should, in general, be admitted to hospital for stabilization on the new insulins. In the two out-patients frequent attendances over a long period were necessary before good control was achieved.

Like FitzGerald *et al.* (1954) we found that transfer from a mixture of P.Z.I. and S.I. or G.I. to I.Z.S. necessitated an increase in dose. This increase reflects, at least in part, a better 24-hour control, but Venning has shown that even a well-controlled patient may need an increased dose after transfer to the new insulin to maintain a comparable degree of control. Similarly, in Ferguson's series 6 out of 10 well-controlled children required more insulin when changed to I.Z.S., and only one a smaller dose.

We agree with Venning that estimation of the 24-hour urinary sugar excretion is a most useful method of assessing control after discharge from hospital. In several children routine twice-daily urine tests before breakfast and the evening meal showed no sugar or only a trace, but the amount of sugar excreted in 24 hours exceeded 10 g. and indicated the need to increase the dose of insulin.

We adopted this method for the first time in the present study, and it has taught us that, though in the majority of diabetic children it is relatively easy to establish good control in hospital, it is much more difficult to maintain such control over prolonged periods at home.

Summary

A single daily injection of insulin zinc suspension (a 3/7 mixture of amorphous/crystalline I.Z.S.) achieved good diabetic control in 18 out of 20 children.

We are grateful to Professor J. M. Smellie and Drs. C. G. Parsons, W. H. P. Cant, and J. W. Gerrard for allowing us to study their patients; to Mr. H. B. Salt and the staff of the biochemical department, Children's Hospital, Birmingham, for the sugar estimations; and to the house-physicians and nursing staff, in particular Sister N. E. Howells, for the care of the patients. We also wish to thank Messrs. British Drug Houses and Evans Medical Supplies Ltd. for the supplies of I.Z.S. before it became generally available.

ADDENDUM.—While preparing this paper we have had the opportunity of studying a further eight children, in all of whom good control was obtained in hospital with a single daily injection of I.Z.S. It is too early to state whether such control will be maintained as out-patients.

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The first secondary technical school for deaf boys to be opened in Britain will begin the September term with thirty boys over 11 who use speech as their normal means of communication. To be known as Burwood Park School, the school is to train pupils for technical schools, technical colleges, and colleges of art. It will be under voluntary management, and is to be recognized by the Ministry of Education. Lady Patricia Lennox-Boyd and her father, the Earl of Iveagh, have given the freehold of the property to the school.

TRICHOPHYTON SULPHUREUM RINGWORM

INFECTIONS IN AN ADULT SCALP, A NEWBORN INFANT, AND THREE NURSES

BY

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The following cases of ringworm infection are of interest because one of them occurred in an infant 10 days old—possibly the youngest case on record—and because of the light the outbreak throws on the incubation period of the disease.

Case 1

This baby was born on December 19, 1953, three weeks premature, after a normal delivery. On the tenth day he was transferred to an isolation ward because of umbilical sepsis, which was readily controlled by chlortetracycline cream. His mother was definite that a rash was present on his face at this time; it was noted in writing by the resident medical officer on the fourteenth day as of a circinate erythematous nature. This caused little concern at the time and was diagnosed as "mucous burns." Dermatological opinion was not sought until the twenty-sixth day, when Dr. D. I. Williams made a clinical and microscopical diagnosis of ringworm, which he kindly invited me to investigate further on the next day.

The child was small but healthy. Three striking circular lesions were present on the face. They were bright red and scaly, with central clearing, without vesiculation or accentuation at lanugo hair follicles; one of these rings involved the eyebrow area. The scalp appeared entirely normal; the sides of the face, including the affected area, bore a luxuriant lanugo beard 1 cm. long. The limbs and trunk seemed to be normal. There was no fluorescence of scalp or face under Wood's light.

Case 2

The mother, aged 19, was seen at the same time as Case 1. Her menstrual history had been entirely normal, and this was her first child. She had lived in London for two years, and before that in a seaside town in Sussex. Two years previously she had suffered from multiple boils and whitlows; following a whitlow six months later she noticed deformity of her left index nail. For the past year there had been patchy hair loss, which worried her little; it had been diagnosed as alopecia areata, and she had used several local applications with little effect. A younger brother, still resident in Sussex, was said to suffer from boils and inflammation of the neck, but this was not investigated. Her husband was well. No other relative or close contact was known to have suffered hair loss or ringworm.

The nail of her left index finger was seen to be fragmented, but very little thickened or discoloured; there were no scars suggestive of old whitlows. At first sight the scalp was normal, except for some thinning in the left frontal and parietal areas, consisting of irregular patches of incomplete baldness on each side of the parting. Only on the closest inspection could one see broken-off stumps resembling "exclamation mark" hairs, and some black dots; these were present not only in the bald areas but all over the otherwise normal scalp. There was no inflammation or appreciable scaling, perhaps because she had been applying a lotion containing salicylic acid. Her skin was otherwise normal except for a nondescript crusted lesion 5 mm. in diameter above the left eyebrow. Removal of the crust left a shallow pit, which disappeared in ten days without treatment.

Other Cases

I was asked to see a staff midwife at the same time as the above cases. She had a scaly circinate lesion of the front and inner surface of the left upper arm covered with gentian violet, scrapings from which showed abundant mycelium. She had been in contact with the mother while in the maternity ward for 23 to 13 days before her rash appeared, and had bottle-fed the baby during the last five days of this period.

Subsequently two other nurses developed typical tinea circinata on their left arms. These two had worked only in the isolation ward and had had no contact with the mother; they had fed the baby from 15 to 7 days before their rashes appeared. In all three nurses the lesions corresponded precisely with the area of contact with the baby's right cheek during feeding: they cleared rapidly with local fungicides.

Investigations and Treatment

Potash preparations from the baby's face showed mycelium. Both at the first visit and later lanugo hairs plucked from infected areas were normal. Fungus was also found in the mother's nail and in the crust from her forehead; hair stumps showed an endothrix infection.

Positive cultures were readily obtained from all these areas on Sabouraud's dextrose agar, malt extract agar with tellurite, and penicillin-streptomycin cyclohexamide agar (Georg, 1953; Sharvill and Talbot, 1954). The fungus grew rapidly on Sabouraud's medium at 22° C., growth becoming visible in three days and reaching a diameter of 1 cm. in a week. While the colonies were flatter and less crateriform than usual, and of a dull buff rather than a bright yellow colour, slide culture identified the organism as *Trichophyton sulphureum*. The mycelium was broken up by numerous chlamydospores and hyphal swellings, microconidia were borne along the sides of the hyphae, and no macroconidia were seen.

Biopsy of the mother's scalp showed the endothrix spores; there was a small amount of dermal infiltrate, mostly periappendicular, consisting almost entirely of plasma cells with small numbers of lymphocytes and reticulo-endothelial cells.

Case 2 was treated for three months with local applications to the scalp, including kerionizing ointments, "asterol" (2-diethylamine-6-(β -diethylaminoethoxy)-benzothiazole) tincture and ointment, and Whitfield's ointment (ung. acid. benzoic. co. B.P.C.) without benefit. X-ray epilation was then carried out, there being no signs of relapse six months later. The affected nail was avulsed and allowed to grow under chrysarobin ointment; this it did entirely normally.

The baby's face was treated with half-strength and later with full-strength Whitfield's ointment. It was normal after six weeks, and remained so up to the age of 9 months, when last seen. The scalp did not become infected.

Discussion

Ringworm in infancy is uncommon in civilized countries, as was noted by Sabouraud in 1910, when he mentioned two cases of tinea capitis in infants aged 12 and 15 days, both confirmed microscopically and culturally. Radcliffe-Crocker (1903) mentioned a case of tinea capitis at 9 days and one of tinea corporis at 7 days, but gives no mycological details, although he was well acquainted with the microscopical and cultural diagnosis of ringworm. King *et al.* (1953) described 10 cases of ringworm in infants under a year; their youngest were 3 weeks (two cases), 6 weeks, and 8 weeks (three cases); none of these was infected by *T. sulphureum*. In a review of the literature of the past twenty years they collected 11 further cases, of which only two were under 3 months; one of these, described by Lynch in 1876, had a lesion six hours after birth diagnosed clinically

as tinea circinata, while another at 17 days lacked cultural confirmation. Omitted from this review are the cases of Beare and Cheeseman (1951), who described an *M. audouini* infection at 4 weeks and an *M. canis* lesion which appeared on the face of a 12-day-old boy ten days after being placed on a pillow vacated by an infected kitten. Bereston and Robinson (1953) described an *M. audouini* infection of the face and scalp in a 4-weeks-old negro baby.

The present case is the youngest patient with trichophyton infection that I have been able to trace, and if the mother's evidence is to be believed, as I think it is, it is even earlier than Beare and Cheeseman's microsporon case.

Scalp ringworm in adults is rare in Britain, although isolated cases are shown from time to time at meetings. It is, of course, commoner in eastern Europe and the Far East; thus Maschkilleisson (1936) described 53 personal cases of trichophytosis of the scalp in persons over 18 in Russia, and collected more than 600 from the literature. While it was considered rare in the United States, Pipkin (1952) suggested that it was commoner than usually supposed, since 106 dermatologists replied to his questionnaire with details of 258 cases. His own series of 1,304 cases of tinea capitis included 64 (4.9%) occurring after puberty; in 39 of these, all confirmed culturally, the patients were more than 20 years of age, 22 being 30 or over at the time of onset.

T. sulphureum is one of the less commonly encountered dermatophytes in Britain, although it is perhaps becoming commoner. Walker (1950) obtained *T. sulphureum* 39 times from 2,473 cultures; this was at a reference laboratory. From a personal series of 250 consecutive culturally positive cases of ringworm attending this hospital I have isolated it three times, excluding the present cases, in the past three years. Partridge (1952) found it in 15 of 179 cases of tinea capitis and in 7 of 109 cases of tinea corporis, but this, too, was in an institution working largely as a reference laboratory. Such figures may indicate an incidence higher than actually exists in London.

Beare and Cheeseman (1951), in Northern Ireland, found *T. sulphureum* in 21 of 1,004 cases of tinea capitis, which included epidemic *M. audouini* infections. Beare suggests (personal communication) that adult scalp infections with this organism are not uncommon and that they are often missed.

Many papers (Georg, 1952; Howell *et al.*, 1952; Scully, 1952; Simon and Schwartz, 1953) point to the increasing frequency of these infections in the United States. Pipkin (1952) found it in 22 of 57 adult and adolescent cases of tinea capitis, and other trichophyta of the group in 16 more. Mullins (1954) describes the examination of 3,365 schoolchildren in Phoenix (Arizona): 32 of these had tinea capitis, due in three cases to *T. sulphureum*. In 1952 Howell *et al.* discussed the clinical and pathological features and geographical distribution of 44 cases of tinea capitis due to *T. tonsurans* (*sulphureum* and *crateriforme*) in Texas and California. Family epidemics were described by Klugman and Constant (1951) and by Scully (1952). Reiss (1954) found *T. tonsurans* 44 times in 664 cultures; in 29 of these cases infections were confined to the scalp and in 11 to the skin. He drew attention to the increasing frequency of these infections in the eastern United States.

The present small outbreak is additionally interesting because of the light it throws on the incubation period of the naturally occurring disease. In the baby it could not have been more than 14, and may have been only 10 days; in the first nurse it was between 23 and 13, probably between 17 and 13, and in the other two between 15 and 7 days. This suggests that the incubation period of tinea corporis due to *T. sulphureum* is between 13 and 15 days; thus in the baby the rash appeared almost as early as it could have done, although Beare and Cheeseman's case suggests the possibility of an *M. canis* infection becoming visible as early as the second day.

Summary

A case of tinea circinata is described in a 10-day-old infant; the 19-year-old mother suffered from tinea capitis and tinea unguium. Three nurses attending the baby were infected.

Trichophyton sulphureum was isolated from the baby and from his mother.

Ringworm in infancy, tinea capitis in adults, and *T. sulphureum* infections are discussed and the literature is briefly reviewed.

The incubation period of *T. sulphureum* infections is discussed with reference to these cases.

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TREATMENT OF ASCARIASIS IN CHILDREN WITH PIPERAZINE ADIPATE

BY

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Great progress in the treatment of ascariasis was attained by the discovery of the anthelmintic properties of piperazine. Many of its derivatives—namely, the hydrate, citrate, and diphenylacetate—have been tried with a variable degree of success.

Treatment with piperazine hydrate was first described by Fayard (1949), who treated about 2,000 adult cases with two 1.5-g. doses of piperazine (corresponding to 3.5 g. of piperazine hexahydrate)—one in the evening and the other the next morning. Of these cases, 70–95% passed ascarides on the second and third days. As stool examinations were not carried out after treatment it is impossible to determine the exact cure rate in this series. White (1954) reported the successful treatment of three ascaris-infested children with piperazine hydrate. He used 68, 30, and 81 mg./kg. body weight a day respectively for seven to ten days. The worms were expelled on the second and third days. Brown (1954) treated 51 cases of ascariasis with a syrup containing piperazine hexahydrate, given for two to five days. He used 1 g. a day for children weighing less than 60 lb. (27 kg.). He reported 100% cure for those who were treated for five days, 87% cure for those treated for four days, 93% cure for those treated for three days, and 85% cure in those treated for two days.

Neurological side-effects, mostly in adults, have been reported following the administration of piperazine hydrate (White and Standen, 1953; Sims, 1953). These included giddiness, lack of co-ordination, sickness, inability to focus vision, and a sense of detachment. Furthermore, the wide use of piperazine hydrate is not quite practicable, because it is a strongly basic substance and its keeping qualities in solution are uncertain.

Brown and Serman (1954) treated 23 cases of ascariasis in children with piperazine citrate. Nineteen were cured after a single course of treatment, based on stool examination. The dose was determined on the hexahydrate content of the syrup employed.

Savaton-Pillet (1954) used the diphenylacetate salt of piperazine in treating 80 cases of oxyuris and ascaris infestation, and reported success in 73 cases with a dosage of 0.075 g./kg. body weight a day for seven days. This piperazine salt has the following disadvantages: (1) it contains 25% piperazine, so that the required dose is larger; (2) it has a distinct urinary odour, which renders it unpalatable to many patients; and (3) as a liquid preparation it is difficult to keep stable for storage.

Davies *et al.* (1954) have sought for a derivative of piperazine of low solubility, as such a compound might undergo slower absorption in the gut than the readily soluble hydrate, citrate, etc., thus avoiding the neurotoxic effects accompanying the use of the more soluble piperazine compounds. Piperazine adipate proved able to satisfy the pharmaceutical requirements considered necessary. Clinical trials in oxyuris infestation in man showed it to be completely effective and without any toxic side-effects. It was tried by Sloan *et al.* (1954), and proved an effective curative agent against a variety of helminth infections in domestic animals. Its main advantages over the hydrate are: (1) its anthelmintic effect is much greater than that produced by an equivalent weight of piperazine hydrate; (2) it is free of toxic side-effects; (3) it is stable on storage; (4) it has a high piperazine content; and (5) it has a pleasant acidulous taste and is free from odour.

While these trials were in progress O'Brien (1954) reported briefly two cases of young children whom he treated for oxyuris infestation and in whom ascarides were also present. He gave 300 mg. of piperazine adipate twice daily for six days, and in both cases the drug appeared to be strikingly effective.

Rearden (1954) also reported his experiences with piperazine adipate in the treatment of ascariasis in children and confirmed its efficacy. The dose used was 0.3 g. each day for each year of life in children up to 6 years—those over 6 were given 0.6 g. three times a day. Administration was continued for one week. All the children, save one, were completely cured.

Present Work

Piperazine adipate was used in a series of cases in order to determine the most effective dose and the number of days during which this dose should be administered in order to obtain complete eradication of ascaris infestation.

The series consisted of 85 children (47 males and 38 females) aged 1½ to 12 years, who were admitted to the Children's Hospital (Cairo University, Mounira, Cairo). The following investigations were carried out in every case: complete blood examination before and one week after treatment; blood pressure before, during, and after treatment; full examination of urine before and after treatment; and stool examinations before, and two days, four days, seven to ten days, and 14 to 30 days after treatment.