milk is a little too slight for safety.² The findings now stated point to the possible value of flash heating in the dairy and a shortened heating at 145° prior to distribution. When the flashing was combined with subsequent pasteurization the counts were halved and the keeping period extended (Table III).

Although the adoption of this practice would involve a period for the development of technical factors, the immediate provision for pasteurization near the sources of supply and the elimination of delays prior to distribution are suggestions that may merit the attention of those interested in the increased consumption of safe milk.

Summary

It is submitted:

That milk must be regarded as a perishable commodity calling for efficient preservation and rapid delivery. Delays between producer and consumer bring hardships to both.

That more effective preliminary measures might be carried out prior to transport; and "flash," or usual pasteurization, might precede, not follow, long-distance transport.

That morning and evening pasteurizations might be advantageous, at least during summer months.

That as cream lines are unaffected by "flash" heating there might be a similar protection for cream marketed in bulk

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ERYTHEMA NODOSUM AND FOCAL INFECTION

BY

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The need for the recognition of more than one factor in the aetiology of erythema nodosum is being increasingly admitted. Four main theories have been suggested. First, that it is a specific infective disease *sui generis*. This theory was brought forward by Trousseau¹ and later by Lendon² of Adelaide, who suggested the name of nodal fever; Symes and Robert Hutchison have also favoured this view. Experimental evidence in support has been adduced by Moon and Strauss,³ who have satisfied Koch's postulates with an organism of the genus *Corynebacterium*, which they cultivated both from the subcutaneous tissues and from the blood of patients presenting this syndrome. Secondly, that it is a manifestation of acute or subacute rheumatism, a theory introduced by Mackenzie⁴ and handed down by generations of textbooks. G. Josephsen⁵ records that out of forty cases of erythema nodosum complicated by some other ailment, in as many as twenty-six the disease synchronized with an attack of rheumatic fever, while in only four could tuberculosis be definitely demonstrated. He comes to the conclusion, however, that the true interpretation of erythema nodosum is that of anaphylactic reaction to various protein poisons, including tuberculin.

A third theory is that it is an early symptom of infection by tuberculosis. This view has been consistently maintained by the Scandinavian school, notably by Mogensen,⁶ Wallgren,⁷ and Giertsen,⁸ who claim that the evidence of x-ray films, gastric lavage, and tuberculin tests proves that the majority of their cases, up to 95 per cent., are tuberculous. This theory has received strong support from Dickey⁹ in America, and from Collis¹⁰ as the result of his investigations in London and Dublin.

Collis has also very clearly demonstrated that a small proportion of his cases are due to an infection by a haemolytic streptococcus, and that the eruption in these cases is usually preceded by an acute pharyngitis and often followed by a polyarthrititis. He asserts, however, that even in London, where streptococcal infection is common, not more than 15 per cent. of cases could be ascribed to this cause, that the balance are mainly if not all tuberculous, and that our attitude should be to regard every case as tuberculous until proved otherwise. Dickey, from his experience in children, is equally emphatic on this point. Forman and Whitwell,¹¹ from a recent series at Guy's Hospital, consider that the rheumatic theory prevalent in England is undoubtedly a menace to the proper treatment of erythema nodosum, which, they assert, should be regarded as tuberculous in every case, and the sore throat that sometimes precedes the appearance of the nodes is merely an activator of tuberculous foci. Such a line of reasoning could hardly apply in Collis's cases, because all his patients who reacted strongly to streptococcal endotoxin had sore throats, and yet in most of them the Mantoux test was negative.

The fourth theory is that the condition is a reaction to various bacterial allergens, of which only those of the *Mycobacterium tuberculosis* and a haemolytic streptococcus have been recognized. This is the view held by Collis. Josephsen, as noted above, comes to much the same conclusion. Collis does, however, record a case definitely associated with a meningococcal infection, and at the same time mentions a similar one, quoted to him by Robert Hutchison, but he considers that such cases are only of academic importance. In this connexion also it is interesting to note that Lendon,¹² who in 1905 was the apostle of the nodal fever theory, in 1927 admitted that there was an increasing tendency to regard these cases as tuberculous, and at the same time he quoted a new theory suggested by Colonel J. C. Kennedy in the *R.A.M.C. Journal* for July based on the observation of four cases of meningococcal septicaemia, and that was, "Given a case of erythema nodosum, suspect meningococcal infection."

Gerald Slot,¹³ in a recent publication, states that he considers the majority of cases in London are due to streptococcal infection and are not tuberculous, but the only evidence he brings forward in support of his statement is the improvement shown in four cases following the administration of antistreptococcal serum. Although the histories of all these cases certainly do symptomatically suggest a streptococcal infection no further evidence such as that of skin tests or cultures is adduced in support of the diagnosis. In this regard, the value of the intracutaneous test as a means of differentiation between the streptococcal and the tuberculous cases has been fully demonstrated by Collis, who utilized a haemolytic streptococcal endotoxin for the purpose. Apart from streptococcal and tuberculous foci, however, the relation of erythema nodosum to other focal infection does not seem to have been demonstrated. The history of the following case, therefore, should be of particular interest.

Case Report

The patient, a nurse aged 29, was first seen by me in September, 1932. She had a temperature of 101° and displayed an eruption of eight or more typical nodes of erythema nodosum over both tibiae and a small one over the left elbow. An apparently glandular mass the size of a pigeon's egg was found in the right axilla, but was not tender. The patient stated that she had first noticed this mass a fortnight previously, when it had been larger and painful. There was no history of abrasion or sepsis in the area drained by these glands. Examination was otherwise negative; her chest, nose, and throat appeared normal, but she had six crowned and pivoted teeth with bridgework, all dating back some years.

There was a gradual subsidence of symptoms, but she again became febrile after ten days, with enlargement and tenderness of the glandular mass, while concomitantly fresh nodes appeared over the tibiae. These again faded, but the temperature remained slightly above normal for a fortnight. The glands then became more tender, with some softening in the centre; at the same time a fresh crop of large nodes appeared over both tibiae with a considerable amount of oedema, also a tense swelling under the periosteum of the left tibia almost suggestive of pus formation. The case was then referred to Dr. Lilley, who opened the axilla in the Brisbane Hospital and evacuated a large quantity of pus. No bacteriological examination of the latter was made. Recovery was prompt and complete. Despite the fact that the evidence so far pointed to a septic factor, it was considered advisable to exclude tuberculosis. A Mantoux reaction was only mildly positive, and the x-ray examination of her lungs showed a slight increase of fibrosis but no evidence of tuberculosis, both findings being quite compatible with her city life.

GROSS INFECTION OF THE TEETH

A further eruption of nodes appeared in February, with malaise, so in March all the gold crowns and pivoted teeth were extracted two at a time, at intervals of ten days and a week. The roots of these teeth revealed evidence of gross sepsis and their odour was extremely offensive, the last two to be extracted being the most grossly infected; there was considerable local inflammatory reaction after the last extraction. Two days later a series of crops of nodes began to appear on the anterior and outer aspects of both knees and legs, followed three weeks later by a polyarthritis affecting the knees, ankles, wrists, and small joints of both hands.

It was more than a month before the patient could walk without pain. She remained well for two months, putting on weight and feeling better than she had for a year. Then a further slight eruption, two small nodes on each leg, appeared, with some malaise. The only remaining teeth to incur suspicion were two lower molars with big fillings, which were probably devitalized; these were extracted and were found to be definitely, but not grossly, infected. A culture was made from one apex and a vaccine of *Staphylococcus albus* and a Gram-positive bacillus prepared. A short course of the vaccine was given, and it appeared to expedite recovery, but one could not exclude the possibility that the micro-organisms grown were not of the main aetiological importance. An intracutaneous test with a potent haemolytic streptococcal endotoxin was completely negative. Likewise, at no time during the course of the attacks had there been any suggestion of a throat infection. The patient put on six pounds in three months, and felt better than she had for years; there has been no further relapse.

Discussion

The points I would emphasize in the above history are:

1. The initial incidence of the rash a fortnight after the onset of the axillary lymphadenitis, and the further outbreak of nodes concomitantly with two subsequent exacerbations of the lymphadenitis, the last culminating in pus formation when the exaggerated intensity of the reaction over the tibiae was especially notable; also its prompt subsidence following surgical evacuation of the axillary abscess.

2. The subsequent recurrence of the eruption on three occasions, once severely, following the extraction of six grossly infected teeth; on this occasion fresh nodes recurred for several weeks and were succeeded by a generalized polyarthritis.

3. The prompt and progressive improvement in the patient's general condition after extraction of two more infected teeth, and the maintenance of that improvement for the fourteen months up to date.

I consider that the chain of evidence in this case points to the lymphadenitis and the dental sepsis as aetiological factors in the syndrome of erythema nodosum. It seems only reasonable to assume that the lymphadenitis was due to the dental sepsis, and by a blood stream infection,

as there was no involvement of any cervical glands. An alternative suggestion might be made that the lymphadenitis and the dental sepsis, as separate factors, each activated a latent specific infection, analogous to herpes simplex, producing the syndrome of erythema nodosum. If that were so an explanation would be lacking for the lymphadenitis. According to Collis a somewhat similar suggestion has been made by Fornara, that erythema nodosum is caused by a specific virus, but that the eruption only appears when the patient is in the allergic state, and, consequently, as tuberculin is the commonest allergen, the condition is most frequently associated with tuberculosis. The weight of experimental evidence is against such a theory, for Osler¹⁴ states that guinea-pigs have been successfully inoculated with tubercle bacilli from the lesions, while Rosenow¹⁵ was able to isolate a diphtheroid bacillus, closely resembling in some stages the streptococcus group, from the blood and skin lesions of eight cases, and to produce similar lesions by intravenous inoculation of the organism. The findings by Moon and Strauss have been already quoted. Such experimental evidence only strengthens the weight of clinical observation that the syndrome of erythema nodosum expresses a reaction to various bacterial allergens. Nevertheless its relation to tuberculosis has been established in such a large proportion of cases that we should, with Collis, regard every one as tuberculous till proved otherwise.

Summary

A case of recurrent erythema nodosum is presented in which the attacks were induced by an axillary lymphadenitis in the first place, the maximum intensity of the reaction being concomitant with suppuration of the glands. Immediate and sustained relief from the attacks followed the evacuation of the pus, but such relief was not permanent until every focus of the dental sepsis present, which was both gross and extensive, had been eradicated. There was evidence, moreover, that neither infection by the *Mycobacterium tuberculosis* nor by the *Streptococcus haemolyticus* was a factor in the production of the syndrome.

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T. Z. Gourevitch (*Klinicheskaya Meditsina*, vol. iii, 1935) has successfully treated with pine-needle infusion twenty-five patients suffering from scurvy. His work is based on the discovery that 1 kilogram of pine needles gives 1,670 antiscorbutic units. Vitamin C is obtained by the following process. Twelve grams of pine needles are pounded in a mortar, water being subsequently added in the proportion of 9:1. The infusion, which takes twenty hours before it is ready for use, is then filtered, and given as it is in two or three portions during the day. The full course of treatment is twenty-one days. The infusion must be made fresh on each occasion, and the needles should be one to two days old.