

In spite of Metchnikoff's statement that the presence of yeasts is detrimental, the commercial preparation investigated, excepting only lactone, contain yeasts in large numbers. Undoubtedly some alcohol is produced by these and probably some esters which impart aroma to the sour milk. Yakhourth of the Bulgarians, kefir, koumiss, leben and all the other fermented milk beverages contain alcohol-forming yeasts, although the amount produced is very small.

Although the sense of taste is largely a matter of personal judgment and idiosyncrasy, it is a matter of no inconsiderable importance. A product of pleasant taste is surely of higher value than one which is disagreeable, and this point should not be neglected. The results of the samples tasted are fairly consistent and a careful perusal will show that there is a decided preference in some cases. The taste produced by the activity of *Strept. lacticus*, perhaps with additions of an aroma-producing yeast, is without doubt the most preferable and evidence in favor of the use of this organism must of necessity be of great value.

2. Recently Sewerin has examined a series of seven samples of Lactobacilline in Germany and was unable to find *B. bulgaricus* in any one.

## NIGHT CAMPS FOR THE TUBERCULOUS

### THE UTILIZATION OF THE CONSUMPTIVE'S LABOR POWER

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In much of our tuberculosis work in municipal and state fields it seems to me that we are open to the criticism applicable to the man who, without telling the naked how to get food and raiment, constantly exhorted them to be fed and clothed. Without telling the tuberculous man how to find maintenance for himself and, more especially, those dependent on him, we exhort him to take the cure for longer or shorter periods.

Those we do provide with maintenance we frequently demoralize with idleness in our sanatoria. It merits objection, it seems to me, that many in charge of the disposition of funds in state and charitable institutions for the tuberculous frequently pauperize by failing to use the potential energy of the patients of such places by compelling them to make some return for benefits. Yet there is scarcely a sanatorium in the country that could not, with benefit to the patient, utilize 33 per cent. of the total potential energy of those resident in the institution. Some remuneration for the work could justly be made in board or money. This is more true to-day when, with little foresight from the standpoint of prevention, the patients admitted to these places must be those with incipient tuberculosis, who in the main grow fat, vigorous and lazy in a few weeks.

If the statement that *jedermann hat am Ende ein bisschen Tuberculose* be true, then, of course, for every one who knows that he is affected with tuberculosis there are one hundred who never know they have it, yet continue working throughout their lifetime and seem none the worse for it.

Since long before the excellent systematic work outlined by Patterson at Frimley, or even before the differences of Brehmer and Detweiler on the question of exercise, we are familiar with the records of patients who, under advice, or contrary to advice, rode horseback or took active exercise in the open air and yet made excellent recoveries.

I fear that, being overwhelmed by the number of yearly deaths, we are apt to forget, especially in our dispensary work, the important lessons to be learned from such facts as the above.

My attention has been called to this lately in making provision for those whom, by our present ability to make early diagnoses, we find by examining the households of those consumptive patients reporting at the dispensary. These cases are unsuspected by the individuals themselves and are of varying degree of intensity from incipientcy to far advancement. The patients have in the past been *en masse* urged to take the cure in a way which is obviously impossible when we stop to think. We have frequently had in the hospital in Pittsburgh from three to five members of one family.

I do not wish my remarks to be taken as in any way bearing on febrile cases, although I have frequently known cases of moderate fever up to 100 of evening temperature in which the patients improved only after being given one hour or two of light work daily. The best law to follow, of course, is that patients with tuberculosis should be treated by the physician, as nearly as possible, individually, both psychically and physically, as if there were in each case a separate malady.