logical findings have been quite recently dealt with in an excellent paper by Paul Frank.⁶

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THE DAILY WEIGHT CHART AS A GUIDE TO TUBERCULIN.

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ONE of the greatest problems in vaccine treatment is the dosage of tuberculin. How are the size of the dose and the interval to be regulated? There are various methods, divisible roughly into two groups: (1) By clinical observation, coupled with experience; (2) by serological tests. Neither of these is entirely satisfactory. The former because the experience required is beyond the reach of most of us, and no amount of experience will tell infallibly what interval is the best; frequently, too, clinical observations are of no assistance, since there may be no clinical facts to observe; the temperature may be unaltered, the pulse-rate unaffected, the focus of disease too deep for changes in physical signs to be detected. How, then, is one to know at what interval to give the next dose? In the result one has to chance it. On the other hand, serological tests in phthisis, at any rate, are useless as a guide to therapy unless frequently repeated, and this I take it to be, for the majority, outside the range of practical treatment.

The object of this communication is to bring forward a method which is as nearly an infallible guide to correct tuberculin treatment as we are ever likely to obtain, and which happily is so simple that there is no case to which it cannot be applied.

If a chart is kept on which the weight, taken daily at the same hour and in the same garments, is recorded, fluctuations

Chart 1.—Showing fluctuations induced by two small doses of tuberculin in a case of early phthisis.

method over a period of some two years or more, I have found that the weight curves, following a dose of tuberculin, fall naturally into the following groups (Chart 2). (Each perpendicular indicates an interval of twenty-four hours.)

What, now, is the meaning of these rather remarkable fluctuations in the daily weight? One notices at once the curious resemblances these curves bear to immunity curves, such as may be obtained by a series of opsonic indices. In 3 and 5 one sees short and long negative phases; in 4 the pre-negative rise, often so marked in phthisis; in 6 and 7 the irregular waxing and waning of immunity following an unsuitable vaccine, and usually indicating active autoinoculation. Opsonic records abound in curves similar to these here indicated. Is it possible

that these weight curves are immunity curves? From the appearance of them one would not be surprised to find this to be the case.

The proof also is not far to seek, for it remains only to plot an immunity curve by opsonic estimations of the blood, taken at the same time as the weight.

Chart 3 is a record of the daily weight and opsonic index in a case of early phthisis, with very slight signs at the left apex; no secondary infection. It is typical of a large number which have been plotted, and shows in a most striking manner that the weight curve (broken line) pursues an undulating curve in detail almost identical with that of the opsonic content of the blood (continuous line).

Chart 2.—Showing weight curves following tuberculin.

Herein, then, is provided for us the proof that the daily weight curve is an immunity curve, and as such a rational method for controlling treatment by tuberculin. But this chart illustrates also a further point which is of considerable importance, and that is that the weight is not quite so sensitive as the opsonic index. The only point at which the curves of index and weight differ occurs immediately after the first dose, the index showing a short negative phase, the weight, on the contrary, rising. The patient had no symptoms suggesting a serious negative phase. If the weight falls after a dose (see response to third dose), the patient frequently complains of malaise. In either case one must presuppose a negative phase. When, however, the weight does not drop, such negative phase may

Chart 3.—Showing daily weight and opsonic index. Doses of T.R. were given in the following order: 20000, 20000, 20000, 100000.

be disregarded; not so where the weight curve shows a fall. Then, again, the weight chart, by reason of the continued fall, gave a better indication that dose 3 was too large than the opsonic index. One further advantage possessed by a record of the weight over the index may be noted, and that is the general rise which may take place over a prolonged period, showing general improvement. The index, on the contrary, remains within certain limits, and gives no indication of general improvement or the reverse. One readily calls to mind cases in which a

high index frequently occurred, yet the condition was getting worse, and the weight (more important than all) was steadily tending downward.

It is held by all who use the opsonic method that vaccine treatment is most accurately and safely to be controlled by index determinations, but unfortunately in practice daily estimations can but rarely be performed. On the other hand, the majority of those who dispute that method, whilst they admit that theoretically an opsonic chart should be the ideal indicator, yet consider that errors of technique and personal bias are liable to invalidate the whole procedure and render it useless. If, now, it be granted that observations of excursions of the weight and of the opsonic index are but different methods of recording the course of immunity, then by means of the daily weight chart an opsonic curve is automatically obtained, and the objections to the index disappear. There remains a small minority who regard the opsonic index merely as a figment of an imaginative brain, and opsonic fluctuations as indicating changes in the grey matter of that brain rather than alterations in the serum under examination. For these the fact that fluctuations in the daily weight do occur as the result of tuberculin inoculation will require some other explanation, which one must leave to their ingenuity to supply.

How far this method is applicable in other vaccine therapeutics I am unable to say. It may, however, be of great value in the control of vaccines directed against secondary infection in tuberculosis.

Chart 4 gives the weight chart during four weeks when streptococcal vaccine for rheumatic pain and bronchitis was administered and controlled entirely by this method.

Chart 4.—Showing weight after streptococcal vaccine.

It will be noted that doses 1, 2, and 4 were of the correct size, but that dose 3 was too large.

In conclusion, I append suggestions for treatment of a case of phthisis by tuberculin, in accordance with the indications provided by a daily weight chart. Reference throughout is to T.R. or P.T.R. The daily weight is taken for a few days before the first dose, which should be small, in an afebrile case, say $\frac{1}{10}$ mg. of T.R., and whatever the weight curves may be, the interval between the doses should never be more than five days, until high doses are brought into requisition.

After a dose no curve may appear on the chart; the weight pursues its course steadily upwards, downwards, or in a straight line, as the case may be; one infers that the

dose is too small; it may be trebled on the third day. Should, however, a curve develop, then the next dose may be given in accordance with the accompanying table, and at that point in the curve indicated by the small arrows (see diagram).

After the patient has had a few doses, he may be instructed to come when the weight begins to fall after the rise, though not later than the fifth day.

THE BACTERIOLOGY OF THE MOUTH IN MAORI CHILDREN.

BEING PART OF AN INVESTIGATION INTO THE CAUSE OF
IMMUNITY TO DENTAL DISEASE IN THE MAORI
OF THE URIWERA COUNTRY, N.Z.

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(Abstract.)

As stated in a previous report, a number of films were made from the mouth direct, in order to obtain a general idea of the number and character of the organisms present. All the films were made from perfectly healthy mouths, both as regards teeth and soft tissues. Except where otherwise stated, the subjects were children between the ages of 4 and 15 (approximately), since this represents the period of life during which European children appear to be most susceptible to dental caries. Four films were made from each of fifty immune individuals as follows:

1. From mixed saliva well triturated in an agate pestle and mortar, and stained by Gram's method.

2. From the gingival "deposit," of which there was in all cases extremely little, and in the younger children it was difficult to find. This was gently mixed with 0.9 per cent. sodium citrate on the slide, allowed to dry slowly, and subsequently stained by Gram's method, and counterstained with weak carbol fuchsin.

3. An attempt was made to estimate the number of organisms present in the saliva by making films of mixed saliva and citrated formalised blood, the idea being to count the organisms against the red blood cells, and so obtain an estimate of the number of organisms present in any given quantity of the saliva. It was not found practicable to shake the emulsion with sterile beads, but the saliva

was well triturated, and the mixture with the blood made as efficiently as possible. It has, however, been found, owing to the clumping of the organisms, their irregular distribution, and the presence of epithelial cells containing large numbers of organisms, that the slides are not of any practical value, for it was not possible to make a reliable count. The slides were stained by the Jenner method.

4. One film from the saliva was stained by Ziehl-Neelsen for acid-fast bacilli, and those showing acid-fast bacilli after ringing with Leitz object marker were further decolorized with alcohol to eliminate saprophytic bacilli.

The results of the examination of the films thus obtained will be found in the accompanying table. The outstanding features may be said to be, firstly, the very large number of organisms present, and, secondly, the great similarity to organisms found in European mouths. The organisms in the tables are, of course, classified only morphologically, and, as far as possible, according to their retention of Gram's stain.

The organism present most frequently and in the greatest numbers was a Gram-negative coccus, which resembled the *Micrococcus catarrhalis*. These organisms always occurred in clumps, and were present in 88 per cent. of cases in the gingival deposit and in 79.3 per cent. in the saliva.

The well-known *Streptococcus brevis* of the mouth was present in the greater proportion, both in the saliva and the gingival deposits. The *Leptothrix racemosa* seemed to flourish luxuriantly in a very large number (68 per cent.) of the mouths, sometimes occurring as isolated specimens, but more often in dense masses. For the most part these organisms were granular in appearance and stained some-

Weight Curve as Diagrammatically Represented Above.	Interpretation.	Dose Proportionate to the Last Dose Given.
1	Correct doses	Double the dose on the second or third day.
2		Increase by 50 per cent. on the third to fifth day.
3		Increase by 20 per cent. on the fourth to fifth day.
4	Dose too large	Decrease by 50 per cent. on the fifth day.
5	Dose much too large	Give half the dose on the third to the fifth day, when malaise has ceased.
6	Tuberculin to be changed or discontinued	Try bovine or some other form of tuberculin, or vaccines for secondary organisms.
7		