In 122 of the 145 mothers and infants tested their reactions agreed. In the remaining 23 there was disagreement—the mother being negative and the infant positive in 2 instances, and the reverse in 21 instances. The circumstances under which these disagreements occurred were as follows:

Mother Negative and Infant Positive (2 instances).—In the first of these the mother was pseudo-negative and the infant reacted only faintly on the second and third days. In the other the woman was definitely negative and the infant definitely positive. It may be observed that instances are recorded in which a relatively high antitoxin titre in the maternal blood is accompanied by a much lower, or even untitratably low, level in the cord blood. Von Groër and Kassowitz (1915) found three such instances in their series.

Mother Positive and Infant Negative (21 instances).—In 6 of these instances the mothers were definitely positive. Three of their infants showed a positive reaction on one day only, and were accordingly classified as negative; in one other instance the mother had had diphtheria 24 years before. In 5 other instances the mother was classified as a faint reactor, and in none did the infant show any sign of a positive reaction for even so short a period as 24 hours. In the remaining 10 instances the mothers, three of whom had had diphtheria in childhood, showed pseudo-positive reactions. One infant in this group showed a positive reaction on one day only.

The most common form of disagreement was thus a failure of the infant to react positively when the mother was positive, and especially when she was either a faint or a pseudo-positive reactor. This state of anergy was present in about one-quarter of the infants in whom a positive reaction might have been expected from the result of the test upon the mother. The proportion is rather smaller than that found in the earlier studies, and is probably due to the frequent examination of the test sites in the present series. Moreover, the lighting conditions for examining the present group of infants were unusually favourable.

Discussion

The belief is still widely held that the great majority of young infants possess a high degree of congenitally acquired passive immunity to diphtheria for some months after birth. Two circumstances in particular have contributed to this belief. First, many of the observations upon specific immunity in newly born infants were made in Vienna and other European cities, in whose populations diphtheria was particularly prevalent, and the results of these early surveys have been applied rather freely to other places and times without allowing adequately for local differences in the endemicity of the disease. Secondly, insufficient attention has been paid to the phenomenon of skin anergy which is shown by young infants to diphtheria toxin and other noxious agents capable of producing delayed erythematous reactions, so that, for this age group, many negative Schick reactions have been interpreted erroneously in consequence. Together, these misconceptions have led to an exaggerated estimate of the prevalence of congenital immunity during the first few months of life, and the reliance which has been placed upon this supposed insusceptibility is unfounded in a large proportion of instances.

The present observations indicate that considerably less than half of the infants born to women living in a typical outer London suburb have any adequate congenitally acquired immunity to diphtheria. So infrequently do the mothers come into contact with toxigenic *C. diphtheriae* that their circulating antitoxin concentrations fall to levels considerably below the critical titre for the Schick test. While a large proportion of the positive reactors among these recently confined women are themselves immune in consequence of the promptitude with which their antitoxin-forming tissues respond to the secondary stimulus of the specific toxin, their low antitoxin titre during pregnancy confers little or no immunity upon their infants.

At the present time the trend of mortality of infants under 1 year from diphtheria in England and Wales is a declining one, and so long as this fall continues no additional prophylactic precautions seem to be required. In the event of an epidemic rise, however, either in some particular locality or in the country as a whole, two possible measures might be instituted. First, infants might be immunized considerably younger than is now the custom: this procedure has the disadvantage that very young infants seem to respond less well to prophylactic immunization than older infants or young children. Secondly, as Dudley (1934) suggested, it might be desirable to immunize all Schick-positive pregnant women during the latter part of the gestation period. Such a procedure would at the same time immunize any woman who was susceptible and raise the maternal antitoxin titre to a high level about the time of the birth of the infant.

REFERENCES

Cooke, J. V., and Sharma, B. M. (1932). *Amer. J. Dis. Child.*, **44**, 40.
Dudley, S. F. (1934). Med. Res. Cncl. Sp. Rep. Ser. No. 195, London.
Glenny, A. T. (1925). *J. Hyg.*, Camb., **24**, 301.
Greengard, J. (1932). *Arch. Pediat.*, **49**, 526.
Kuttner, A., and Ratner, B. (1923). *Amer. J. Dis. Child.*, **25**, 420.
Ruh, H. O., and McClelland, J. E. (1923). Ibid., **25**, 59.
Von Groër, F., and Kassowitz, K. (1915). *Z. ImmunForsch.*, **23**, 108.
Wright, G. Payling, and Wright, H. P. (1942). *J. Hyg.*, Camb., **42**, 451.

RADIOTHERAPY OF ECTOPIC CALCIFICATION

BY

E. MILLINGTON, D.M.R.

Radiotherapist to the Royal West Sussex Hospital, Chichester

For some years radiotherapists have been treating with success deposits of calcium in the tissues, but unfortunately few outside the specialty seem to know of them. In two recent books on bone and joint conditions (McMurray, 1937; Watson-Jones, 1943) no mention is made of radiotherapy at all in this connexion, and few writers on general surgery have commented on this mode of approach, although in America the use of *x* rays in treatment is much more widely appreciated, and standard works, such as that by Comroe (1941), give full credit to radiotherapy. Ectopic calcium deposits may appear almost anywhere in the body, but of most interest here are those occurring in muscles, tendons, and bursae, as such deposits are in many cases painful and thus attract attention and demand treatment. The shoulder region is often affected, as in the calcified subacromial bursa or supraspinatous insertion, and the olecranon and Achilles bursae are also quite often involved in this process.

No convincing explanation of this deposition has as yet been given, and the formation of actual bone is even more obscure. Many theories have been put forward on the subject; these are summarized by McCurrich and Millington (1943). It is only with calcification, and not with true ossification, that we are now concerned, as *x*-ray treatment has no effect on formed bone, but only on calcium deposits. Calcium is frequently deposited in dead or devitalized tissue, possibly because of the change in *p*H in such regions, and the lesions with which we are dealing are mostly traumatic in origin, with pain dating from some injury or strain and becoming more persistent with time and the usual methods of treatment. *X*-ray examination eventually shows the presence of shadows due to the deposition of calcium of an amorphous and flocculent nature. It seems questionable whether it is the calcium that causes the pain, but in most cases if the calcium can be removed the pain also goes to a large extent, and perseverance with physiotherapy will then complete the cure.

Many surgeons recommend and practise surgical removal of the calcium. It was sometimes found at operation, however, that what appeared radiographically to be a large mass of chalk could not be distinguished from surrounding tissues when exposed, and at other times only a small amount of chalky fluid was seen; so there is no guarantee of cure from operation. *X*-ray treatment offers a method which is devoid of trauma and risk, and in any case does not preclude any more drastic methods later should it fail. The mode of action of the rays is not known, any more than it is with other applications; it may be due to alteration of blood supply, or quite possibly to some change in the *p*H of the irradiated part. The dosage is small and not harmful, there are no known ill effects, and the patient is not laid up or incapacitated in any way; but it must be realized that the effects of *x* rays are not usually manifest for some time after the treatment has been given, and as a rule it is some four to six weeks before there is any change in the radiographic appearances even if the pain has been relieved earlier.

Technique

The technique of treatment is not standardized, and good results are obtained by widely varying methods, but one technique which has proved satisfactory in the hands of quite a number of therapists employs repeated small doses of highly filtered *x* rays—namely, 200 *r* at 200 kV with 0.5 mm. Cu and 1 mm. Al filter, given once a week for four doses. Re-examination of the part after four weeks will often show absorption of most of the calcium; if not, the course may be repeated. Only a small area is treated, and there should not be any skin reaction or adverse systemic effect.

Three typical cases are reported below—one occurred in the subacromial bursa, one in the tendo Achillis bursa, and one in the soft tissues of the hand. All were of long standing, and with treatment all cleared up completely, both radiologically and clinically, although the cause was quite different in each case.

Illustrative Cases

Case 1.—An area of calcification was found under the deltoid on *x*-ray examination of this patient, who had had pain and stiffness in the shoulder for five years after falling from a horse. The pain had become continuous and had been accentuated by a course of radiant heat administered by the patient to himself. A single course of treatment was given as above, with relief of pain two days after the first dose, and no return to date (nine months). Radiographs taken four weeks after treatment showed no definite opacity; only some scattered mottling was seen.

Case 2.—A bursitis of the tendo Achillis region followed injury to the heel 12 months ago in this patient, suspected of gonococcal infection. Radiographs showed a definite patch of calcification, and a small sinus formed which discharged a creamy fluid at intervals. After one course of treatment the pain was much easier; but the discharge continued, and radiographs at this stage revealed considerable diminution in size of the patch of calcium, but not complete regression. A second course was therefore given, after which the discharge stopped, pain vanished, and radiographic examination showed complete disappearance of the deposit.

Case 3.—Localized deposits of calcium were found in the hand of this patient, who is suffering from a very low-grade type of Hodgkin's disease. The deposits were palpable and very painful, with some oedema of the surrounding tissues. An attempt was made at surgical removal, but this was unsuccessful, as no discrete deposit was found on exposure of the region involved. After one course the pain had gone and radiographs showed almost complete disappearance of the calcium, so no more treatment was given. The patient is well to date, after one year, but has grown other deposits elsewhere which have not yet been treated.

Comment

In these three examples ossification had not occurred, and it must be emphasized that radiotherapy is efficacious only when unorganized calcium is present; but, nevertheless, in early ossifying lesions *x*-ray treatment will often prevent the formation of bone from the preliminary calcium deposits. In the elbow region a deposition of calcium occurs before ossification in the antecubital muscles, and in the early stages will disappear if treated with radiation; some American surgeons even recommend the prophylactic irradiation of elbow injuries to prevent subsequent myositis ossificans. Haematomata may be treated in the same way with small doses of *x* rays and ossification be prevented in most cases. Unfortunately, organized deposits of calcium in the form of biliary and urinary calculi show no response to doses of *x* rays.

REFERENCES

Comroe, B. I. (1941). *Arthritis and Allied Conditions*, Philadelphia.
McCurrich, H. J., and Millington, E. (1943). *Brit. J. Surg.*, **31**, 86.
McMurray, T. P. (1937). *Practice of Orthopaedic Surgery*, London.
Watson-Jones, R. (1943). *Fractures and Other Bone and Joint Injuries*, Livingstone, Edinburgh.

A post-war programme of measures to reduce road accidents has been published by the Pedestrians' Association (180, Fleet Street, E.C.4). The proposals include better speed control, stricter enforcement of the law, a higher standard of efficiency among drivers, and a safety motor car. The Association takes the view that the 30 m.p.h. in built-up areas is too high a limit for safety and that the limit should be 25 m.p.h. with higher speed limits on main roads outside the built-up areas. Proposals for a safety car include placing the engine at the rear, giving the driver a better view of the road; greater manœuvrability; a shock-absorbent frame; and flexible upright fenders in front of the leading wheels with a net catcher between them.

Medical Memoranda

General Hypersensitivity to Sulphanilamide after Surface Application

Although the occasional development of general hypersensitivity to sulphathiazole after the application of that drug to skin lesions has been described (*J. Amer. med. Ass.*, 1943, **121**, 406), no mention is made in the Medical Research Council's War Memorandum No. 10 (The Medical Use of Sulphonamides) of a similar occurrence with sulphanilamide. The following case may therefore be of interest.

A telegraphist aged 21 complained on March 8, 1944, of a sore throat of 24 hours' duration. His temperature was 101.6°, pulse 100, and respirations 20. The tonsillar lymph glands were palpable and tender, both tonsils were slightly swollen, and the fauces and oropharynx were injected. He was given 2 g. of sulphanilamide at 8 p.m., to be followed by 1 g. 4-hourly. Next morning his temperature had fallen to 97.4° and his throat felt much better. At 8 p.m., however, 24 hours after sulphanilamide therapy had been started, his total intake being 8 g., the temperature was 103° and a generalized skin rash had developed. It was most marked on the dorsal surfaces of the hands, on the forearms, and on the feet and legs; and it was morbilliform in character, except on the hands, where there were some clear vesicles about the size of a pin-head. The throat was only a little sore and injected. No more sulphanilamide was given and the temperature fell abruptly. It was below normal on the 10th, but was raised, up to 102°, on the following 4 days. The rash faded slowly, and on March 13 it was rather more urticarial than morbilliform. Its distribution had also changed, for it was almost as intense on the front of the chest as on the hands and feet. Ten days later the only abnormality was slight scaling of the skin of the hands, forearms, ankles, and legs, which persisted for a further 3 weeks.

It was found from his previous records that sulphanilamide paste had been applied to an incised wound, about 2 in. long, on the front of the right leg, from Oct. 9 to 12, 1943—i.e., for four days—five months before this illness. The only other occasion on which he had received medical attention since he was a child was in 1940, when he had a cough, for which he was given a "black bottle." Thus there seems to be little doubt that the appearance of pyrexia and a rash after only 24 hours' treatment was due to sensitization by the surface application of the drug.

G. G. WALLIS, M.B., B.S.,
Surg. Lieut., R.N.

Weil's Disease without Jaundice

The name Weil's disease has been criticized on the ground that Weil was not the first person to describe the disease, but alternatives such as spirochaetosis icterohaemorrhagica and spirochaetal jaundice, which lay so much stress on the jaundice, probably result in many cases being misdiagnosed. We have recently had four consecutive cases in which there was no jaundice.

FOUR RECENT CASES

Case 1.—A child aged 4 fell into a brook which was flooded with storm water. The accident occurred in the winter, and was followed immediately by a brief febrile illness which was diagnosed as pulmonary collapse and treated with sulphathiazole. Chest symptoms and signs soon disappeared, but the child remained unwell and refused to eat. On the eleventh day she vomited, and there was an abrupt rise in the temperature to 105°. On admission to hospital two days later her temperature was 103°, her conjunctivae were injected, and there was a trace of albumin in the urine. The serum agglutinated *Leptospira icterohaemorrhagiae*. The acute symptoms rapidly subsided; no other physical signs appeared, and the urine was normal after the first day. Nevertheless, it was some months before the child was really well again, and on several occasions there was a slight rise in the evening temperature.

Case 2.—This case was discovered accidentally after a short febrile illness originally diagnosed as influenza. The patient was a young doctor who worked in one of the Emergency Public Health Service laboratories. He described an abrupt onset of malaise with fever, pains in the limbs, headache, and sore eyes. After six days he had apparently recovered, but realized he still lacked energy. He therefore continued to take his temperature, and a fortnight after the onset of his illness he found it was 100° on two consecutive evenings. The head of his department, who knew there was no epidemic of influenza at the time, insisted on routine agglutination tests on his serum, and the diagnosis of Weil's disease was made in this way. The patient had bathed in the Cherwell four weeks before the illness began—probably too long an interval for infection to have occurred then—but his home was near the river, and rats had been seen there. At this stage there were no objective signs of ill-health, but he was still very easily tired, and it was nearly three months before he felt really fit.

Case 3.—This patient had also been bathing in the Cherwell. He was sent from a boys' harvest camp with a provisional diagnosis of poliomyelitis. Four days before admission he suddenly developed a severe headache and pains in the legs, and on admission his