burner, and then immediately set to cool. This procedure was arranged to imitate, as far as possible, a common household method of boiling milk before feeding to infants, and one that may be relied upon to destroy the tubercle bacillus and other infective disease germs. Measurements of temperature were made, and it was ascertained that during this process the milk was exposed to a temperature between 70° and 100° C. for 1½ minutes during the heating, and 4 minutes during the cooling.

Milk so treated was found to possess an antiscorbutic value much in excess of that possessed by dried milk. A rapid cure was the result of substituting 200 c.cm. of this "scalded" milk for the dried milk ration in case of monkey No. 7. The day after the change was made the animal showed a very slight improvement, and in a week was markedly better; in 16 days he had regained the use of his hind limbs and loss of weight had ceased, and satisfactory growth became established. Two experiments in the table (B) are described as yielding an inconclusive result. In both cases symptoms of scurvy developing on a certain ration of milk, raw in one case and dried in the other, disappeared later without any intentional change in diet. The experiments were started in the winter and scurvy was detected about four months later, in April-May, but soon afterwards the symptoms began to clear up. This we attribute to the change in the cow's diet about this time of year—i.e., from the hay, roots, oil-cake, and cereals of the winter feed to the fresh grass of the open pasture. In consequence of the great increase of antiscorbutic material in the cow's diet, one would expect a corresponding increase in the antiscorbutic value of the milk given.

Summary and Conclusions.

1. The antiscorbutic value of cow's milk, fresh, heated, and dried, was determined by means of quantitative nutritional experiments with guinea-pigs and monkeys. Cow's milk, even when fresh, was found to be a foodstuff comparatively poor in antiscorbutic properties, and large daily rations, 100 to 150 c.cm. daily for guinea-pigs and 125 to 175 c.cm. daily for monkeys, were needed to protect these animals from scurvy, when upon a diet otherwise devoid of antiscorbutic material. Dried milk was found inferior to raw milk in this respect. Even with material of quite recent manufacture we were unable to protect guinea-pigs from scurvy with any amounts that it was found possible to administer. In case of monkeys the minimum protective dose was found to be approximately from 250 to 300 c.cm. daily; in other words, about half the original antiscorbutic value of the fresh milk had been destroyed in the process of drying. "Scalded" milk was found distinctly superior to dried milk.

2. These facts form a strong argument for the desirability of adding an extra antiscorbutic to the diet of infants nourished on dried milk. The most suitable substances for this purpose are raw orange juice, raw swede juice (Chick and Rhodes, 1918), or juice of tomatoes, raw or canned (Hess and Unger, 1919). Grape juice and carrot juice are also useful but less valuable, as, being inferior in potency, correspondingly larger doses are required. Potatoes cooked and mashed can be employed in cases where starchy foods are not considered unsuitable (Hess and Fish, 1914).

3. Some evidence was obtained showing that winter milk is inferior to summer milk in antiscorbutic properties, corresponding to the differences in the cow's diet at these different seasons. In this connexion the suggestion is made that the value of winter milk in this respect might be raised if swedes were employed for winter feeding in place of mangolds, where possible. In the investigation of Chick and Rhodes alluded to above, the raw juice of beetroot, to which plant the mangold is nearly related botanically, was found to be much inferior to that of swede as an antiscorbutic.

4. No significant difference was detected in the growth-promoting properties of raw and dried milk respectively, and this was true with both guinea-pigs and monkeys. In both cases growth declined with onset of scurvy symptoms, but until this occurred the growth made upon diets containing dried milk was equal to that obtaining when equal rations of fresh milk were substituted.

References.—Chick, Hume, and Skelton (1918): i., THE LANCET, Jan. 5th; ii., Biochemical Journal, xii., p. 132. Chick and Rhodes (1918): THE LANCET, Dec. 7th. Hess and Fish (1914): American Journal of Diseases of Children, viii., p. 386. Hess and Unger (1918): Proceedings of the Society of Experimental Biology and Medicine, xvi., p. 1.

A NOTE ON IMMUNISED SKIN-GRAFTS.

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CERTAIN German writers during the war described a process of rendering the skin immune to the toxins present in the wound for which the skin-graft was intended, and claimed that if skin immunised in this way was employed for skin-grafts the growth of epithelium was quicker and more certain than if the usual methods were followed.

Description of the Process.

The method consists of placing the dressing which has been in contact with the surface of the wound it is intended to treat, and which is therefore soaked in the discharges of the wound, upon an area of skin suitable for obtaining grafts by the Thiersch method and allowing this dressing to remain in position for 24 hours, after which it is replaced by another dressing removed from contact with the wound.

It was found necessary to moisten dressings on which the discharges had dried and to mark out the skin selected for yielding the graft by means of nitrate of silver.

Applied with these precautions, the skin to which the wound discharges were brought into contact was found to redden and to show on the third day of the application a slight prominence of the papillæ. It was necessary to watch the skin carefully at this point in the treatment, as it is of considerable importance to guard against the occurrence of a violent reaction. When the skin showed a marked elevation of the papillæ and slight reddening the treatment of the area was stopped for a day, but in most cases it was possible to treat the skin in this way for a period of seven days, after which the graft was ready for removal.

It was found that the severity of the reaction varied within rather wide limits, and that it was necessary to guard against a violent reaction. In two or three cases no reaction occurred. This was thought to indicate that the skin already possessed immunity to the organisms of the wound, and to a certain extent this view was borne out by the fact that the graft "took" readily in these cases.

Technique.

I found that the following technique gave the most satisfactory results.

The granulations of the wound were rubbed with dry unmedicated gauze and the graft removed by the method of Thiersch, applied to these granulations, and well pressed down. The graft was then covered with a piece of waterproof tissue, in which a number of holes of about one-eighth of an inch diameter had been cut, and the opposite edges of this waterproof tissue were fixed to the skin with adhesive plaster. This was then covered with unmedicated gauze and wool, and bandaged in position. The wound was examined every second or third day and any discharge removed by gently syringing through the holes in the waterproof tissue, which was not otherwise disturbed.

Results.

Applied in this way, I have not seen a case of failure by this method, although up till now I have only treated 27 cases, and of these only three were cases that had failed to give a successful result by the ordinary methods. Of these 27 cases, 10 were cases of ecthyma, where deep ulcers had developed and which had resisted treatment for several weeks previously to the grafting, 13 were cases of infected lacerations, where healing was delayed for several weeks, and 4 were cases of chronic ulcer, which had resisted treatment for a long time. In several cases a certain amount of movement of the limb was allowed, and all the cases in which walking with a fresh graft applied to some part of the lower limb was permitted, the graft took without any difficulty.

Local anæsthesia was employed in all the cases, and in the case of ulcers with thickened bases the ulcer also was anæsthetised and the thickened base punctured with a needle in numerous places after the method originally described by Tubby for freeing contracted scar tissue.

Although the character and small numbers of the cases in which I have made use of this method does not permit of any definite conclusion as to the superiority of this method over any previously employed, the method appeared to me to be based on such logical principles and, in the limited number of cases in which it has been tried, to have been so successful that I have ventured to bring it to the notice of those practitioners who did not have an opportunity of seeing the résumé of the original article, which appeared in the "Summary of the Foreign Press" issued to certain medical units of the Army. I regret that I have been unable to obtain the names of the German authors, but the impossibility of obtaining the literature must be my excuse.

Lincoln.

MUCUS DEPOSIT OF URINE.

By S. G. BILLINGTON, M.B., B.S. LOND.,

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If a sample of this deposit in a febrile or convalescent urine be pipetted up from about the junction of the upper and second fourths it will show on direct examination an interlacing mass of strands, many resembling gigantic flagella. These structures are very dim and indefinite, and no satisfactory impression of their form can be obtained except under the low power and with the light, preferably daylight, almost entirely shut off.

If the deposit is washed with filtered water to remove the soluble constituents of the urine the same structures will still be dimly seen; but they at once stand out clearly on adding one drop of 10 per cent. tannic acid to the fluid film, and they will be seen lying in the midst of a coagulated homogeneous material. The structures also take up added watery stains at this stage, although they would not do so before the addition of the tannic acid. If the fluid-stained film obtained in this way is dried while under observation all the structures will be seen to disintegrate as the evaporating line crosses the field of vision.

When fixed and stained the structures show a most extraordinary variation in size and form, and resemble somewhat an interlacing mass of worms. They may be straight, curved, or wavy; some resemble gigantic spirochaetes, others resemble more or less closely enormous trypanosomes or

FIG. 1.—Mucus deposit of urine. Flagellate-like structures lying in masses of coagulated matrix. Stained with methylene-blue.

Leishman-Donovan bodies. Bodies resembling miniature tadpoles with an apparent vacuole at the blunt end are also frequently seen. With the Romanowski stains the blue only is taken up. With Indian ink the general morphology is brought out more distinctly than in stained films, especially as regards the perfect fine flagellate-like extremities and processes.

Under the higher powers these structures appear to be made up of enormous numbers of filamentous strands

Some show darker centres, probably due to contained minute granules, and the forms resembling trypanosomes frequently contain one or more deeply staining bodies about the size of a red blood cell.

The Origin of the Deposit.

As far as I am aware, the mode and site of origin, the significance and the reasons for variation in amount of this substance, are shrouded in obscurity. There are, however, two points of interest. 1. When there is an actual excretion of organisms, as in bacilluria, and a catarrhal condition of the urinary tract may be presumed, the mucus deposit is slight or absent. 2. From chemical examination we are told that this substance in many cases is not true mucin, probably a nucleo-protein. 3. The structures described as being present in mucus deposits vary in size and texture much as in the case of casts. They are much larger and coarser in the urine from a case of febrile or post-febrile trench fever than in the case of influenza.

A year ago the urines of 300 men were examined with regard to the mucus deposit. 200 were patients in hospital

FIG. 2.—Masses of structures in the mucus deposit of urine resembling spirochaetes. Stained with Indian ink.

and 100 were the staff of a medical unit. The urines of the 200 patients all showed a pronounced deposit, and the structures described could be readily seen with the lower power on direct examination. Over 70 per cent. of the controls showed a varying amount of deposit with similar structures. The difference in the bulk of deposit, however, in the two series was extraordinary, and would never have been realised unless series of 20 urines, 10 from patients and 10 from controls, had been placed in line. It may also be added that quite 50 per cent. of the controls had been marked for base duty on account of previous or existing disease of various kinds.

These examinations demonstrated that active disease produces a pronounced increase in the mucus deposit in the urine. In the absence of any definite knowledge as to the origin or significance of the mucus, knowing that the kidneys are the natural filters of the body and the urine the filtrate containing undesirable excreted products, it would not appear to be illogical to suspect that the addition to the deposit represents some form of the infecting agent after excretion.

The presence of spirochaetes in the urine in trench fever and also in normal urine has been recorded on several occasions. One source of these spirochaetes has been found by Japanese workers to be the urethral mucous membrane, and as to that source no comments can be made. The origin of morphologically perfect spirochaetes from the deposit of urine, however, can be directly watched under the microscope. The mucus deposit is washed once, and to a sample on a slide a drop of tannic acid and watery stain are added, as previously described. The film is then gently dried, and as the evaporating zone crosses the field under observation all the large structures mentioned will disintegrate. It will be seen, however, that here and there one of the fine spirochaetal-like processes apparently project beyond the hygroscopic surrounding matrix, and these will be left in the debris as morphological spirochaetes.