number of days of treatment of the cured cases was 330, the average time for each case being 55 days. Improvement began between the third and eighth weeks of treatment, and once the improvement started it took from two to four weeks for the cases to become negative. There was no relapse. The time of observation was from one to four months. Pustulation occurred in three cases, slight reaction in two, and no reaction in one. In Case 7 the nailbrush was not used. Cases 7 and 8, which failed, were cured by x rays in one and four months respectively. It is interesting to note that Case 8, which was treated locally for 120 days, took exactly the same time for cure after x-ray epilation. It was necessary to carry out several local manual epilations combined with antiseptics to effect a cure.

(b) *Cases of M. felineum*.—There were 6 boys, 2 girls, and 1 woman. Eight cases were cured and one failed. The average time of cure was 75 days, excluding Case 17. Improvement began between the first and sixth weeks of treatment. It took one to six weeks for the cases to become negative once the improvement started. The time of observation varied from one to four months. Case 11 showed severe pustulation and refused further treatment. When examined several weeks later this patient was found to be negative to Wood's light; we considered, therefore, that he was cured.

It is interesting to note that there was a difference of about three weeks in the time of cure between the human and the animal types of ringworm. Variation in the resistance of the individual fungus, and last, but not least, the co-operation of the mother, might be responsible for variations in therapeutic response. Case 17 (*M. felineum*) started treatment in November, 1946, and was discharged cured in September, 1947. It was impossible to persuade this patient to cut her hair, and the treatment, therefore, was technically very difficult. It was confined to the inunction of ointments into the affected area. Different kinds of ointments were used for a considerable time, but when Ointment No. 1, combined with mechanical epilation, was employed she was cured in six weeks.

(c) *Cases 18-21* could not be identified by culture. We cannot therefore make any further comment upon them, except that Cases 20 and 21 were cured by x-ray epilation in five and four weeks respectively.

(d) *Case 22*.—A 9-year-old girl had suffered from *T. endothrix* infection for seven months. Clinically she presented widespread inflamed patches over the scalp. The Wood's light test was negative. No identification was possible by culture. *Endothrix* is notoriously resistant to treatment unless epilated by x rays. Another patient, who refused x-ray epilation, was treated for nine months with local applications unsuccessfully and had to be x-rayed eventually. Case 22 is all the more remarkable as it became clinically and microscopically negative after 53 days' treatment, and has remained so for the last two months.

A new series of cases has been started on 5% salicylanilide in carbowax and Crill No. 6, and of 23 under treatment 10 cases of *M. felineum* have been cured after two to nine weeks and are still under observation.

Summary

A preliminary report is given on new advances in the local treatment of ringworm of the scalp, demonstrating that infections due to *M. audouini* can be cured in a reasonable time without previous epilation.

With 0.5% phenylmercuric nitrate in carbowax and Crill No. 6, 22 cases were treated, including 8 of *M. audouini* infection, 9 due to *M. felineum*, 4 due to unidentified microspora, and 1 due to *T. endothrix*.

Seventeen cases were cured in an average time of 2½ months.

In this small series of cases we found no significant differences between the responses to treatment of the human and that of the animal type of ringworm.

Preliminary epilation, even when followed by old-time remedies, still affords the quickest prospect of cure.

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PREVENTION OF RINGWORM IN THE TROPICS

BY

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Ringworm is a far greater problem in the Tropics than in temperate climates, and for the British Army in the Netherlands East Indies (N.E.I.) in 1946 it was at one stage the commonest cause, apart from venereal disease, for admission to hospital. In February and March, 1946, ringworm accounted for 19.2% and 21.2%, respectively, of all admissions to a military hospital in Batavia receiving all types of cases except venereal disease. To these must be added the far greater number of cases treated by unit M.O.s, some having up to 50% of their men affected. These figures give a fair picture of the epidemic proportions which ringworm reached in this area. Furthermore, from discussions with colleagues in other parts of the East, I realized that these numbers were typical rather than exceptional for the Tropics.

To reduce this incidence was a military necessity of considerable urgency, in view of the fact that the N.E.I. was an active theatre of operations at the time. This paper describes a successful experiment carried out with 400 British other ranks (B.O.R.s) to test the efficacy of certain preventive measures which were later adopted on a much larger scale, and which may have a wider application to civil life as described later.

In temperate climates ringworm is largely confined to the feet, and from these it spreads to certain selective areas, notably the groins, axillae, and, in women, the submammary regions. In the Tropics, however, it is much more widespread because of the profuse sweating, and although these selective areas are usually the first and more severely affected the whole of the skin may rapidly become involved. In this way a man might have two or three lesions one morning and within a few hours his body, including the face, might be covered with confluent ring-like figures consisting of vesicles and pustules round the edge of an erythematous area, which in the more severe cases would be moist or even weeping. The effect of this was to produce intense irritation; the body became covered with scratch marks, and the man no longer efficient as a front-line soldier. An associated and usually severe tinea interdigitalis, consisting of the typical white sodden skin between the toes, sometimes fissured and sometimes partially detached, occurred in 98% of the cases.

Mode of Spread

Most writers on ringworm emphasize the frequency of spread to the body from lesions between the toes; for example, Brain (1941) writes: "Tinea pedis is usually due to the same organism as tinea cruris and, indeed, is often the source of the groin infection, so that examination of the feet in all cases of ringworm is important." Experience in N.E.I. bears out this frequent mode of spread in tropical climates. Further, although some of the patients had failed to notice their interdigital lesions, the majority stated that they had had them for some time before the ringworm on their body.

It must be pointed out, however, that the diagnosis of these cases was essentially on clinical grounds only, since the conditions of active service at that time precluded any cultural or large-scale microscopical surveys. Only four cases, picked at random, were examined microscopically, and in all of these the characteristic mycelium of ringworm was observed.

Some writers, notably Linn and Magarey (1941) working in Australia, have commented on the relative infrequency with which the fungus from lesions between the toes is obtained, and obviously no direct answer can be given to this from the present experiment owing to the impossibility of carrying out the necessary investigations. However, the experimental method described here was based on the assumption that the lesions between the toes were due to a fungus infection, and the success of the experiment would appear to bear this out, at any rate in the Tropics.

The commonest method of spread between patients is undoubtedly via the feet, and in particular from bathroom floors. This is emphasized by Gray (1934), who quotes: "Legge *et al.* (1929), examining the feet of 3,100 entrants to the University of California in one session, found 53.3% of the men and 15.3% of the women had foot ringworm. At the end of a year they again examined 1,000 of these men and 997 of the women who had access to the showers, swimming-pools, and gymnasiums. Of these, 78.6% of the men and 17.3% of the women were found infected. The increase in the case of the men is striking. The authors point out that the women students occupied a gymnasium with every known sanitary device. The women students and attendants were obliged to wear rubber shoes, and in no circumstances were they permitted to walk with bare feet on the floors or runways leading to the swimming-pools or gymnasiums. On the other hand, the men occupied an antiquated gymnasium where, on account of the lack or non-use of bathing shoes and inferior sanitary facilities, the students constantly walked on their bare feet and became infected." Fraser (1940) emphasized the importance of spread from bathroom floors and the need for careful foot hygiene to prevent it.

In view of these facts I believed that the main feature in a drive against ringworm must be the prevention of the spread of infection from the feet of one soldier to those of another. Consequently it was decided to carry out a large-scale field experiment on an air dispatch company consisting of 400 B.O.R.s. These men were employed on the loading and unloading of aircraft, which in tropical heat, with heavy loads, caused intense sweating: in fact, this unit was chosen because it was one in which working conditions were ideal for the development of severe ringworm, and one in which there was already a high incidence of the disease.

The Experiment

The success of the experiment would largely depend on the men, and therefore at the onset a brief talk was given to them by the unit M.O. and myself; here the rationale

of the experiment was explained, and in particular we pointed out that what the men called "foot-rot" was due to ringworm, and this could largely be prevented by frequent and thorough washing and drying between the toes. During the three months of the experiment each soldier was inspected once a week.

Equipment

Underpants.—Two pairs of cotton underpants were issued to each man, and these were washed on alternate days so that a clean one was available for wear each morning.

Foot-towels.—Each man was given two foot-towels, which were washed and changed daily. These were only used for drying the feet in order to prevent the spread of ringworm to the body from lesions between the toes.

Clogs.—Each man was provided with one pair of roughly made wooden clogs consisting of a shaped board with a single canvas strap. As showers were provided and not baths this made it possible to wash the toes without having to take off the clog, thus keeping the feet off the ground. Consequently the feet were never brought into contact with the bathroom floor, and this most important method of transference of infection was eradicated. As a corollary to this the men were instructed not to walk barefooted around the buildings.

Foot Powder.—This was kept in the bathroom, and the men were instructed to apply a little between the toes after drying.

Treatment

No attempt was made to segregate infected from non-infected men, and in fact this would have been almost impossible in the circumstances under which the men were living and working. It was also felt that the success achieved without this measure would add weight to the argument that the spread of infection was largely via the feet, since this was the one mode of spread which was being controlled. The routine treatment was of necessity modified in some cases, but the majority responded to the following measures.

Lesions on the Body.—1% chrysarobin in Lassar's paste was applied. It was never found necessary to increase the percentage of chrysarobin, so severe reactions to it seldom occurred.

Lesions on the Face.—Whitfield's ointment was used in place of chrysarobin, owing to the danger of conjunctivitis with the latter.

Lesions Between the Toes.—Brilliant green 1 in 500 in spirit, with 3% salicylic acid, was applied.

Results

June 1, 1946, was the starting date for the experiment, and on the previous day all the men were examined. Since up till then no record had been kept of the ringworm cases the figures

Graph showing total number of cases under treatment for each week of the experiment.

that cases occurring at the end of the three months were much less severe and less extensive than the early ones. The second part of the Table gives an analysis of the site of the lesions, and shows the rarity of ringworm of the body without an associated tinea interdigitalis, since only two cases occurred and both were present on the original inspection. The fall in the numbers of cases affecting body and toes will be seen

to be much more dramatic than the more steady fall in the number of cases affecting the toes only. This is explained on the theory, already outlined, that the earliest lesions are almost always between the toes, and that during the experiment the spread from toes to body was largely prevented by early treatment and the use of foot-towels.

Month	Average Time Taken for Cure	Distribution of Lesions in New Cases			
		Feet and Body	Feet Only	Body Only	Total
May	—	41	48	2	91
June	14.75 days	2	21	0	23
July	8.5 "	2	18	0	20
August ..	7.75 "	3	10	0	13

Relapse Rate.—There were no relapses in June, but five occurred in July and five in August—eight of these were cases of *tinea interdigitalis* only. However, in order to give a fair picture of the total ringworm state of the unit these have been included under new cases.

Discussion

It is emphasized that this experiment was carried out without alteration in the normal working routine of a very active unit, and in fact, because of the essential operative work on which the men were employed, it was very often necessary for a man with ringworm to miss one of his daily treatments. Therefore it is practicable not only for an active unit but also for immediate application in the wider field of civil life. Outbreaks of ringworm, particularly *tinea interdigitalis* and *tinea cruris*, are liable to occur in any civil community where communal washing facilities are provided, and especially in schools, factories, and mines.

Summary

A description is given of a successful experiment designed to reduce the high incidence of ringworm among troops in the Tropics. The importance of the spread of the disease via floors, from lesions between the toes (*tinea interdigitalis*), is emphasized, and this is made the basis of the preventive measures adopted. The application of these findings to civil life is noted.

The success of the experiment was largely due to Captain John Middleton, R.A.M.C., regimental medical officer to the unit concerned, to whom I am most indebted. I would like to thank the Director-General, Army Medical Services, for permission to publish, and Lieutenant-Colonel C. F. Michell, R.A.M.C., adviser in dermatology to the War Office, for his encouragement and assistance.

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"The School Dental Service has substantially recovered from the wartime relapse due to the calling up of dental officers, but we still have a long way to go to make it truly comprehensive and efficient," said Mr. George Tomlinson, Minister of Education, speaking in London on April 3 at the annual dinner of the Dental Officers Group of the Society of Medical Officers of Health. Stating that the average interval between periodic inspections was still a good deal more than twelve months and needed to be reduced, Mr. Tomlinson said that nearly 70% of the children in schools had dental inspections in 1946 and that 72% of those found to need treatment were willing to accept it. Almost every local education authority had now appointed a senior dental officer, and it was expected that the few stragglers would soon come into line, but the expansion of the service was hindered, as with other parts of the educational system, by shortage of labour and materials. Much could be done by improvisation, however, and local education authorities were encouraged to provide additional clinics by taking over existing buildings and adapting them cheaply. Emphasis on preventive rather than curative aspects of dentistry was becoming more common. Nutrition was a vital element in this, and the school dental service together with the school milk and meals service and the school medical service formed a great co-operative enterprise designed to foster the physical welfare of the children.

EFFECTS OF SEX AND THYROID HORMONES ON THE PROCESS OF AGEING IN FEMALE RATS

BY

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This paper is a summary of the results of experiments published in detail in four previous papers (Jones and Korenchevsky, 1946; Korenchevsky and Jones, 1946, 1947, 1948), and contains the general conclusions to be drawn from them. The effects of ovariectomy and of androsterone, oestradiol benzoate-butyrate, progesterone, and thyroid hormone, given alone or in various combinations, were investigated on the process of ageing in ovariectomized rats. All these hormones, including the androgenic hormone androsterone, are naturally present in the female organism. The literature relating to some parts of this subject is extensive, and it was reviewed in detail in the previous articles. Therefore, for economy of space, the papers of only a few workers are here referred to. For the same reason our previously published detailed tables are summarized in three abbreviated tables and the illustrations are omitted.

Main Lines and Methods of Gerontological Research

The best definition of old age was given by Prof. Warthin (1930): essentially old age is a major involution of the organism, of all its vital organs and tissues and of all their functions. Surprisingly, this ageing involution starts in most organs very early, at childhood. Therefore gerontological research can be carried out on individuals of any age. Hence there are two chief approaches to gerontology: *research on ageing* in young or adult individuals (as in the present experiments) and *research on actual old age or senility* in old animals or old human beings. It is obvious that both these ways are equally important. For therapeutic purposes of geriatrics the investigation of ageing in the earlier years of life is of great importance, since it might contribute to the problem of prevention of the present premature and abnormal senility.

The ageing involution of at least some organs should first show itself in the decrease in their relative weight—i.e., in the relative hypoplasia of organs (Korenchevsky, 1942). On the other hand, if any factor has some anti-ageing effect on a certain organ, it should increase the weight and produce hypertrophy of that organ. Obviously the changes in weight of organs alone cannot be sufficient for conclusions on hypertrophic, atrophic, or especially on any degenerative changes. For this purpose at least histological examination is necessary in order to eliminate errors in cases of enlargement of the organs due to oedema or hyperaemia, and to discover degenerative changes, etc. However, a complete understanding and an accurate definition of the processes of ageing and of the anti-ageing properties of any factor examined could be obtained only after the performance of several morphological, physiological, and biochemical investigations, both experimental and clinical.

Technique of the Present Experiments

Five experiments were performed on 197 female rats, of which 11 were normal controls, 29 ovariectomized controls, and 157 ovariectomized rats treated with hormones. The

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