diagnosis has been established. They may mask clinical signs, and if used for any length of time in inadequate dosage may favour the multiplication of resistant organisms. Yet if the diagnosis is confirmed and definitive therapy is begun in a matter of hours these objections are of little import. Should confirmation of the diagnosis by examination of the cerebrospinal fluid be unavoidably delayed, their use at this stage might be life-saving provided really adequate quantities of penicillin and sulphonamide are given (see below). They should be unhesitatingly given immediately if the patient has a petechial rash making the presumptive diagnosis of meningococcal infection very likely.

Antibacterial Therapy

Only the commoner forms of pyogenic meningitis are considered. The standard agents used in the treatment of *meningococcal meningitis* are the sulphonamides and penicillin. Some use both drugs routinely, others think that the former alone will give optimum results in all but severe infections. However, substantial doses of a sulphonamide—for example, sulphadiazine—must be used: at least 9 g. for an adult and 3 g. for an infant a day for the first three or four days. An initial intravenous dose is desirable to establish a high blood level, and if the patient is comatose or vomiting subsequent doses could be given by this route. A five- to seven-day course of treatment is usually adequate. If penicillin is used there is no merit in restricting the quantity; some authorities recommend 1 mega unit (1,000,000 units) of procaine penicillin twice a day for five days. It is neither necessary nor desirable to give penicillin intrathecally for meningococcal meningitis.

Pneumococcal meningitis is usually treated with a combination of a sulphonamide and penicillin, the latter being given both intramuscularly and intrathecally, 20,000 units being introduced intrathecally daily for four to seven days or until the meningitis is controlled. Some consider that if very high doses of penicillin, of the order of 12 mega units a day, are given systemically for at least ten days, using the intravenous route for the first few days, intrathecal injections can be dispensed with after an initial one, but most authorities prefer to continue with the latter for a longer period. If chloramphenicol is used in addition, it should be given for at least a week. The dose for infants and children is 200 mg. per kg. body weight per 24 hours, given at six-hourly intervals by mouth. In any case treatment should not be terminated too hastily, as pneumococcal meningitis is notoriously prone to relapse.

Streptococcal and *staphylococcal meningitis* should be treated along the same lines as pneumococcal meningitis, chloramphenicol being used instead of penicillin if the organism is resistant to the latter. *H. influenzae meningitis* will often respond to chloramphenicol alone, but some prefer to give sulphadiazine in addition, continuing with both for at least a week. If for any reason chloramphenicol cannot be used, streptomycin in full doses intramuscularly and intrathecally is of value. For children 20 mg. per lb. (0.45 kg.) body weight a day, injected twice daily intramuscularly, and 50 mg. intrathecally a day has been recommended.

The treatment of the complications of acute meningitis is beyond the scope of this article, but it should be noted that neurosurgical aid will be required in dealing with some of them, including the tapping of ventricles if it is necessary to give penicillin by this route owing to obstruction of the spinal theca, investigation and treatment of a coexisting cerebral abscess, the relief of hydrocephalus, and the treatment of some cases with subdural effusion. It is therefore highly desirable that when practicable patients with acute pyogenic meningitis should be treated in institutions within easy reach of a neurosurgical unit.

Mortality

Pneumococcal meningitis carries by far the highest mortality of the three common forms of the disease, the average fatality rate being around 40%. The prognosis is worse in

patients over 50, often because they are suffering from some intercurrent illness, and is better in infants and children. Over 90% of patients with *H. influenzae meningitis* should recover, though fulminating infections are occasionally encountered. As with other forms of meningitis, late diagnosis or prolonged suboptimal treatment also adversely influences the outlook. In good hands the mortality of meningococcal meningitis should be under 10%, though the official mortality figures of the Ministry of Health for notified cases are much larger. This discrepancy underlines the importance of the principles of treatment discussed above.

Next article on Emergencies in General Practice.—"Syncope," by Professor E. P. Sharpey-Schafer.

Refresher Course Book.—Copies of the second volume of collected articles from the Refresher Course for General Practitioners are still available at 25s. (postage—inland 1s. 6d., overseas 1s.) each. The first volume is now sold out.

Clinical Pathology Book.—"Clinical Pathology in General Practice," a collection of 39 articles on clinical pathology that appeared in the *Journal* as part of the Refresher Course for General Practitioners, is now available, price 21s. (postage—inland 1s. 3d., overseas 9d.).

Both these volumes are obtainable from the Publishing Manager, B.M.A. House, Tavistock Square, London, W.C.1, or through any bookseller.

ERADICATION OF TUBERCULOSIS* IMPRESSIONS DERIVED FROM A SCANDINAVIAN TOUR†

BY

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As far back as the 1920's the Scandinavian countries began to realize that pulmonary tuberculosis is very largely an asymptomatic disease, diagnosable only on x-ray examination. To wait for the patient with symptoms was to wait too long, as by then he was infectious and had probably disseminated his disease widely. In order to stop the spread of tuberculosis it was necessary to leave the dispensary and go out into the field looking for the disease before it became infectious. Two weapons were available: the x-ray machine and the tuberculin test. The x-ray machine would detect early disease and the tuberculin test would detect tuberculous infection in man and cattle.

During the 1930's the mass x-ray machine and the technique of its use were being developed. Portable fluoroscopy was used at first. The centres for these were village halls, public buildings, and even private houses, and the public were invited to attend in a rather haphazard fashion. I had the pleasure of meeting one of the pioneers in this field in Yuvaskula, in Finland; his fingers and hands showed evidence of x-ray dermatitis.

From these beginnings evolved the present-day mass community x-ray surveys. These are highly organized

*A lecture given to the East Anglian Group of the Society of Medical Officers of Health.

†This tour was undertaken as a result of my being awarded the N.A.P.T. Hunter Scholarship.

and managed, sometimes on a national, sometimes on a county basis. Development is continual, particularly in design of equipment and technique of radiology and interpretation of x-ray films. Many of these schemes are run at a profit by asking patients to pay one shilling or more a film. In this way apparatus is replaced every three to five years. Compared with British standards the staffing is very economical, and while an average of 40,000 films a year is considered good in this country most Scandinavian units maintain an output of 100,000 a year.

Method

The principle behind the procedure is similar in both countries. The administration and running of the survey in each community is left to the community itself under the guidance of the team manager. Each community or unit of survey must not exceed 3,000 population, and only adults over 15 years of age are radiographed. Each such person is visited and given a personal appointment to attend, convenient to himself and the unit. Defaulters are vigorously followed up by the local doctor, the priest, or other influential public person. In country districts and small towns 85 to 95% attendance is almost universal, but in larger towns 75 to 85% is more usual. For each community a working committee is formed consisting of general practitioner or community health doctor, health nurse, priest, schoolmaster, representatives of workers, farmers, the community, and other voluntary bodies.

By some such method as this, practically the whole of Scandinavia and Holland has been surveyed once, and some areas twice; others are completing the third survey. The first survey usually reveals over 1 in 1,000 cases of active tuberculosis, the second survey under 1 in 1,000, and the third about 3 in 10,000. In the first survey the heaviest incidence is in those over 45. When this pool of infection has been removed there is relatively little fresh infection between subsequent surveys at three- to five-year intervals and there is little difference in the rate of incidence of disease in adults at any age.

However, removal of infection is not without its dangers, as it leaves an increasing proportion of the population without the protection of a natural or an artificial first infection, much as is happening in Great Britain as a result of removal of bovine infection. This also explains why local epidemic outbreaks of tuberculous infection and disease are much more common in Scandinavian countries. Of this they are well aware, and the necessary steps are taken to detect these outbreaks at an early stage.

The methods used are: (1) Repeated mass x-ray surveys. These are vitally important in order to discover fresh disease and relapse of old disease. So long as the overall cost of the survey does not increase unduly, the authorities are delighted with the diminishing returns and do not count the cost in terms of new cases discovered. (2) Where an infectious or infected patient is discovered, the x-ray and tuberculin net is spread as widely as possible to catch all possible contacts at home, at work, and at play. The methods of tracing and following up these contacts are much more intensive than ours. Home contacts are tuberculin-tested and retested at intervals, and all infected are examined frequently to detect disease at the earliest stage. In some of the Scandinavian countries examination of works contacts is compulsory. (3) Tuberculin matriculation in schoolchildren; this is discussed later. (4) B.C.G. is not universally used, and is probably the least important measure.

Surveys in Great Britain

Community x-ray surveys have been tried in the Rhondda Fach, Salford, Edinburgh, and in Ireland. Except in the research project in the Rhondda, none of these have achieved anything like the same success as those in Scandinavia. They have been costly, financially and in personnel. The

Salford survey examined 60% of the total population but only about 40% of the adults. Does this mean that such schemes will not succeed in this country? I think we can do better. We fail, I believe, with regard to the following:

1. *Adequate Preliminary Planning.*—Preparations for each unit of population surveyed in Scandinavia start at least six months before the actual survey.

2. *Units of population in this country are too large:* 2,000–3,000 is a manageable unit to survey at a time.

3. *Access to the Unit.*—Persons in Scandinavia are never expected to walk more than a mile to the x-ray centre. If necessary, the unit will be moved twice or even three times a day, and where essential for aged and cripples, as well as for long distances, transport is provided.

4. *Organization.*—The survey is organized and run by the community for the people, the central government or provincial administration supplying the unit and the technical assistance to administer the scheme and run the unit. The change of emphasis from central organization and management to the periphery or the people themselves is, I believe, of great importance.

5. *Perseverance and Tactics.*—It was made clear to me that success is not always achieved the first time or even the second, and that different types of localities require different treatment, and one must be prepared to adapt one's team accordingly. At Porri, in Finland, it was necessary in a community to make four attempts before a satisfactory survey achieved a 90% attendance. This was entirely due to the open opposition of one influential person. Because of the chance of failure it is wise to stagger surveys all over the place to start with. Success and failure are infectious. Failure in one community will almost certainly spread to the adjacent communities; so will success if properly nursed. Locate one or two successful areas and spread yourself from there, and as your area of success enlarges you will creep up on those areas in which you first failed.

There are many other small points to consider, but I believe the above to be the chief reasons why the Scandinavians succeed where we fail.

I have laid great stress on community mass x-ray surveys, as I believe that these are the key to the eradication of tuberculosis of human origin, to which all other methods are subsidiary and of varying degrees of importance.

Follow-up of Known Cases

Tuberculosis is a chronic relapsing disease. Every person who has had a significant lesion which has healed is a potential case for relapse. The only difficulty is to determine when this relapse will occur. We know that there is a diminishing incidence of relapse the further we proceed from the period of acute disease, but relapse may occur after 20, 30, or even 40 years. Therefore, anyone who has suffered from tuberculosis is a potential source of infection; it is too late to wait until he is ill or has a positive sputum. He must be kept under constant supervision, and for this purpose the modern x-ray reduction camera is the perfect weapon. Even if it is necessary to remove a patient's name from the tuberculosis register he should be kept under periodic x-ray examination for the rest of his life. By this means potential sources of infection are detected at a very early stage.

Identification and Follow-up of Infected Persons

The tuberculin test is the only method we possess for discovering persons infected with the tubercle bacillus. The nearer it is possible to get to the date of infection, the easier it should be to discover the source of that infection. For this reason it is the usual practice in most Scandinavian schools to give the school population a tuberculin test annually, and in some cases twice a year. Because it is known that the infection must be recent, children who are positive to the tuberculin test are kept under close x-ray supervision—monthly for six months and then at increasing intervals. The reason for this is based upon Wallgren's time table: (1) Infection; (2) 3–6 weeks later, tuberculin skin hypersensitivity develops; (3) 3–6 months after (1), earliest x-ray or clinical signs of disease; (4) up to 2 years after (1), phthisis becomes manifest in adults; (5) where

there has been any clinical or x-ray manifestations at the time of infection, significant disease may show itself up to 5 years and rarely longer.

As a child rarely develops phthisis, the usual period of observation is two years; in the case of an adult it is usually extended to five years.

Having identified an infected person, the next step is to discover the source. In the case of a child all home contacts are tuberculin-tested and positive reactors x-rayed. If no source is found or suspected the tuberculin-testing is repeated after two months to discover if there is any further infection. If there is none it is clear that infection occurred outside the home. A council of war is now called, consisting of doctors, parents, schoolteacher, and/or parson, and a detailed review of the possible contacts is made and a list drawn up. All suspects are then invited to undergo an x-ray examination. A school or class infection would be obvious at the time of testing, as there would be an abnormally high rate of infection in the particular group. All schoolteachers are x-rayed annually. Two or three simultaneous conversions in different families often give a clue to a possible source. As can be seen, the permutations are innumerable.

Success with this form of case-finding depends upon (1) knowing the normal infection rates in the age groups of those tested; and (2) repeating the tuberculin test annually. Practically, this means testing the whole school population to get the basic rates and then repeating the tests annually to pick up the infected. Success at discovering the source of infection during the first survey is not nearly so high as in those known to have matriculated within a short period of time.

Another important point with such a survey is to interview the parents and guardian, who know the child's habits and environment. Mass techniques such as have been used in several surveys in this country are useless. Only very rarely will an x-ray picture tell you where the child got its infection.

Contacts of Known Tuberculosis

With the same thoroughness the contacts of known cases are searched for and followed up, whether they are human or bovine. All the Scandinavian countries, except Sweden, and Holland have been declared free of bovine infection, but even then they are well aware that bovine reinfection can occur from: (1) isolated sources that have been overlooked; (2) imported cattle; (3) human sources harbouring bovine disease; (4) infected feeding stuff (imported milk products, etc.).

In Sweden and Denmark as recently as 1938-9 4% of pulmonary tuberculosis was found to be due to the bovine bacillus. The only figures for this country are those of Griffith (1937), giving a rate of 2%. The human sources of the disease that live in rural districts are a grave risk to cattle and to humans.

For these reasons there is a very close liaison between the medical and the veterinary services. As part of the procedure for finding the source of infection when cattle become tuberculin-positive, the local tuberculosis dispensary is notified and all persons having any dealings with the herd are called up and examined to find out if they are suffering from the disease. Infection of cattle with the human tubercle bacillus does not cause disease, but only temporary tuberculin-skin hypersensitivity, lasting usually less than a year. The greatest dangers are from milkers who are infectious, in which case local ulcers on the teats, rather like the ulcers produced by B.C.G. in humans, may cause the milk to be infected with bacillus of the human type. Bovine infection of a human and pulmonary tuberculosis in farmers, their family, or farm workers are notified to the veterinary surgeon, who also examines and tuberculin-tests the herd. Bovine pulmonary disease is particularly dangerous in farm workers, as the cattle are easily infected, resulting in great damage.

I feel that such interchange of information might be introduced in this country, in the interests of both man and cattle.

Examinations of Other Groups

In most Scandinavian countries it is compulsory for certain groups of workers—nurses, teachers, sailors, food workers, and farm workers—to have an annual x-ray examination of the chest, and this usually includes a tuberculin test. When natural infection or superinfection on B.C.G. vaccination is known to occur, contacts and sources of infection are traced, examined, and followed up with the same thoroughness as in the school child, but in adults, because of their wider environment, it is obviously more difficult to trace infection.

Certain physicians believe that by recording the measurement of the tuberculin sensitivity reaction following B.C.G. it is possible to detect human superinfection. Various standards are in use, but one clinic I visited considered that an increase of 6 mm. or more in the diameter of the reaction, measured in two directions, indicated a superinfection.

I do not wish to leave the impression that all these principles are accepted and practised everywhere in Scandinavia. This is by no means so; in fact, one of the most refreshing experiences of my tour was to discuss these different principles with as many doctors as possible. I think that most of the things I have had to say would be accepted, but the details of operation and the thoroughness with which they were practised varied a great deal.

B.C.G.

This most controversial point I have left till the last. It is impossible to detail all the views I heard or the different practices in regard to its use. On my return from Scandinavia I was unconvinced of its value as a mass preventive for tuberculous disease, but believed that it was of definite value in so-called "high risk" persons—that is, people who were likely to have a natural superinfection within a period of 18 months and, at the latest, two years. The following are the more important of the many reasons I have for this belief.

The tuberculosis mortality rate in Holland for 1954 is probably the lowest in Europe, and this in spite of the fact that in 1946, because of war starvation, it had one of the highest rates in Western Europe. This remarkable fall was achieved without the use of B.C.G. Similar results have been attained in Iceland, where only an abortive attempt was made to give the vaccine.

In Denmark more than any other country, B.C.G. is given to everyone, not once but again and again. However, there is one group that escapes, and that is infants and children below school age. One of the main reasons for this is that nurses are not allowed to give B.C.G. and the vaccine is not popular with paediatricians. This 0-6-year group when infected has a higher morbidity and mortality rate than any other, yet in Denmark the rate of fall of both morbidity and mortality has been greater in this age group than any other.

In Sweden it has been the practice, due to Professor Wallgren's influence, to vaccinate all infants in the first few weeks of life. Yet this policy is now being put into reverse because the natural infection rate is so low that the morbidity and mortality from tuberculosis is in danger of being exceeded by that of B.C.G. At the time of my tour five deaths and one case of advanced generalized B.C.G. disease had been reported in Scandinavia.

In each country where B.C.G. had been extensively in use the x-ray machine had been used to a greater or corresponding extent, resulting in the removal from the population of large pools of infection. The resulting fall in morbidity and mortality has been claimed to be due to B.C.G., whereas it was probably due to the discovery of many of the sources of infection by x-ray examination, thereby reducing the spread of the disease.

Summary

Mass community x-ray surveys hold out our greatest prospect of eradicating tuberculosis.

The repeated use of the tuberculin test and the chest x-ray film on certain groups will give us the yardstick by which to measure our achievements and will also serve as our most useful guide to local outbreaks of tuberculous infection.

The potential source of infection—the known case of tuberculosis—and the recently infected person must be kept under constant review: in the former case “till death do us part,” and not just till the end of the statutory period of follow-up; in the latter until there is certainty that the disease will not become manifest (probably two years).

B.C.G. will probably play only a very small part in eradicating the disease, and then in only the “high risk” group.

REFERENCE

Griffith, A. S. (1937). *Tubercle (Lond.)*, **18**, 529.

APPROVED NAMES

On January 7 (p. 42) we printed the last supplement (dated December, 1955) to the consolidated list of “approved names” selected by the British Pharmacopoeia Commission. Below is the latest supplementary list, dated February, 1956. We have added brief notes on the main actions and clinical uses of each drug, and the manufacturer in the case of those proprietary products named.

Approved Name	Chemical and Other Names	Notes
Busulphan ..	1:4-Dimethanesulphonyloxybutane “Myleran”	Used in chronic myeloid leukaemia (Burroughs Wellcome & Co.)
Buthalitone sodium	A mixture of 100 parts by weight of the mono-sodium derivative of 5-allyl-5-isobutyl-2-thiobarbituric acid and 6 parts by weight of exsiccated sodium carbonate “Transithal”	Short-acting intravenous thiobarbiturate for use in anaesthesia (May & Baker Ltd.)
Diacetylnalorphine	Diacetyl-N-allylnormorphine	Narcotic; stated to be dangerous; name issued at request of Home Office for use in poisons lists and for general control purposes. Not on sale
Halopyramine	N-p-Chlorobenzyl-N'-N'-dimethyl-N-2-pyridylethylenediamine “Synopen” is the hydrochloride	Antihistaminic (Geigy Pharmaceutical Co. Ltd.)
Nicoumalone..	3-(2-Acetyl-1-p-nitrophenylethyl)-4-hydroxycoumarin “Sinthrome”	Oral anticoagulant (Geigy Pharmaceutical Co. Ltd.)
Probenecid ..	p-(Di-n-propylsulphamoyl)benzoic acid “Benemid”	Inhibits renal tubular excretion of certain organic compounds, e.g. penicillin; acts as urate eliminant (Merck-Sharp & Dohme Ltd.)
Promethoestrol	3:4-Di-(4-hydroxy-3-methylphenyl)hexane	Oestrogen; similar to stilboestrol (Reed & Carnrick, U.S.A.)
Propylhexedrine	1-cycloHexyl-2-methylaminopropane “Benzedrex”	Similar to amphetamine; less pressor activity; used chiefly for local shrinking effect on nasal mucosa (Menley & James Ltd.)
Trimetaphan ..	4:6-Dibenzyl-5-oxo-1-thia-4:6-diazatricyclo[6:3:0:0 ⁹¹⁷]undecanum “Arfonad” is the (+)-camphorsulphonate	Ganglion-blocking agent with direct dilator effect on peripheral vessels; used in surgical procedures where hypotensive agent needed (Roche Products Ltd.)
Verazide ..	1-isoNicotinoyl-2-veratrylidenehydrazine	Anti-tuberculous; drug is in early stages of development. See <i>Nature (Lond.)</i> , 1955, 176 , 887. Australian origin (Rubbo and Cymerman-Craig)

Reports of Societies

FIBROIDS AND FERTILITY

On January 27 the Section of Obstetrics and Gynaecology of the Royal Society of Medicine held a discussion on the place of myomectomy in the treatment of primary infertility.

Case for Myomectomy

Miss GERTRUDE DEARNLEY, the new president of the Section, opened the discussion. A review of the literature, she said, gave an incidence of pregnancy following myomectomy varying from 3 to 38%. These figures were often difficult to interpret, since they did not take into account such factors as age, marital status, and the desire for children. Miss Dearnley then described a selected series of 56 cases of infertility where the only abnormality detected had been the presence of myomata. Thirty-six of these patients had a myomectomy only, whilst in twelve a uterine curettage was also performed and in eight a modified Gilliam's operation. Of the total 56, 29 had ultimately become pregnant, bearing in all 38 children at term. These results strongly suggested that the presence of myomata was a definite cause of subfertility. In a further 24 cases where in addition to myomectomy operations for lesions of the tubes and ovaries had been performed, the results were disappointing. Only two patients had borne living children, one had miscarried, and there had been one ectopic gestation.

Concerning the operation itself, Miss Dearnley recommended the use of 0.5 mg. ergometrine given in several small injections around the site of the tumours. Modern anaesthesia also helped to reduce blood loss. Cervical clamps were not considered necessary, and several clean incisions were better than elaborate tunnelling manœuvres. On leaving hospital patients should be encouraged to attempt conception as soon as possible. Miss Dearnley concluded by urging more frequent use of myomectomy where myomata were the only abnormality detected in the infertile patient.

Safety of the Operation

Mr. D. B. FRASER then presented an analysis of 100 abdominal myomectomies performed between the years 1947 and 1954. Only twelve of the patients had presented complaining of infertility alone, and only two of them were known to have since become pregnant. In a further 22 patients infertility was associated with other symptoms, and, of these, eight had ultimately become pregnant. This series was too small for any firm conclusions to be drawn. There had been no deaths in the whole series, ten patients had required blood transfusion during or shortly after operation, whilst in a further three paralytic ileus had occurred. The speaker concluded, therefore, that myomectomy was no more dangerous than hysterectomy. The use of a rubber catheter encircling the lower part of the uterus was the simplest method of controlling haemorrhage during the operation.

Fertility Despite Fibroids

Mr. HUMPHREY ARTHURE reviewed 45 cases of abdominal myomectomy performed since the war. Only 17 of these patients had been pregnant before the operation, but the others were not necessarily infertile, and 13 were unmarried. 33 married women having a hysterectomy for fibroids were found to have produced 58 children between them, which was very little below the national average. Although the speaker believed that fibroids might sometimes cause miscarriage or premature labour, he did not believe that fibroids alone, whether single or multiple, were likely to be a cause of sterility; other causes of sterility should be looked for before advising myomectomy for symptomless fibroids. If one or both tubes were compressed by the tumours, they were likely to be damaged by the myomectomy. Were no