THE ADMINISTRATIVE CONTROL OF RINGWORM.*

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RINGWORM occurring in children may be conveniently classified according to the site of its occurrence into :—

- (1) Ringworm of the skin.
- (2) Ringworm of the scalp.

1.—RINGWORM OF THE SKIN.

Is usually due to one or other variety of the large spored fungi. The small spored organism rarely attacks the skin, when it does the ring which is formed is of small diameter, not usually larger than a florin; there is little inflammatory reaction and the skin infection occasionally disappears without treatment. The small spored fungus occasionally causes small solid raised scurfy patches, in these cases which are not easy to diagnose without microscopic examination, there is usually a distinct margin to each patch.

In ringworm of the skin, due to a large spored variety, the rings are of wide diameter with a well marked inflammatory zone surrounding them, so much so that in some cases the periphery may be pustular.

2.—RINGWORM OF THE SCALP.

Is almost always due to a small spore organism. Of 200 cases microscopically examined small pores were present in over 90 per cent.

The large spore fungus rarely attacks the scalp, except by extension from a skin infection, usually on the forehead or neck.

When it does so the disease is, as a rule, not difficult to cure.

Ringworm of the skin rarely occurs on a patient suffering from ringworm of the scalp. Seven cases occurred in those examined being 1·75 per cent.

The disease begins as a minute scaly patch on the surface of the scalp, from the position thus gained, the fungus attacks the hair. Having passed down into the follicle (in which case, a small red papule may be seen surrounding it), or more probably, having eaten directly into the hair, the fungus forms a mycelium within the shaft. The hair at this stage breaks off—leaving the characteristic stump protruding through the scales.

Consideration of the cases examined leads me to the conclusion that the usual mode of entry into the hair shaft is a direct one. It is probable that the organism erodes the hair by the action of a kerolytic ferment.

The extension of the mycelium along the shaft in the case of the large spore variety is slow.

As the age of puberty approaches, changes occur in the hair which render it more resistant to attack, should infection then take place it is almost always due to the large spore fungus, the hair affected is usually fine and silky and moreover direct penetration of the shaft appears to be rare.

Infection may be due to :—

- (1) Direct contact (occasionally intentional).
- (2) Use of infected articles, brushes, caps, etc.
- (3) Aerial transmission.
- (4) Animal infection.

My opinion is that aerial transmission is not an uncommon method of infection during school life. It is not unusual to find an outbreak of ringworm of the scalp for a long period almost entirely confined to one class, and as the opportunities for infection by direct contact, or by use of infected articles are no greater, but less, in a class, than in the school as a whole, the reasonable inference appears to be that the class limitation of the disease is due to the infection having been transmitted by the air of the class-room. The probability is increased by the fact that the ringworm parasites belong to the Hypomycetes or Mould family, whose spores float through the air.

In this connection it is interesting to observe what is the most common site of scalp infection.

If the infection is generally due to contact or to the use of infected caps, &c., the sides, back and vertex should be equally liable to attack, that is to say about 33 per cent. of the cases should show an infection on the top of the head and about 66 per cent. on the sides and back. If, however, infection usually occurs by aerial transmission, it is likely that the vertex will suffer most severely.

Analysis of the 400 cases gives the following figures :—

Vertex	66·25 per cent.
Back and Sides...	29·25 ,,
Whole head	4·50 ,,

* Read before the Midland Branch of the Society of Medical Officers of Health on December 1st, 1910.

4.—ANIMAL INFECTION.

It is said that a considerable number of the cases of skin ringworm arise from contact with an infected animal, usually a cat, although attention has been paid to the possibility of this mode of infection, up to the present I have not been able to obtain very satisfactory evidence in support of the statement.

In one case parents complained that their children had caught the disease while playing in a field in which cows were put out to graze. Investigation showed that the children were suffering from an infection with the large spored fungus, and that one of the cows was infected by a similar organism, further than this statement of facts I am not prepared to go. It is well known that farm labourers acquire the disease through contact with infected cattle.

DIAGNOSIS.

The following varieties of scalp ringworm occur:—

(1) The typical circumscribed scurfy patch, thickly covered with short stumps of brittle hair—91·75 per cent. in this series.

(2) Diffuse scattered foci, each focus only involving a few hair follicles—8·25 per cent.

(3) Bald smooth patches, showing a few short broken hairs around the margin of the patch—0·0 per cent.

(4) Kerion, in which there is a boggy area of acute inflammation—seen to consist of suppurating hair follicles.

This condition is also very rare, only two instances occurred in my series—0·5 per cent.

It is possible that some cases which have been described under the term Kerion are in reality due to a mixed infection of ringworm and pyogenic cocci.

In carrying out an inspection for scalp ringworm attention should be directed mainly to two points.

(1) *The presence of scurf.*

Scurf, particularly when localised, demands a careful examination of the head aided by a lens, such examination will generally reveal:—

(2) *The presence of short broken hairs* characteristic of ringworm, each hair appears frosted and can be readily broken off, its removal causes no pain. These broken hairs, or as they are often termed “stubble” are absolutely diagnostic of Scalp Ringworm, when mounted in Liquor Potassæ and examined under a 1/6th, the spores and mycelium can easily be seen.

TREATMENT.

(1) *Ringworm of the skin*, no difficulty should

arise in affecting a cure of this disease. The simplest method is to paint the patch daily with Tincture of Iodine. Three applications are usually sufficient.

(2) *Ringworm of the scalp*, the successful treatment of this condition may, under unfavourable conditions, be a difficult and wearisome undertaking. Two methods are available.

(1) The application of irritant parasiticides.

(2) The use of X rays.

Whichever method is adopted the first step is to determine the extent of the disease, and for this purpose it is essential that the whole of the head should carefully be examined, in a good light with the aid of a lens. Should the disease be found localised and not extensive, there appears no reason why a cure by means of parasiticides should not be attempted, and it is probable that some parents will insist on this method of treatment.

Many drugs have been recommended for the treatment of ringworm of the scalp. My opinion is that it does not much matter which drug is employed provided that it is antiseptic, and irritant, that the liquid in which it is made up is capable of dissolving fatty material and that due diligence is displayed in its application.

(1) The extent of the disease having been determined, the affected area shaved and thoroughly cleaned with ether soap, paraffin, or methylated spirits, the solution decided upon should be applied with a very stiff brush by the medical man or nurse daily for about a week. By this time a moderate amount of reaction will have been produced. After a few days' rest, the area diseased should be well rubbed with a coarse cloth, moistened with methylated spirits, by this means loose hairs will be removed. The painting must then be repeated for a further period. Under this routine a cure can usually be effected in about 3—6 weeks. Under no circumstances should water be applied to a scalp affected with ringworm, or a watery solution used in treatment.

(2) Where the disease has resisted drug treatment, is extensive, or consists of scattered foci, treatment by X rays should be undertaken.

After exposure to the rays for an appropriate time, the quantity given being measured by Saborauds' pastiles, the case need not be seen for about three weeks; during this time an antiseptic lotion should be used and the head rubbed daily to assist in the removal of the hairs, unless complete baldness of the affected area occurs the treatment is useless. New hairs

should appear in about two months. The scalp must then be carefully inspected to discover whether a cure has been effected, and some of the new hairs microscopically examined.

Should a scurfy condition of the scalp persist after ringworm has been apparently cured, careful examination will almost always show that the disease is still present.

INFLUENCE OF SCHOOLS ON THE SPREAD OF RINGWORM.

In considering this problem it is necessary to bear in mind that as age advances children become less liable to attack, and that ringworm of the scalp—due to the small spored fungus—becomes stationary or dies out by the time that the child leaves school. On the other hand there is no reason to think that infants and small children under school age are at all immune from attack; on the contrary, the disease seems to find a particularly suitable nidus in the scalp of infants and young children.

In the examination of school children of various ages I have been impressed by the fact that not only is Ringworm more prevalent in the Infants' Department (as one would expect) but that infants of the age period 6—7 are most commonly found affected.

Table I. shows the age distribution of all the children attending the Elementary Schools in Coventry and compared with it the age distribution of about 400 cases

of ringworm of the scalp. From the table it will be seen that total number of all children attending school is about equally divided up amongst the various age periods. The relatively small size of the 13 group, probably testifies to the success of the attempt of certain children to advance the date of their fourteenth birthday.

On the other hand a similar table showing the age distribution of the 400 Ringworm cases shows striking differences:—

1. The affected children are mainly distributed over the first four age periods.
2. After the ninth year the number of children in each age period steadily decreases; this is probably due to the immunity which advancing age bestows.
3. The age period 6-7 shows by far the largest proportion of cases.

As there is no reason to think that the age period 6-7 is one of increased predisposition, the only reasonable inference is that during this period and the previous year, occurs an increased opportunity for infection.

This increased opportunity must be due to attendance at school which commences at the fifth year or soon after.

The liability to infection at school will vary according to certain circumstances.

AGE DISTRIBUTION

1.—SCHOOLROOMS.

(a) Of primary importance is the amount of floor space per child; it is obvious that overcrowding must increase the danger.

(b) Physical Drill carried out in the classroom is bound to assist in disseminating the spores.

(c) Frequent cleansing of the floors should diminish the risk of infection. It is reasonable to suppose that spores of the fungus, falling to the ground, intermingle with the dust, which thus becomes a source of danger; class-room floors should be thoroughly cleansed with soap and water once a week, and the desks and forms suitably treated.

2.—CLOAK ROOMS, &c.

Doubtless the insanitary and ill-arranged cloak rooms generally found, even in the newer schools, assist in the spread of the disease.

An infected cap is a source of danger to other articles hanging beneath it. It is important that each child should use a numbered peg; there should be a clear space of 18 inches between the pegs, with no peg vertically below one another.

Clean towels should be substituted for those in use each morning, and not once a week—a more usual method.

3.—PLAYGROUND.

Contrary to the general opinion, risk of infection during play in the open air appears to be slight, unless there is intimate contact. It is probable that spores are carried away before they infect the occupants of the playground.

It is difficult to believe that infection often occurs in the playground, when it is realised that an outbreak of ringworm can remain for a considerable period almost localised to one class. I am certain that the risk of infection during out-door play, even though contact often occurs, is considerably over-rated. It has been stated that children in the different classes do not considerably intermingle during play. I have carefully observed at different schools and cannot agree with the statement.

PERSONAL FACTORS INFLUENCING INFECTION.

Apart from the opportunities for infection it must be remembered that there are personal factors influencing the occurrence of the disease.

Ringworm of the scalp is rather more common in Boys (53 per cent. Boys, 47 per cent. Girls). This may be partly due to the fact

that in boys it is more easy to discover; but it is mainly due, I think, to the long hair of girls affording a protection, so that spores are brushed or shaken off before they can establish themselves on the scalp.

An unclean or ill-cared-for head certainly does not predispose to the disease, other things being equal, a clean well washed scalp is as likely to show evidence of ringworm. This may, to some extent, be due to the fact that washing the head rapidly disseminates the disease; moreover I believe that a slight greasiness of the hair tends to protect it.

Bodily health does not seem to affect the growth of the fungus, neither does the state of nutrition appear to be of much importance. But it is probable that the colour and texture of the hair, particularly the latter, play a part in predisposing to attack or in influencing the progress of the disease.

Below are tables showing the state of nutrition, cleanliness of the head and colour of the hair in about 1,000 children; compared with it is a similar table concerning about 400 ringworm cases.

A thousand children attending four schools were examined, the state of nutrition, of cleanliness, and the colour of the hair of each child recorded. The results form the standard with which the cases of Ringworm are compared.

In order to make the comparison as exact as possible the "standard children" consist of about 72 per cent. Infants, and the remainder Seniors.

Table II. seems to show that the state of nutrition is of little importance as far as Ringworm of the scalp is concerned.

Table III.—The state of cleanliness also appears to have little influence in predisposing to infection. It is true that the "good" class, as regards nutrition (and also as regards cleanliness), appears rather less likely to show presence of the disease; this is probably due to careful watching of the head and early resort to medical advice by the parents, rather than to immunity conferred by bodily cleanliness. That this is so is borne out by the fact that the "bad" class shows no increased predisposition to the disease.

Table IV.—Contrary to the experience of some observers dark-haired children, in this series, appear more liable to attack, but in them the disease seems more amenable to treatment.

METHODS OF DEALING WITH THE DISEASE.

Various means have been adopted to cope with the disease occurring in children attending the Elementary Schools.

In the first place there can be no question that a child suffering from Ringworm should be excluded from school until cured.

In some districts children suffering from the disease are allowed to attend school, provided that the affected area is covered with ointment, or the child wears a cap; this procedure is not only unsound in principle because it permits a scholar suffering from a contagious disease insufficiently protected, to attend school, but it is undesirable in practice as it subjects the

child to considerable annoyance, since it is recognised by its fellows as being "unclean."

It is stated by some that it is useless to exclude children suffering from Ringworm from school as there is no means of controlling their movements after exclusion, and that the affected children can disseminate the disease while attending Sunday School or various social gatherings, and by playing with their neighbours in the streets. This appears to me a narrow-minded view to take of the position. If the argument is sound, children suffering from Chicken Pox, Impetigo or Scabies, should not be excluded from school.

It is sometimes stated that Ringworm of the scalp is a disease of low infectivity, mainly on

the assumption than an affected child may remain in a class for a year or more without other cases being apparent. Unless all the children that have been associated in school during the year with the one affected child are carefully examined for the presence of Ringworm, and found to be free from the disease, the necessary proof appears to be wanting.

If Ringworm is to be effectually dealt with in the Elementary Schools, three essential steps must be taken.

(1) Regular systematic examination of all the children by Medical Officer or by a Nurse especially instructed in the work of examining for Ringworm.

It is useless to rely on the Teachers for this purpose. Although they can readily diagnose the circular patch of Ringworm of the skin, it is quite impossible to convince the majority of teachers that a small area of scurf showing two or three broken hairs is the beginning of a disease which may continue—unless properly treated—for several years. Nevertheless teachers should be compelled to notify at once to the Medical Officer a case or suspected case of Ringworm, and to exclude the child until a certificate has been issued by the Medical Officer to the effect that the child may attend school.

Too much stress cannot be laid on the value of a careful examination of the head of every child in a school, such examination should be carried out at least twice a year throughout the whole school and about every month in the Infant Departments,

A careful capable Nurse can examine about 200 children in a day, the suspected cases should then be seen by the Medical Officer, and the name and address of each child, together with other particulars, entered on a card which should be filled. By this method it is always easy to refer to any particular case. A microscopic examination of the hairs is sometimes necessary to assist in the diagnosis.

(2) The affected child having been excluded from the school the question of treatment arises. No difficulty should be experienced in the case of *Ringworm of the Skin*, the majority of the children can be passed back into school in a week.

With *Scalp Ringworm* experience has shown that it is of little use to simply exclude the children. Although a great deal can be done by home visits paid by a school Nurse, yet the scalp affection, being a disease demanding in treatment more continued attention and pro-

longed perseverance than a busy practitioner has time to bestow (it must be remembered in this connection that the majority of the cases may be Club patients) to be effectually stamped out, should be treated by the Education Authority. The actual method adopted must vary with the circumstances of the district.

(i) In a large urban area, a Ringworm school appears to be a satisfactory way of dealing with the disease. The period of exclusion from school of each child, even when treated at once, with X rays, is rarely short of three months, and may under unfavourable conditions extend to more than a year.

The loss of education to the child and the loss of the grant to the Authority, unless treatment is carried out in a school, is bound to be very considerable.

The difficulties of establishing and carrying on such a school may arise through:—

(a) *Expense.*

Unless use can be made of existing school-buildings the cost of acquiring and fitting out premises &c., together with the salary of a teaching staff, is an important item.

(b) *Teaching.*

A difficulty in teaching may occur through the grouping together of children of different ages. If the number of children is large, the difficulty diminishes. Moreover the majority of affected children are under 9 years of age—72 per cent in this series.

(c) *Travelling.*

Some children may have to travel a long distance in order to reach the school, and in the case of Infants this is not an unimportant detail.

These difficulties are, however, by no means insuperable and are more than counterbalanced by the great advantage of having the children collected together and easily accessible for observation and treatment.

The child does not lose the education or the Authority the grant, and it appears probable that unless satisfactory treatment is being carried out, attendance at a Ringworm school can be enforced by the Education Authority.

(ii) In a small town, all the cases of Ringworm may be isolated in a class or department at one school. The affected children should enter school after and leave before the other scholars and use the playground at a time separate from the others.

Due care must be taken in other ways to prevent the spread of the disease, such as frequent cleansing of the classrooms, &c.

Should it be impossible to establish either of the above systems, a clinic offers some assistance. The affected children must attend at frequent intervals for inspection and treatment, obstinate or extensive cases being referred for X ray application.

A clinic has many important disadvantages when compared with a Ringworm school, such as loss of education and grant, difficulty in enforcing attendance, particularly if the treatment is disliked by the child.

(iii) In rural districts, the difficulties of successfully dealing with the disease are considerable, and the methods adopted must vary with the local conditions. Generally the treatment will remain in the hands of the medical men, although in some cases arrangements may be made with a neighbouring urban authority to accept the children at a Ringworm school or clinic.

When re-admission is sought the child should be visited by the School Nurse or Health Visitor and a specimen of hairs sent to the Central Office for examination.

(3) The third essential is efficient inspection before return to school; this to be thorough often entails a microscopic examination of the hairs.

No child should be allowed to return to school until certified as cured by the medical officer.

Even with the most careful examination it is impossible to be certain that a case is cured, time only can prove whether the treatment has been successful or not. Therefore, the re-admitted child should be seen again in about two months.

Although Ringworm is a disease causing no danger to life, yet it is a disfiguring and loathsome complaint, and during its existence renders a child socially "unclean," except, of course amongst the slum population. Moreover, unless the child is allowed to remain in school the disease often considerably retards its educational life, with the consequent loss of grant to the Education Authority. There is no doubt that the disease is much more prevalent than is generally believed; probably between 3 and 5 per cent. of children of all ages attending elementary schools suffer from Ringworm.

Thus it behoves us who are members of a Public Health service to exert our influence so that efficient administration shall diminish the prevalence of the disease.

DISCUSSION.

DR. SNELL dealt with the subject of exclusion of the children suffering from Ringworm. In Coventry the first method adopted was that the children with Ringworm were simply excluded from school in the same way that they were excluded when suffering from many other complaints, and it was left for their own medical men to sign the certificate that they were cured. By this method it was frequently found that children got back to school in a week, in some cases they were back at school in two days. After this experience the Committee decided that no child should return to school except on a certificate signed by their own officer. Dr. Snell did not think they could do much towards combating the disease until they had an X ray clinic. He quite agreed with Dr. Cates's remarks as to the uncleanness of the schools, and so far as aerial transmission was concerned he thought this must be a possible method of infection.

DR. BOSTOCK HILL said that from an administrative point of view there was a vast difference between dealing with this matter in towns and in large rural areas. In Warwickshire they had found a great deal of good could be done by the medicinal treatment of Ringworm if it were reasonably well carried out. He had possibly an advantage over some members of the Branch inasmuch as he had no less than 10 Health Visitors and School Nurses at work in the County, and the school population being relatively small they could have a fair amount of supervision. Teachers, in the County Schools, were instructed to point out to the School Nurse any suspected cases, and when a sample of the hair had been microscopically examined, and it was definitely decided that the child had Ringworm, then that child was excluded from school and told to obtain medical advice; if, in a month's time, the treatment was not being carried out, the chief School Medical Officer was given instructions to "stimulate," *i.e.* to see that the treatment was carried out; should this not be successful, the next step was that the parents were told that they would be dealt with under the Children's Act for cruelty, or summoned for not sending their children to school, or the case would be referred to the N.S.P.C.C. The consequence of these steps being taken was that an immense amount of good was done by the medicinal treatment. Dr. Hill said that in Warwickshire a case was never considered cured until the hairs had been microscopically examined in his own laboratory.

DR. ROBERTSON said he had had to do with Ringworm infection in hospital, and he found that if the nurses had been in any way slack in the use of the brush and comb Ringworm very soon occurred; he also found that if the "barrier" system was kept in good order Ringworm was very little to be feared. In his opinion it was very doubtful if Ringworm was ever spread through the air, but remarked that this did not do away with the fact that schools must be kept clean. He said that he noticed that no reference was made to the remarkable differences which are noticeable in the prevalence of Ringworm in different parts of the country; in Birmingham there was very little Ringworm compared with other districts, but he did not know whether this was due to the fact that for eight or ten years they had been devoting special attention to Ringworm.

DR. ORR said that there were three important points in regard to Ringworm in schools; first, the discovery of the cases; second, proper treatment; third, proper supervision before re-admission. Out of 4,200 children in Shrewsbury there were 129 cases of Ringworm. Whether X ray treatment was the best he was not prepared to say, but his experience went to show that drug treatment was very effective. The children in Shrewsbury were asked to go to their own doctor, but he often found that this advice was not followed and the children were taken to a chemist. No child was re-admitted to school until the hairs had been microscopically examined, and he alone issued certificates for the re-admission. Alluding to the washing of the head, Dr. Orr said that one might think that washing the head would spread the spores; but this, in his experience, was not so.

DR. HALL EDWARDS said he assumed the Branch wished him to speak more particularly with regard to the treatment of Ringworm by X rays. He saw a very large number of cases of Ringworm, but only a small portion of them were treated by X rays; those that were treated by X rays got well very quickly, and if the area were limited the necessary treatment could be carried out in three weeks. One per cent., he thought, would represent the proportion of cases where Ringworm recurred after treatment by X rays if properly treated, and the recurrence is then due to dirty heads. He did not hold the opinion that X rays was the best method of treatment for Ringworm, but that it resulted in a very great saving of time. Some time ago in France the average length of time for the treatment of Ringworm was 15 months, but they had now reduced this to about four weeks by the aid of the X ray treatment. The chief advantage lay in very severe cases, which required most careful treatment. If one had only a small patch to deal with it was a simple matter to give the proper exposure, and he had not seen a single case in which the hair had not come on again, and

there were no ill-effects, this being due to the fact that the rays required to produce the best effect were themselves possessed of very little penetrative power; the soft rays did no good at all. Referring to the treatment of Ringworm in the Birmingham General Hospital he said that they always cut off the children's hair previous to treatment by X rays; this being a precaution against the spreading of the disease, although this made it more difficult to find out which hairs are affected. To treat a whole head by X rays required five exposures; it was rather a lengthy process, requiring 10 to 15 minutes to give a full pastille dose. In conclusion, Dr. Hall Edwards said that he quite agreed with the previous speakers that the only way of showing whether the children were completely cured was for the hairs to be examined microscopically by a doctor whose time was solely devoted to such matters.

DR. J. H. GARRETT said he had found that the children received a very slack method of treatment when it was left in the hands of the parents, and even though advice were given to the parents, it was seldom followed. He said that treatment of Ringworm must be persistent to be successful, and, in this connection, more especially in country districts, trained nurses were of very great value for they were able to see that certain minor treatment was carried out, and in this way it would be better done than if left to the parents; also the nurses would see that proper specimens of hair were sent for examination. Dr. Garrett had never known Ringworm to occur in cats, but, there was a Ringworm among calves which is rather common, the ring being rather large, possibly about the size of a penny; this Ringworm attacks the cheeks and shoulders of the calves, but he did not know whether there was a Ringworm which attacked other bovine animals.

DR. CATES in reply said he did not propose to stand or fall by the theory of aerial transmission. If scurf could be carried by the air, there was no reason why spores could not also be transferred in that way. He could not agree that the children's heads should be washed with water, and thought this was likely to spread the disease. He quite agreed that the scurf must be removed but not with water. It was essential that X-ray treatment should be in the hands of a medical man who was a specialist in that treatment. In the Coventry General Hospital, he said, a mechanic works the X-ray apparatus and this was not successful.

The Bournemouth Corporation have appointed Dr. Edwards as medical officer of health, school medical officer, and medical superintendent of the Sanitary Hospital, at a salary of £500 per annum, and Dr. Nunn as consulting medical officer of health and consulting physician of the Sanitary Hospital at a salary of £350 per annum.