the unsound condition, and even when they improve they remain long hampered by some degree of false or unsound ankylosis."⁴ At Alton great care is devoted to posture, and to weight extension of the joints with a view to mobility, but immobilization is less complete. At Leysin everything is designed so that the whole body may be exposed to the sun. Mobility is Dr. Rollier's aim in every instance. In cases where one can expect the bearing surfaces to be well adapted this is undoubtedly right, but where the joint surfaces are much deformed the marriage of extensive disease and restricted movement is perhaps happy at Leysin, but afterwards the wear and tear of life and the ups and downs of health will put the couple to severe tests. We have found divergences of aim and of method; in one hospital mobility is always the goal, however serious the disease and deformed the articulating surfaces. So, too, there are schools of absolute and of relative immobilization. My own belief is that during the period of active disease, characterized by pain and muscular spasm before splints are applied or if they are inefficient, perfect surgical rest is indicated. But when all pain and muscular spasm are past, and muscles are no longer quick to resent, but ready to induce, minor movement of the joint, relative immobilization is allowable. At the end of treatment comes the "secondary diagnosis of restoration." But in the meantime, as soon as the height of the disease is past, one must decide whether ankylosis or mobility is to be the aim. Where the damage has been severe, ankylosis may be preferable to limited and not altogether safe mobility.

Except in the minority of cases where ankylosis is the aim, three stages can be distinguished: (1) during active disease—rest, enforced, uninterrupted; (2) during the stages of healing—comparative immobilization; (3) the stage of free use, under careful supervision. During the convalescent and after-care stages Thomas's tests should be applied again and again.

Operative Methods.

For children under 16 formal operations are seldom if ever warranted, but in adults when disease is advanced, and a stiff joint is the best that can be hoped for, an excision will give a healed, strong, painless limb more quickly, more certainly, and of sounder stability, than conservative measures, and more safely. *Operative internal splintage* has real value in spinal caries in adults.

Cold Abscess.—Sir Henry Gauvain aspirates frequently, but at Shropshire and Leysin an abscess is only aspirated if it threatens the skin. A fine needle is used; no determined effort to empty the abscess is made; as a rule nothing is injected. Sir Robert Jones has always taught that the fluid in a cold abscess is harmless; Dr. Rollier is equally convinced. To open and drain a cold abscess is to commit a surgical crime.

Besides all these things there are many points of technique suitable for a demonstration, but too confusing to include in a review such as this. I have tried to make the main issues clear. A tuberculous focus in a bone or a joint is the obvious part of a deep-rooted disease, serious in itself, crippling if there is delay, disastrous if there is neglect; but it is also evidence of tuberculous infection of the body which pre-existed but is now gaining the upper hand. On the other hand, modern treatment, with its artistic use of *rest, food, and weather*, if started in good time and kept up long enough, will almost always bring about a cure—a cure that skilled after-care will make permanent. Thus crippling and disaster can be forestalled, and health and activity take their place. This treatment necessitates a special open-air hospital and a staff experienced and expert; but there is no need to transplant a patient from his home climate to a distant hospital. Rather is a hospital in the district best, for it will admit its patients early, follow them home when they go out, and spare no effort to make their cure complete and final.

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LACK OF EXERCISE AS A DETERMINING FACTOR IN THE EPIDEMIOLOGY OF BERI-BERI.

BY

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DURING investigations by a committee into the occurrence of beri-beri in the prison at Freetown, Sierra Leone, it was observed that the disease affected those who were employed as tailors to a greater extent than other prisoners. Of 59 cases of beri-beri in 1922, 34 occurred in tailors—that is, 57 per cent. The average daily strength of tailors was 15 per cent. of the average daily strength of all prisoners; that is to say, the 15 per cent. of the population employed as tailors yielded 57 per cent. of all the notified beri-beri cases. It appears, therefore, that in Freetown Prison in 1922 there was some factor in the occupation which rendered tailors particularly prone to develop beri-beri.

It has been suggested that convicts sentenced to three years or over suffer more from beri-beri than other prisoners, and also that they are, from mental depression, more prone to all diseases. Of the 34 tailors affected, 18 were convicts (long sentence) and 16 were common gaol prisoners (short sentence); on the figures, the conclusion was that both convict tailors and non-convict tailors are susceptible to beri-beri.

In an endeavour to discover factors other than length of sentence which may predispose tailors to disease generally, and to beri-beri in particular, the conditions under which the tailors worked were considered. Such factors as overcrowding or insanitary surroundings were not found to have any influence, nor was there any distinction between tailors and any other class of prisoners as regards food, water supply, or sleeping accommodation. The factor which appeared to be all-important was lack of exercise, due to the sedentary nature of the occupation. It should be pointed out that even the exercise of half an hour a day prescribed was liable in the rainy season to be curtailed or even omitted altogether.

The facts which came into prominence during the investigation were reported upon, and recommendations were made as regards diet, also one which involved drastic alteration in the employment of tailors; it was to the effect that no prisoner should be employed for more than half his working day in tailoring, and that the other half should be spent in some active outdoor occupation, such as stone-breaking.

The effect upon the death rate among the prisoners is shown in the following table; the years mentioned are those in which beri-beri appears in the records.

Year.	Total Deaths.	Deaths from Beri-beri.
1913	20	5
1919	8	2
1920	12	3
1921	25	3
1922	12	3
1923	3	1*

* This case arrived in Freetown Prison from Kennema Prison on July 26th, 1923, and died September 5th, 1923.

The effect upon the admissions to hospital for beri-beri is seen in the graph.

The admission of cases early in the year 1923 is partly to be attributed to the detection of early cases due to the increased vigilance of the prison medical officer. The notable fact is that whereas in 1922 the beri-beri admissions commence in July

Continuous line: Months of admission to hospital of 59 cases of beri-beri during 1922. Broken line: Months of admission to hospital of 20 cases of beri-beri during 1923.

and rise to a maximum in October, which is the common curve of beri-beri admissions in Freetown Prison Hospital, in 1923 no case was admitted subsequent to August; that is to say, that in 1923 the disease disappeared just at the very time when usually it begins to

increase rapidly. It appears, then, that the modifications in diet and in the working conditions of the prisoners have produced the effect of materially reducing the incidence of beri-beri, and with it the death rate.

Experiments on Fowls.

In the meantime experiments on fowls were undertaken, with the design of throwing light upon this and other questions. The first experiments included one which would show whether sunlight was capable of preventing the development of polyneuritis in fowls fed on a diet of highly polished rice and water; and also one to show whether exercise was capable of preventing such development.

The Effect of Sunlight.

Fowls were exposed to direct sunlight for several hours daily, while others were kept constantly in the dark, the conditions being otherwise equal. The fowls in the two categories died in the same time as did control fowls exposed to a normal indoors variation of light and dark. No evidence of any preventive effect of sunlight or any contrary effect of lack of sunlight was obtained.

The Effect of Exercise.

Fowls were kept in two batches—the first in individual small cages, in which there was no room for free movement, the second in a large run where free movement was possible. The difference in the periods of survival was striking; all the fowls deprived of exercise died in seventeen days or less, whereas of those which had free movement none succumbed in less than thirty-one days.

The exercise experiment was considered of importance and was repeated. The conditions were as follows:

Each animal of batch number one was placed in a separate cage of such size that, while the fowl had ample room to turn round and stand upright and feed, it was prevented from obtaining exercise. The cages were placed in a large room, well ventilated and well lighted. The fowls of batch number two were allowed to roam free in the room and were provided with a stick on which to roost some feet above the floor. The room and cages were thoroughly washed before starting the experiment, and each day the floor of the room and the cages were swept out and dusted with clean sand. The small cages permitted slightly more movement, while the room space permitted much more exercise than in the first experiment. The diet, as before, consisted of highly polished rice and water. The results of the experiments were:

Of five fowls fed on polished rice and water none survived longer than twenty-six days when deprived of exercise.

Of five fowls fed on polished rice and water all survived thirty-eight days or longer when allowed free exercise.

A control experiment was carried out in order to determine whether lack of exercise would adversely affect fowls which were given a normal diet; for this purpose the same small boxes were used. Of five fowls kept in these boxes under identical conditions except as regards diet, none died in a period of three months; on the contrary, all kept in excellent condition and increased greatly in weight.

The conclusion to be drawn from these experiments is that, given a group of animals which are subsisting on a diet containing insufficient anti-beri-beri vitamin, lack of exercise forms a very important factor in precipitating the ultimate result.

The results of the two experimental investigations in fowls confirm thus in a most definite and convincing manner the conclusion arrived at as the result of clinical observation in man—namely, that lack of exercise played an important part in precipitating the occurrence of beri-beri in tailors in Freetown Prison.

Attempts were made to ascertain whether this factor may not have produced effects of a similar kind in other epidemics of beri-beri. An observation on this point is made by Lasnet in Senegal. Lasnet¹ found that, in the gaol at Dakar, military prisoners who were exempt from outdoor duty developed beri-beri in greater proportion than other classes of prisoners. It is noted that when the disease made its appearance for the first time compulsory exercise was invariably followed by an amelioration of symptoms. Davidson² says that the disease attacks men on active service far less severely than those in barracks.

Lack of exercise is frequently mentioned in a general way as a contributory cause, especially when coupled with overcrowding and insanitary surroundings, but it does not seem to have been recognized hitherto that lack of exercise has such a definite effect as has been brought into evidence by the observations and experiments here recorded. It is probable, however, that this factor plays a part which may in some cases be of great importance. It may, for example, serve to explain such facts as surgical beri-beri occurring

in patients lying in hospital. The records of epidemics are as a rule of little service in throwing light upon the effect of this factor, as they do not afford information as to the amount of exercise taken by those affected by the disease—the significance of this not having been realized. Such records, however, as those given by Greig³ seem to suggest that lack of exercise may have had a definite influence. Under "Occupations of persons attacked by epidemic dropsy" he gives a table for males. This table shows that in 293 cases the highest incidence was in clerks (104). Greig considers that the extensive outbreaks of epidemic dropsy are determined by a sustained high price of food grains, and that "it is just those persons with small fixed incomes who would be most severely affected." In this way he explains the high incidence among the clerical, artisan, student, or petty trader classes. While it is difficult to assign a proportional value to the figures given, the fact that a sedentary occupation, such as that of clerks, yields such high figures of epidemic dropsy is suggestive. Clerks cannot be regarded as the class who are most adversely affected in their diet by an increase of the cost of grain.

Beri-beri is notoriously a disease which occurs in institutions and in places where a fixed diet and some degree of confinement are almost constantly present—for example, prisons, asylums, ships, etc. It is important for those in charge of institutions to realize that such useful occupations as tailoring, mat-weaving, and basket-making are not such as to provide sufficient exercise.

SUMMARY.

1. Observations of an epidemic in Freetown Prison suggested that lack of exercise played an important part in determining an attack of beri-beri where the necessary predisposing conditions of diet existed.

2. Experiments on fowls showed clearly the decisive influence of lack of exercise in accelerating death in animals fed on a diet deficient in vitamin B.

3. In previous beri-beri epidemics this factor has been almost entirely overlooked.

4. The fact that lack of exercise accelerates and accentuates the ill effects of a diet deficient in vitamin B opens up an interesting problem in metabolism.

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THE INTRANASAL OPERATION FOR DISEASE OF THE LACRYMAL APPARATUS.

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THE treatment of disease of the lacrymal apparatus has always been full of disappointments both to the ophthalmologist and the patient. The rhinologist has ignored it, although a considerable proportion of the cases of disease of this system originate in the nose. In consequence it has been left to the ophthalmic surgeon to do the best he could with probes, styles, and excision of the sac. The introduction of drainage of the sac through the nose by one or other of the operations now performed has modified the treatment considerably and to a very great extent done away with the troublesome effects of excision of the sac. The cases must be properly selected, as the operation is devised for disease arising from stenosis of the lacrymal duct, and is useless for epiphora due to some defect of the puncta or canaliculi, facial paralysis, or disturbed secretory function of the gland.

For mucocele or suppuration of the sac the operation offers a method much preferable to excision of the sac, doing away with the unpleasant epiphora which remains after the latter operation. For some reason the intranasal operation has not made as rapid an advance as it deserves, though a steadily increasing number of cases are being operated on