1. That this treatment is very unsafe when large doses are employed or when the temperature is unsteady.
 2. That it is quite safe in the minute doses hereafter mentioned, when commenced with a practically normal temperature and when the patient is kept under observation.

3. That in many cases tuberculin treatment appears to have no definite effect upon the condition one way or another.

4. That in cases in which treatment by rest, climate, feeding, and careful nursing can be employed, improvement by these means alone is usually so marked that it is impossible to attribute to tuberculin, when given in these cases, its due meed of praise or to judge whether it takes any part whatever in the improvement.

5. That, however, when treatment by rest, climate, feeding, and careful nursing cannot be properly adopted, tuberculin is often of very marked value. These are the cases which otherwise do badly, and tuberculin treatment is with them of the greatest importance.

6. That T.R. is as a rule preferable to P.T.R.

7. That for routine use the method of hypodermic injection is greatly superior to that of oral administration; the effect of giving tuberculin by the mouth varies very much.

These impressions are derived from the treatment of about 100 cases during the past three years. At the commencement I used the opsonic index as a guide, but early found it impossible, and I think unnecessary, to take the index in selected cases such as these. The condition of the temperature is, I think, a sufficient guide for the initial administration and the clinical symptoms thereafter in relation to each injection.

The forms of tuberculin I have used have been Koch's new tuberculin, T.R., and the corresponding bovine tuberculin, P.T.R. The two varieties I originally employed in order to determine their varying results in cases showing different reactions to von Pirquet's test with human and bovine tuberculin. I have come to the conclusion, however, that, no matter to which strain of bacillus von Pirquet's reaction is positive, T.R. is the tuberculin of the greater therapeutic value.

The tuberculin was given hypodermically and by the mouth. By the mouth the doses I gave varied from $\frac{1}{1000}$ of a milligram to $\frac{1}{50}$ of a milligram, and the results I considered very disappointing; only very occasionally was any satisfactory result noticeable. By hypodermic injection the initial dose varied from $\frac{1}{1000}$ of a milligram to an infant 9 months old to $\frac{1}{3000}$ of a milligram to a child of 12 years.

The injections were repeated weekly or fortnightly and the dose increased at long intervals and by very minute amounts, the rapidity and amount of increase desirable being gauged by the clinical condition.

In all cases, diminished vitality or health—apparent in any manner whatever—during the few days following an injection was considered a sign either to diminish the dose or increase the intervals between doses, the conditions aimed at being that after each injection the child should continue steady improvement or show a step in advance. In several instances a child while under tuberculin treatment had apparently attained sound health. The tuberculin treatment was stopped for two or three months; the child relapsed, only again to improve on the renewal of the injections.

DRIED MILK AS A FOOD FOR INFANTS.

By C. KILLICK MILLARD, M.D., D.Sc.,
 MEDICAL OFFICER OF HEALTH, LEICESTER.

Dried milk is the residue left after the natural moisture in milk has been evaporated. The process of manufacture usually adopted is that invented some years ago by Drs. Just and Hatmaker and known by their names. Fresh milk is fed in a continuous stream on to revolving heated cylinders on which it forms a thin film. These cylinders are heated by steam at about 40 lb. pressure; the surface attains a temperature of, say, 250° F., and the moisture in the film of milk is almost instantly dispelled. The dried film is automatically detached from

the cylinders by knife edges, and falls off into receptacles below. The small amount of moisture not evaporated is taken up by the milk sugar as water of crystallization. The dried milk is subsequently passed through a sieve to ensure uniform pulverization, and is obtained as a coarse granular cream-coloured powder, practically sterile, which, in airtight packages, will keep almost indefinitely. I have kept samples in my laboratory for over a year and found them still good.

When again mixed with the equivalent quantity of water about 60 per cent. is found to be soluble, the remainder being readily suspended. The resultant fluid is slightly different in consistency from fresh milk; the flavour is altered, although by no means unpleasant, and the fat tends to separate and to rise to the surface, owing to the cream globules having been ruptured. To what extent the chemical composition is affected is a little uncertain. The relative proportions of the main groups of constituents—proteids, fat, milk sugar, and salts—remain, as we should expect, practically unchanged; but there is, no doubt, some interference with the exact composition of the more complex albuminoids and enzymes, similar to what occurs when fresh milk is boiled. Owing, however, to the extremely short time—only a matter of seconds—during which the heat is applied, which is one of the essential principles of the Just-Hatmaker process, it is possible that the alteration in chemical composition is less than in the ordinary process of boiling milk. The heating process destroys all tubercle bacilli and other pathogenic organisms.

The process of manufacture is not expensive, and, owing to the saving on carriage, dried milk, if manufactured in localities where milk is cheap, can be sold wholesale at a price very little above the price of fresh milk. If retailed in small quantities in tins the price is, of course, increased.

USE OF DRIED MILK IN LEICESTER.

The use of dried milk at the Leicester Corporation Infants' Milk Dépôt was begun about eighteen months ago. I was somewhat prejudiced against it, disliking the idea of abandoning fresh milk with its antiscorbutic properties, and only very limited use was at first made of it. It was very soon discovered, however, that dried milk had one most important advantage—greater digestibility—and that many infants would retain it and at once begin to thrive who previously had been continually subject to vomiting after each feed and in consequence were making little or no progress. This difference in digestibility would seem to be largely accounted for by the character of the curd formed in the stomach; it does not tend to run into hard cheesy masses, as is the case with ordinary cow's milk. The babies certainly like the milk. In my experience they never refuse it when offered it for the first time; and it is quite common to hear that they show a decided preference for it, and after getting used to it they will sometimes refuse ordinary milk.

As a consequence of these good results it gradually became our practice to order dried milk in all cases where infants were not thriving on the humanized bottled milk, but it was found that once a baby had been put on dried milk it was very seldom that the mother wished to go back to the humanized milk. Indeed, with the mother dried milk has been very popular from the first. After a time requests from neighbours began to be received that their babies should also be put on dried milk, and medical practitioners began to specify dried milk when sending cases to the dépôt.

A careful watch has been kept for any bad effects, such as scurvy or rickets, but although I have had experience of some hundreds of infants fed on it for periods ranging up to ten months, or even longer, so far none have been seen. Inquiries have also been made from fifteen medical men practising in the districts whence most of the cases have been drawn, and their replies in all cases were favourable to the use of dried milk, and support the conclusions that no bad effects have followed. Inquiries, too, have been made from the mothers of babies fed on the dried milk to ascertain if the health had continued good after giving up the milk, but nothing pointing to bad after-effects has been discovered.

As for rickets, it was not to be expected, having regard to modern views as to the etiology of this affection, that

the use of dried milk would predispose to it, provided the proportion of fat was adequate. Whilst as regards scurvy the precaution has been taken of advising the routine administration of fresh fruit juice every other day as an antiscorbutic. There is reason to think, however, that this advice has not always been very carefully followed, nor is it certain how far it is necessary. The question as to what extent the antiscorbutic properties of fresh milk are destroyed in the Just-Hatmaker process can only be decided by practical experience. It is, of course, a very controversial question how far the use of ordinary sterilized milk predisposes to scurvy. Whilst many writers have insisted upon this supposed danger very strongly, others, like the late Professor Budin, of Paris, who made use of sterilized milk on a very large scale for many years, take the opposite view. The experience of infants' milk dépôts, both in this country and abroad, at almost all of which sterilized milk is used, and has been used for years, is to the same effect. It seems a reasonable conclusion, therefore, that the infantile scurvy danger is rather of the nature of a bogey, and not of much practical importance.

At the Leicester Infants' Milk Dépôt two grades of milk are used: one, "full-cream," containing the whole of the fat present in the original milk, amounting to about 26 per cent. of the dried milk; and a slightly less rich grade—three-quarters cream—which only contains about 20 per cent. of fat. The latter is used for babies under 6 months old. An addition of 10 per cent. of sugar is made to both grades.

The milk is supplied in airtight tins, holding about 1 lb. A special metallic scoop or gauge is supplied to each customer, and the directions specify so many scoopsfuls of dried milk to so many tablespoonfuls of water, varying with the age of the infant. The milk is prepared for use by stirring in the requisite quantity of warm (not boiling) water, and it is then ready for use with any ordinary feeding bottle. Only enough for one meal is prepared at a time.

At the present time at the Leicester Infants' Milk Dépôt dried milk has almost entirely superseded the "humanized" milk, about 200 infants out of 230 now on the books being fed on it. In addition to its intrinsic merits as a food for infants, it has the important practical advantage over humanized milk of being much less expensive. The latter, as is usual at infants' milk dépôts, is supplied on the principle of a separate feed in a separate bottle. This method, whilst it secures uniformity and appropriateness in the amount of each feed, in the number of feeds per day, in the strength of the milk, and in freedom from contamination, is very expensive, owing to the great amount of labour entailed in bottling, etc., and to the loss incurred on broken bottles, and as it is necessary to keep the price within reach of the poor it was found that a loss was incurred on every bottle of milk supplied, in addition to the cost of upkeep of the dépôt. Also, owing to the milk having to be fetched daily (or delivery paid for as an extra), poor persons living at a distance from the dépôt found the milk beyond their reach.

With dried milk both these objections are obviated. It can be sold at cost price, and, as a week's supply or more can be fetched at a time, distance from the dépôt is of little moment.

The advantages of dried milk as a food for infants may be summarized as follows:

1. *Ease of digestion*—milk not "sicked up," as is so often the case with fresh milk, however modified.
2. *Bacterial purity*—freedom from tubercle bacilli or contamination by flies.
3. *Conservability*—no "souring" in hot weather.
4. *Cheapness*—no waste.
5. *Convenience*—always ready for use, no waiting for the milkman.
6. *Palatableness*—babies love it.

Its disadvantages are of a theoretical nature, and consist in the presumed destruction of the antiscorbutic properties of fresh milk. This, however, can be compensated, if thought necessary, by administration of fruit juice. For domestic purposes, apart from infant feeding, dried milk has distinct limitations as a substitute for fresh milk, as, owing to its taste, it is not so suitable for adding to tea or coffee.

An important consideration remains to be referred to. One reason, no doubt, why dried milk is so popular with the mothers is that it possesses all the convenience of the patent "food." As a matter of fact, they like to refer to it as a "food" rather than as milk. Yet it is obvious that dried milk, being after all "only milk," stands in an entirely different category from all patent foods prepared from cereals. The serious objections rightly entertained to the wholesale use of these proprietary foods, which inevitably tend to supplant milk in the infant's dietary, sometimes almost entirely, obviously do not apply to dried milk. It may prove, therefore, to be a very real blessing to the infant population if dried milk should come to supplant patent foods of the class referred to.

ON THE THERAPEUTIC VALUE OF CARBON DIOXIDE SNOW IN THE TREATMENT OF VASCULAR NAEVI, MOLES, ETC.*

BY

J. M. H. MACLEOD, M.A., M.D. ABERD., M.R.C.P. LOND.,
PHYSICIAN FOR DISEASES OF THE SKIN (OUT-PATIENTS), CHARING
CROSS HOSPITAL AND VICTORIA HOSPITAL
FOR CHILDREN.

THE value of cold as a local therapeutic agent has long been recognized, but until recently its field of utility in the treatment of skin affections has been limited and practically confined to its employment as a local anaesthetic. With the discovery of liquid air and the intense cold (-250° C.) associated with it, new therapeutic possibilities presented themselves. It was recognized early in America that in liquid air we had a valuable addition to our local destructive agents, and a remedy which might be of great service in reducing or removing such superficial lesions of the skin as vascular naevi and moles. It was found that the application of liquid air caused an immediate freezing of the underlying skin, succeeded some hours later by an inflammatory reaction, and that if the application lasted only a few seconds complete recovery followed, while if it was more prolonged a destruction of the tissue would occur with ulceration or sloughing. Inflammation properly controlled is followed by a process of repair and a rebuilding through the formation of new fibrous tissue. Liquid air, if applied for a few seconds, is capable of producing an inflammatory reaction and subsequent repair, and of replacing certain superficial skin lesions by a scar which is hardly appreciable.

At the July meeting of the Dermatological Section of the Royal Society of Medicine, the late Dr. Radcliffe Crocker showed a series of cases of naevi, lupus vulgaris, etc., which he had treated with benefit by liquid air, and conclusively demonstrated the value of this method of treatment. There were certain disadvantages, however, associated with its employment which detracted from its utility—namely, the costliness of liquid air, and the difficulty of obtaining it, and of definitely restricting its area of action by the method adopted—namely, of dipping a pad of cotton-wool on the end of a rod into the liquid air and applying it to the affected skin. Previous to this an excellent substitute for liquid air had been found in carbon dioxide snow. This material, though not so cold—its temperature being about -90° C.—has all the advantages of liquid air and none of its disadvantages, for it is easily obtainable, cheap, and is capable of being applied in the most definite manner. One of the first to use carbon dioxide for therapeutic purposes was Dr. Allen Pusey, of Chicago, who described the method he adopted in 1908.¹ Three years before this Juliusberg had employed carbon dioxide for local treatment in the form of a spray; but, so far as I am

Fig. 1

* Being a demonstration given at Charing Cross Hospital on Thursday, November 25th, 1909.