A FIELD EXPERIENCE OF MASS PERCUTANEOUS B.C.G. INOCULATION AS AN IMMUNISING AND DIAGNOSTIC PROCEDURE

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The objective was a trial of rapid field application in a selected community of a procedure already established as safe and effective in raising general immunity to tuberculosis and providing preliminary diagnostic data.

THE CONTROL OF TUBERCULOSIS

Accumulated international experience has resulted in significant advance toward control of the disease. Work in all branches has produced an increasing wave of factual information which confuses with its complexity, and a return toward basically simple thinking with reappraisal of fundamental epidemiological concept was thought necessary prior to this study.

GENERAL

Primarily, assessment may be made under 3 considerations.

a) The Infector Pool

b) The Epidemiological Instrument

c) Adjustment of the Instrument to the Needs of Individual Communities

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a) THE INFECTOR POOL. Canetti [1], in an extensive review of the problems of control, referred to the "Infector Pool" of tuberculosis which consists of cases excreting tubercle bacilli. We consider that the infector pool so described is, in fact, the only significant source of infection in man, particularly in South Africa where bovine strains are not important, and that it emerges as the crucial centre against which control measures must be directed. The magnitude of the problem of tuberculosis in any community is related to the size of its infector pool. Clearly, control measures fall into two groups; one directed toward the prevention of new subjects entering the pool, and the other toward removal of infected subjects therefrom by rendering their sputa free of tubercle bacilli. Both groups should operate concomitantly and the epidemiological instrument of their application be adjusted to the circumstances of individual communities.

b) THE EPIDEMIOLOGICAL INSTRUMENT. Amongst problems in arranging control programmes is evaluation of the influence of protagonists of various control measures, for example chemotherapy, mass radiology or B.C.G. vaccination, some of whom might consider that any one of these is the prophylactic procedure of universal choice, irrespective of the existing socio-economic and environmental circumstances of the community to which the control programme is to be applied. To clarify the broad adjustment of control

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measures necessary, we formulated a simple postulate represented in Fig. 1 to indicate the priority rating of prophylactic procedure applicable to any given situation. The postulate is based on the relationship between the infector pool and socio-economic circumstance; the poorer the socio-economic circumstance the larger the infector pool and vice versa. The priority rating of prophylactic procedures is dependant upon and adjusted according to this factor. These procedures, represented as parts of the epidemiological instrument in Fig. 1, require simultaneous application, and must overlap and interlock to retain an unbroken ring of encirclement. Where this is not attained the control programme will lose effectivity in accordance with the gaps created. Control measures applicable for a community of high socio-economic status with a small infector pool will be all those represented in Fig. 1. Similarly, they will all be applicable to a community of low socio-economic status with a large infector pool, but their proportional representation in the ring of encirclement will be different.

Fig. I.

c) ADJUSTMENT OF THE INSTRUMENT TO THE NEEDS OF INDIVIDUAL COMMUNITIES. In communities with high socio-economic status and a small infector pool, socio-economic measures and B.C.G. vaccination will form a small part of the control programme which will be concentrated on case finding and treatment. B.C.G.

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vaccination would be reserved for small groups at especial risk such as nurses attending tuberculotics or for contacts of cases. Conversely, in communities with a low socio-economic status and a large infector pool, B in Fig. 1 will become the primary objective, while further adjustment will be necessary between a and c, for socio-economic measures are long term projects and B.C.G. vaccination therefore has to be an absolute priority within this category. Extreme hypothetical examples are shown in Fig. II, and gradation to the needs of individual communities will lie between the two,

Fig. II.

There can be no single policy applicable to every country, nor can there be one for the whole of any specific country. In most instances it is not possible to have one policy even for a single city, where the principles laid down in Figs. 1 and II will likely determine different priority ratings for control measures against tuberculosis in the affluent areas and in the slums.

In addition to the basic factors outlined there are complex considerations bearing on each control measure which do not fall within the scope of this paper. Nevertheless, some of the more salient features have a secondary effect on control programme planning and are briefly considered. Over and above fundamentals of geographic circumstance, population structures, evolutionary standards and attitudes, and economic

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resources for the undertaking, it is well to recall that no communicable disease has thus far been eradicated in the history of medicine. It is more accurate to reason in terms of control rather than eradication, for, at best, control measures can only be effective to the point where incidence and mortality become virtually negligible though the infection remains slumbering in its habitat. This reasoning of highly effective control rather than eradication has the advantage of keeping in mind the truth that any relaxation of control measures, even though a disease has virtually disappeared, will result in unfortunate and forceful recurrence. The recent outbreak of smallpox in England gives grounds for thought. It is likewise significant that treatment alone does not control a disease to the point of low incidence unless it be combined with established epidemiological methods to cut the chain of its survival, as instanced by yellow fever, malaria, smallpox, trypanasomiasis, spirochaetosis, plague, typhus, typhoid, poliomyelitis diphtheria and others. Thus in tuberculosis no misplaced confidence should be directed toward the hope that case finding and treatment alone will finally control the disease. They only form part of the epidemiological instrument and in the countries where tuberculosis has been reduced to a level of low threat, the position has been brought about by combination with those measures and factors which inhibit the passage of new subjects into the infector pool.

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Apart from these generalities, there are other matters to which the worker must give expert consideration. Even in communities where mass radiological surveys are clearly indicated to detect unknown infectious cases of tuberculosis, it becomes necessary to pinpoint the survey at particular sections of the community. Brightman and Hilleboe[2] drew attention to this aspect and further considered that a goal of finding one new case per 1,000 persons examined should be established, and that coverage of high socio-economic groups with yields of less than 0.5 new cases per 1,000 was wasteful of time and effort.

The advent of effective chemotherapeutic agents in the form of streptomycin, isoniazid, P.A.S., ethionamide and more recent additions has completely altered the prognosis for the individual sufferer, and has held high promise as a most effective element in the epidemiological instrument of control. However, in this field too, serious problems are encountered. Multiple drug regimes to meet the difficulty of drug resistance are of little value where continuation of therapy cannot be maintained because of socio-logical circumstances. Where chemotherapy is inadequate drug resistance is a serious sequel, not only for individual patients, but from the epidemiological aspect where these persons excreting drug resistant bacilli cause primary resistant infections in their contacts, producing a new chain of danger to the

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community and a setback to the control of tuberculosis. In less developed communities the maintenance of therapy over long periods becomes completely unsatisfactory. MacFadyen, Klopper and Shongwe[3] working in the Hlatikulu district of Swaziland, in spite of their efforts to use all available medical and social means for regular treatment, found that half their patients (52% adult cases and 50% children) were lost to sight. It was of interest that one of their problems was that they failed for various reasons to obtain the cooperation of tribal chiefs in reducing the defaulter rate. In our experience in urban and rural Bantu communities, especially in view of the motivations and attitudes of the Bantu toward tuberculosis, it was found essential that any programme of control be brought to the people through the medium of their own respected persons of authority and status who well understand their traditional fears and concepts in regard to this disease. This feature remains the same whether the worker is in a tribal area or in a Bantu residential complex in a large city such as Johannesburg. Menon[4] reported that in Hyderabad, of 472 patients treated with isoniazid alone, 48% were excreting resistant bacilli after a year. An even more important finding was that 15% of previously untreated patients had cultures resistant to isoniazid which caused concern over the potential epidemiological threat arising from these cases. In a leading article in the same journal in which

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Menon's paper was published the view was held that his experience confirms yet again that isoniazid alone is unsatisfactory chemotherapy for mass treatment, and that it might be argued that the eventual burden to the State may be added to by the spreading of isoniazid resistant infection. This view is of significance in Bantu areas in South Africa where issue of isoniazid under conditions and attitudes which often preclude assurance of adequately continued therapy should be given cautious consideration. Moodie[6] stated that drug resistance is one of the main problems in Hong Kong where it was found that 40% of patients attending the public clinics for the first time admitted to having had previous treatment. In a comprehensive National Survey in Great Britain by a Research Committee of the British Tuberculosis Association[6] the number of treated patients who were excreting tubercle bacilli was estimated to be at least 3,500, of whom 1,800 were excreting bacilli resistant to all 3 major drugs. If these findings show the extent of the problem caused by inadequate treatment in a community such as that of Great Britain, it constitutes a warning as to what may be anticipated in Africa, including South Africa, where circumstances often prevail which would not permit adequate continuation of chemotherapy. Moreover it lays emphasis under these conditions to use every means possible in prevention with minimal delay of the uninfected becoming infected, and to

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employ B.C.G. vaccination, not in pitiful pockets of application over protracted periods thus allowing great numbers of persons to enter the infector pool who could have been protected in a mass campaign, but in as extensive and rapid a method of application as local circumstances permit.

B.C.G. vaccination does not protect the infected, but with modern vaccines, techniques and readings of local skin reaction to inoculation, an immediate indication is given in these cases that they require further investigation as potentially active tuberculotics in need of treatment, whilst the view is held that it causes no harm to persons with established tubercular pathology and may boost immunity levels in persons harbouring quiescent foci. A problem related to large scale B.C.G. vaccination is that resultant specific hypersensitivity precludes the use of the valuable tuberculin test for simple preliminary diagnosis. In great part the loss is compensated by the modern dual role of B.C.G. vaccine as an immunising agent and for concomitant detection of Koch's phenomenon of hypersensitivity, though should any non-infected vaccinees contract tuberculosis at a later stage the tuberculin or B.C.G. sensitivity tests would be of no value in these cases. In practice we found that the maintenance of a register of B.C.G. immunisation, to which reference could be made to ascertain whether a person had been vaccinated or not, was little used by clinicians faced

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with differential diagnoses of tuberculosis. Clearly, in communities where socio-economic factors and a high incidence of tuberculosis indicate the need for a priority rating to be given to mass B.C.G. vaccination, the loss of the tuberculin test as a diagnostic procedure is of little comparable consequence. B.C.G. is a safe vaccine and carries no threat similar to drug resistance and a resultantly more potent infector pool. Finally the level of protection afforded by B.C.G. vaccination is not maintained indefinitely and necessity arises for recurrent inoculation. However, protection levels were found to be substantial $7\frac{1}{2}$ to 10 years after inoculation in the precisely controlled study of the Medical Research Council[7] in Great Britain involving 54,239 children.

Chemoprophylaxis has little place in large scale control programmes as its effect is no longer exerted after cessation of administration and it cannot be continued indefinitely. Its major use is in protection of contacts of active cases.

THE PROBLEM IN THE BANTU RESIDENTIAL AREAS OF JOHANNESBURG.

Tuberculosis control programmes in South Africa are complicated by population groups of widely differing social and economic status, not only between European, Bantu and other groups, but marked by variation in level amongst the Bantu themselves, many of whom have rapidly attained advanced

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socio-economic, environmental, scholastic and academic standards, whilst a large proportion remain at tribal level with the mass of the people in various transitional stages between the two. In terms of the postulate described, basic data for broad adjustment of control measures are tabulated in Table 1.

Table 1.

The size of the infector pool amongst Bantu in the Republic is so much greater than amongst Europeans that the priority rating of control measures for the two population groups must be unlike. Adjustment for the Bantu population demands maximum rapid application of measures to prevent entry of new subjects into the infector pool and, whilst all possible urgency is applied to long term socio-economic progression, immediate priority should be given to large scale B.C.G. inoculation. In the European, on the other hand, adjustment requires maximum emphasis upon case finding and treatment with reservation of B.C.G. vaccination for groups at especial risk.

This study is only concerned with the Bantu residential areas of Johannesburg. In previous communications[8,9] dealing with mass diphtheria, whooping cough, tetanus, poliomyelitis, smallpox and measles live-virus vaccination in these areas, the residential complex and the development of

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mass immunisation techniques to meet the epidemiological needs of the community were described. In brief summary, the complex covers 26 square miles and houses approximately half a million people varying from recently detribalised Bantu to professional levels. The area has an extensive integrated hospital and clinic network. Those clinics operated by the Johannesburg City Council provide curative, midwifery, dental, child welfare, health visitor, tuberculosis, immunisation and domiciliary services, are staffed by 520 medical and other personnel and there were 935,052 patient attendances, 12,135 district confinements and 72,299 ambulance removals during 1961. In addition private practitioners have established practices in the area. During mass immunisation procedure the community therefore has a medical service to which they would report abnormal reaction. The gradual development over recent years of techniques of bringing large scale immunisation campaigns to the homes of the people was discussed. It has resulted in a population group conditioned to large-scale, swift immunisation drives involving the whole area in a systematic linear progression and in which they have evolved considerable trust.

The tuberculosis sections are extensive with satisfactory hospitalisation, diagnostic, domiciliary and social welfare services. In 1962 there were over 180,000 attendances at tuberculosis clinics, 27,167 visits by

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domiciliary staff, with 7,478 patients on ambulatory treatment and 1,212 in hospital at the end of that year. In the 3 year period 1960-1962, apart from tuberculin negative case contacts, 11,046 tuberculin negative pre-school and school children were vaccinated with B.C.G. vaccine.

Considerable strides have been made in housing but the rise in wage level, though marked, has not yet attained a standard to provide the necessary socio-economic level to combat tuberculosis in spite of better housing and effective medical services. An analysis of the notification rates and death rates of pulmonary tuberculosis in Johannesburg in Table II shows that the Bantu incidence has increased in 1962 as compared with the previous year. The rise may be attributed to better case finding by an expanded tuberculosis service. The death rate is falling. Nevertheless, the morbidity of tuberculosis in these areas remains critical notwithstanding the standard of diagnosis and treatment, indicating the need of adjustment of the epidemiological instrument to meet the circumstance and provide increased prevention of entry into the infector pool. This is further evident when related to the improvement in other health aspects exampled by a fall in the Bantu infantile mortality rate from 132.70 in 1958 to 122.75 in 1960 and 61.20 in 1962, and by downward trends in other communicable disease.

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Table II.

Finally, in applying the postulate described to the problem in these areas, the extensive infector pool demands priority for rapid large scale B.C.G. inoculation for immunising and diagnostic purposes followed by indefinite maintenance B.C.G. immunisation of the newborn, whilst routine services should be retained at peak efficiency and, in addition, provide for a programme of investigation and therapy for cases detected as a result of preliminary diagnostic data obtained from B.C.G. inoculation.

B.C.G. VACCINE

In 1908 Calmette and Guérin[10] studied a virulent bovine strain of the tubercle bacillus isolated 6 years previously by Nocard. They employed a bile-glycerine-potato medium and found that the cultural characteristics of the organism became permanently modified and related to progressive attenuation of virulence. They subsequently rendered the strain completely avirulent after 230 transfers on ox bile-glycerine-potato medium over a period of 13 years (1908-1921). The strain was designated as B.C.G. (Bacille Calmette-Guérin) and became of particular significance in relation to active immunisation against tuberculosis. The vaccine was first given by mouth to newborn infants in 1921 and has since been administered by various techniques to well over 100 million people throughout the world.

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SAFETY. B.C.G. has proved one of the safest vaccines used in medicine, especially following the use of freeze-dried vaccine which permits precise standardisation and sterility in preparation, and has replaced the former liquid type. Pollock[11], after a meticulous review of B.C.G. vaccination in man, concluded that objections to the safety of B.C.G. vaccine were not substantiated by experience. The ultimate indication of safety is the introduction of B.C.G. vaccination as a compulsory measure in France, Denmark, Norway, Brazil and Japan.

IMMUNOLOGY. Various immunological considerations in regard to the vaccine have a bearing on our study.

Anergic and depressive changes in tuberculin sensitivity are known in various conditions, for example, the terminal stages of tuberculosis, advancing age, after parturition, exposure to roentgen or ultra-violet radiation, cortico-steroid therapy and in some infectious diseases. Von Pirquet[12] in 1908 noted depression of tuberculin sensitivity in measles. Bloomfield and Mateer[13] in 1919 recorded the general belief that the skin test during acute infectious disease altered and commented on constant depression in measles. Mitchell et al.,[14] in 1935 investigated a group of 1,487 cases, consisting of scarlet fever, measles, diphtheria, poliomyelitis, varicella, pertussis, mumps and other diseases, and found a depression of

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allergy during the acute stages of scarlet fever and measles. Mellman and Wetton[15] recently reported on depression of the tuberculin reaction by attenuated live measles-virus vaccine. They studied a group of 17 children with positive tuberculin reactions, of whom 10 received measles vaccine with gamma-globulin and 7 without. There was no change of tuberculin reaction in those who received the measles vaccine with gamma-globulin, but the tuberculin reaction was depressed in the children given measles vaccine alone. There was a return to pre-vaccination sensitivity in 2 to 11 weeks in 6 of the 7 children but one child was still tuberculin negative after 5 months. Previous natural measles infection did not seem to alter the depression of tuberculin sensitivity by the measles vaccine suggesting the action of some principle in the vaccine, and the authors observed that the depression of sensitivity may not have been specific. The report of their work was received immediately prior to the B.C.G. vaccination campaign described in our study and had relevant significance. The fourth booster phase of a diphtheria, whooping cough and tetanus immunisation campaign had been conducted 4 months previously in these areas in children 3 months to 9 years old. A total of 105,636 inoculations was given in 14 working days. Children aged 3 years to 9 years received diphtheria and tetanus antigens, whilst those aged 3 months to 2 years

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received diphtheria, whooping cough and tetanus antigens and, simultaneously, Edmonston strain live measles-virus vaccine without gamma-globulin. Altogether 22,289 children received measles vaccine in this age group[9]. Possible effect on conversion by B.C.G. vaccine was considered. It was not felt likely to alter protective efficiency, but could have an effect on reading of diagnostic reaction to B.C.G. vaccine where local hypersensitivity could be depressed by any residual effect of measles vaccine given 4 months previously. This seemed improbable in the face of Mellman and Wetton's findings, even though one of their cases was still tuberculin negative 5 months later. Their sample of 17 cases was small and further investigation by these and other workers will be important. The coinciding of receiving their report and the commencement of our B.C.G. vaccination campaign left no opportunity for the initiation of a properly controlled study during our undertaking.

Eighteen years ago Pilcher[16] made the interesting observation while investigating measles and scarlet fever in relation to tuberculin sensitivity that the local reaction to a non-specific whealing agent (codeine solution) was lessened or partially abolished in measles and scarlet fever and, even more interestingly, so was an ordinary atropine flush.

Emphasis has fallen on the loss of the tuberculin test as a diagnostic aid after B.C.G. vaccination. Major interest has been focussed in the past on

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the hypersensitivity reaction in diagnosis, no doubt because antibodies to the tubercle bacillus are present in such low titre that they are of little diagnostic value. In our opinion the tubercle bacillus in many respects initiates reactions in the body not dissimilar to the host-parasite relationship established in parasitic invasions like toxoplasmosis[17]. It is possible that the loss of the tuberculin test after B.C.G. vaccination may in turn stimulate greater interest in a suitable test of a haemagglutination type for antibody reaction to the tubercle bacillus, in the same way as the danger of the Sabin-Feldman dye test for toxoplasmosis stimulated the evolution of a haemagglutination test for that disease. Of further significance in regard to the tuberculin test was the recent demonstration by Singer and Rodda[18] of antigens common to the Mycobacterium tuberculosis and other Mycobacteria and fungi, groups which are closely genealogically related, and that these organisms are able to produce tuberculin conversion, especially fungi of known infectiousness for man. Their work suggested that the degree of specificity of the tuberculin test may need reassessment, particularly in areas where warm moist conditions are suitable for rapid multiplication of fungi and mycobacteria which may be related to the high tuberculin positivity found in tropical areas.

An advantage of B.C.G. vaccine over tuberculin in sensitivity

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reaction readings is that it will demonstrate infratuberculin allergy in subjects with partial hypersensitivity who are negative to the tuberculin test.

EFFICACY. The many well known and extensive trials reported from different parts of the world bear irrefutable testimony to the efficacy of B.C.G. vaccination in man. A classic amongst these was that of Aronson et al.[19] who in a 20 year survey of B.C.G. vaccination amongst American Indian tribes showed that 12.5% of all deaths in the vaccinated and 45.3% in the unvaccinated were due to tuberculosis. The Medical Research Council[7] of Great Britain in a significant investigation involving 54,239 children over a period of 7½ to 10 years showed that the incidence of tuberculosis in the vaccinated was one fifth of the incidence in the unvaccinated, and found that it greatly diminished the danger of miliary tuberculosis and tuberculous meningitis. Shennan,[20] after a critical statistical analysis of a 3½ year B.C.G. vaccination campaign in Southern Rhodesia, found that the vaccine conferred about 78% protection in African school children with probability limits of 61% to 91%. He therefore concluded that B.C.G. vaccination in Bantu appears as effective as in various other races and nations studied.

Hyge[21] reported an instance where 94 tuberculin-negative unvaccinated children and 106 vaccinated children were exposed to a tuberculous teacher.

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Forty one of the unvaccinated children developed progressive tuberculosis whilst only 2 amongst the vaccinated children developed the disease giving a protection rate of 96%. This report was recalled during the course of our campaign when a reading team indicated at the end of a day that they thought there had been a class in one of their allotted schools with an unusually high number of positive hypersensitivity reactions. The routine statistical review at the end of each day proved this so, and immediate investigation found the teacher to be an advanced undiagnosed pulmonary tuberculotic.

With careful techniques tuberculin conversion rates in the region of 96% can be anticipated.

COMPLICATIONS. Complications were not infrequently encountered with intradermal inoculation of liquid B.C.G. vaccine and were related to individual resistance, variation of vaccine potency and dose magnitude, and inelegant intradermal procedure. Complication, occasionally generalised and serious but usually minor, was sometimes troublesome and protracted, and included ulceration at the site of inoculation, lymphadenitis and suppuration, skin rashes, erythema nodosum and other manifestations. However, with the adoption of painless, facile percutaneous techniques and accurately standardised freeze-dried

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vaccine these complications have ceased to be a problem. Hsing[22] in describing local reactions after intradermal inoculation of over 6 million people since 1950 in Taiwan, drew attention to cases of unpleasant keloid formation resulting from B.C.G. vaccination 6 to 10 years previously and which caused resentment. In view of the predisposition of Bantu to keloid formation this observation is of interest but percutaneous techniques are unlikely to result in this development.

The opinion is currently held that persons should not be vaccinated with B.C.G. when they are being immunised against other infections because of the possibility of precipitating complications, or that in multiple antigen administration the antigenic properties of weaker antigens will be depressed by the more potent. In compliance with this concept we discontinued routine diphtheria, whooping cough, tetanus and smallpox immunisation procedure by our services one month before, during and one month after the mass B.C.G. campaign. Routine B.C.G. immunisation was discontinued to avoid confusion. Routine maintenance immunisation of newborn children and pregnant women with oral trivalent poliomyelitis vaccine was not interrupted during this period. However, we have previously stated[9] that the development of multiple immunisation techniques is of especial significance in Africa where mass immunisation procedure is often required for the control of disease,

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and where environment and population attitudes often preclude return on numerous occasions for different inoculations. We have described mass campaigns[8,9] in these areas of combined diphtheria, whooping cough, tetanus and smallpox immunisation, and combined diphtheria, whooping cough, tetanus and live measles-virus immunisation without untoward reaction. Further Winter[23] and his co-workers have demonstrated the satisfactory combination of immunisation against poliomyelitis, diphtheria, whooping cough, tetanus and smallpox in this country. In view of these trends, and provided other parenteral inoculations are not given on the same arm as the B.C.G. vaccination, combination with other immunisation procedures may well be practicable with percutaneous B.C.G. techniques.

IMPROVED VACCINES AND TECHNIQUES. Freeze-dried vaccines, which have replaced the former type of liquid vaccine, are much more uniform in constitution and effect due to greater stability after lyophilisation, and may be used 6 months to 1 year after manufacture if properly stored under refrigeration. The vaccine contains living organisms, of which a minimal number are necessary for satisfactory vaccination, and accordingly has to be protected from raised temperatures. However, the work of Ungar et al.[24] produced a freeze-dried vaccine with increased stability to heat by growing the cells in a glycerol-free medium. The improved heat resistance is only maintained in unopened

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ampoules and is lost immediately on reconstitution. Thus short unrefrigerated periods during transportation and accidental exposure to higher temperatures for a little time will not render the vaccine ineffective but, nevertheless, no latitude or abuse is permissible in carrying out manufacturers' requirements for storage, transport and reconstitution.

Methods of administration used are oral, scarification, intradermal and multiple puncture procedures. Oral methods are less certain and give less marked and shorter lasting tuberculin conversion, requiring frequent revaccination. Scarification is slow and permits too much variation in technique. Intradermal injection has been generally accepted and is considered to give better and more lasting conversion than multiple puncture, but takes longer, requires greater skill, and is related to minor complication in a proportion of cases to which multiple puncture is not. Vaccination using multiple puncture inoculation was described by Rosenthal[25] in 1939 and Birkhaug[26] in 1947. Modern percutaneous application requires the use of apparatus which causes simultaneous skin puncture by 20 needles to a set depth and force of penetration through a film of B.C.G. vaccine of greater strength than used for intradermal inoculation and of minimal standards of viable organismal count (200 to 300 million organisms at a needle pressure of 10 lbs.). With correctly applied multiple puncture methods giving

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sufficient needle force and a full pattern of penetration, the tuberculin conversion rates have become as satisfactory as with intradermal inoculation, but insufficient time has elapsed to draw accurate conclusions regarding the duration of conversion. Percutaneous isoniazid-resistant vaccine is not yet available and contacts on prophylactic isoniazid should be vaccinated with isoniazid-resistant vaccine by intradermal injection. Various sterilisation methods are advocated for multiple puncture apparatus some of which include flaming the instrument. Heat and antiseptics inactivate the vaccine. Instrument surfaces coated in inflammable sterilising fluid and subsequently ignited undergo little sterilisation by heat, as heat at a flame base is insufficient to sterilise, but the process is useful for removing excess sterilising fluid. Sterilisation by flame requires insertion in the upper hot regions of the flame and Hopper[27] found that as the needles became blunter through the effects of flaming and clogging with carbon deposits so the clinical results deteriorated.

Reading of smallpox and B.C.G. vaccination scars in assessment of immunisation status is becoming difficult. Lorber[28] after a one year follow-up of 240 infants vaccinated with percutaneous B.C.G. vaccination by multiple puncture found that the site of vaccination was virtually invisible in all.

Over a decade ago Frappier and Guy[29] drew attention to the use of

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B.C.G. vaccination as a preliminary diagnostic procedure. Normal local reaction to B.C.G. develops 10 to 12 days after inoculation. Using scarification as the method of inoculation, they showed that in negative allergy the inoculation was reduced to simple lines or mere traces in 48 to 72 hours, whilst positive allergy showed as a local reaction in 24 hours. This reaction was still present at 96 hours though after 48 hours the intensity diminished each day and had virtually subsided at the end of a week. The authors gave as criteria of positivity, oedema, redness or a different shade to controls without any vaccine application, and that the reading at first sight was strikingly apparent and palpable, even though superficial. They concluded that, not only did this test assess total skin allergy, but also infratuberculin states of partial hypersensitivity, thus showing greater accuracy than tuberculin testing, and that it was an economic and efficient substitute for tuberculin testing prior to B.C.G. vaccination. Similarly Friedman and Silverman[30] in 1952 considered that B.C.G. vaccine provided a more sensitive and specific test than ordinary tuberculin tests, and many reports, mainly of Continental origin, have substantiated these earlier views. Heaf and Davies[31] concluded that it was possible to dispense with tuberculin and use the vaccine itself for sensitivity testing. A logical development has been the dual purpose

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use of the vaccine for combined immunising and diagnostic procedure. Indeed, in view of the difficulty of maintaining patient contact for procedures and observation on numerous occasions in many Bantu communities, successful mass B.C.G. vaccination campaigns in these circumstances become impracticable unless the preliminary tuberculin test is dispensed with.

de Assis[32], quoted in other reports, described the vaccination of over 3 million persons in Brazil by frequently repeated oral administration without tuberculin testing, and claimed a 100% conversion rate without untoward reaction. The attractive theoretical course of combining oral B.C.G. feeds in established programmes of oral poliomyelitis immunisation for the newborn lends stimulus to the thought that reappraisal and improvement in oral techniques would not be inappropriate.

THE CONTROL PROGRAMME

Shortly before this study the State Department of Health issued a policy directive with specific requirement in respect of Bantu in these areas:

(a) Inoculation of persons of all ages with percutaneous B.C.G. vaccine without prior tuberculin testing.

(b) Reading the local reaction to inoculation after 24 hours in persons up to and including the age of 20 years.

(c) The taking of no further steps where there was no local

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reaction to inoculation at 24 hours.

(d) Management of cases showing local reaction to inoculation after 24 hours to be the following:

(i) Treatment of those under 5 years of age with isoniazid for 2 years as active cases.

(ii) Radiological examination on 100 m.m. film of those 5 to 10 years of age who showed clinical evidence of tuberculosis, or who gave a history of having been a contact of a tuberculosis case, with treatment of tuberculotics detected.

(iii) Radiological examination on 100 m.m. film of those 11 to 20 years of age with treatment of tuberculotics detected.

(e) Radiological examination on 70 m.m. film of those over 20 years of age, without any reading of the reaction to inoculation, and treatment of tuberculotics detected.

There was no stipulation as to whether inoculation with percutaneous B.C.G. vaccine was to be introduced as a mass campaign or over a protracted period with inoculation of persons living in circumscribed areas and

investigation of positive reactors before proceeding to inoculate another similar group. Decision regarding individual control programmes in different places was obviously dependant upon local conditions, facilities and resources for the programme.

Our primary objective was the introduction of measures which met the requirement of the State Department of Health and coincided with the epidemiological needs of the community in regard to the control of tuberculosis drawn in accordance with the principles of the postulate described. (Figs. I and II). On these grounds it was evident that a rapid, mass B.C.G. immunising and preliminary diagnostic campaign was indicated, that its effect should be maintained by continued immunisation of the newborn and revaccination conducted in accordance with eventual determination of duration of conversion after percutaneous inoculation, that it should be preceded by pilot reaction and field studies, be followed by routine follow-up procedure in terms of the requirement by the State Health Department, that existing tuberculosis services be maintained at highest efficiency and that the immunisation campaign would be directed especially at the age group 0 to 20 years considered to be most at risk.

The control programme for the Bantu areas of Johannesburg therefore fell into defined stages: (a) a pilot B.C.G. reaction study, (b) a pilot

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field study, (c) a mass immunisation campaign with assessment of local accelerated reaction and (d) follow-up procedure.

THE PILOT REACTION STUDY

In this study local reaction to percutaneous B.C.G. inoculation was observed and related to known clinical tuberculotic states. In the mass immunisation campaign reading teams had to follow mobile inoculation teams at 24 hour intervals and required a precise simple directive regarding reaction assessment which they had to record. The objective of the study therefore was to obtain practical experience of 24 hour local reaction to inoculation and to present the data in precise format to reading teams in order to achieve a reasonably uniform assessment by multiple observers in the field.

The extent of the study was limited by the time interval remaining before the date of commencement of the mass campaign which had to adjust to school terms and annual examinations. It was further limited by available doses of percutaneous vaccine, as supplies for the mass campaign only became available shortly before the campaign commencement.

The field team consisted of one of us, one health visitor, and a nurse when necessary. The medical officer was the only observer of reactions to eliminate the uncontrollable variable of multiple observation. The sample

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of subjects consisted of 120 persons, was selected and not random, and had a median age distribution of neonate to middle age. It was divided into 2 groups:

(a) Sixty subjects infected with tuberculosis and not on therapy.

(b) Sixty subjects not infected with tuberculosis and not previously inoculated with B.C.G. vaccine.

The criteria of infection and non-infection used are shown in Table III.

Table III.

A control was considered advisable but impracticable. Local reaction would consist of reaction to the trauma of introduction, to the residual menstruum and additives of the reconstituted vaccine and, lastly, to the organism. A true control would require inoculation with the menstruum and additives containing no growth of bacteria. Inactivation of bacilli in reactivated vaccine would be unsatisfactory because of contained killed organisms, whilst a filtrate would not necessarily be free of bacterial products. No true samples suitable for a control were available in the time at our disposal. However, as a control measure, observations were made of the traumatic pattern of needle penetration on arms dried after the application of cleansing fluid (ether 25%, water 25%, ethyl alcohol 50%) but without any

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application of vaccine.

Reaction survey forms were drawn detailing in their top half full personal data of the subjects including sex, age, nutritional status, time of inoculation, whether in the category of non-infected or infected persons and, if in the latter, whether in the high, intermediate, or minimal risk groups. At the bottom of the form was a tabular questionnaire to be completed by the medical officer regarding details of diameter, induration, swelling, colour, local temperature, papule formation and other data related to the local reaction. The personal information at the top half of the form was completed by someone other than the medical officer, and the form was folded before presentation to him for completion of the questionnaire to avoid observer bias. He had no knowledge of the clinical status of the subject.

The data of the completed survey forms were critically analysed by 2 of the other co-authors of this paper, who were unbiased, unprejudiced observers, with no knowledge of the subjects in the study. Their statistical deductions were then taken to an independent study group of doctors and nurses by the remaining co-author for evaluation, and was finally compared with the recorded clinical impressions, which were made available at this stage, of the original field team who inoculated and read local reaction.

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There was no variation between their field impressions and the final criteria drawn after the evaluation outlined.

The reactions were either positive or negative and no degrees of positivity were elicited. The criteria were simple and suitable for field reading teams. Negative reactions showed no overall swelling at the inoculation site, no colour change, no increase of local temperature and showed variable signs of needle penetration from a few small traumatic elevations to a pattern of puncture marks which were barely visible. Positive reactions invariably showed a plateau of overall swelling upon which papules were present and distributed according to the pattern of needle penetration. The papules were usually much more obvious than the elevations due to traumatic swelling at the points of needle penetration in negative reactions. In addition, positive reactions in most instances showed a faint purple colour change related to each papule, which in the pigmented skin of our Bantu subjects was not as obvious as in unpigmented skins and was best seen out of doors. There was a slight increase of local temperature in a proportion of cases. The pattern of needle penetration tended to vary in a few cases where inaccurate skin contact due to unsatisfactory application of the multiple puncture apparatus caused inadequate skin puncture by needles in one or other half or quadrant of the circle of inoculation. An obvious positive reaction in this series is

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shown in Fig. III. Observation in a group of positive reactors 48 hours after inoculation showed the changes to be more marked than at 24 hours, but in no way indicated that reading at 24 hours was not entirely satisfactory; a factor which was additionally important in the mass campaign to follow as, in our experience, the longer the delay after inoculation the more difficult it becomes to make contact with vaccinees in Bantu areas.

All the persons in the infected group showed positive reactions except for 2 cases of anergic response, one of whom was found to be an advanced toxic pulmonary tuberculotic and the other has not yet been elucidated. All the persons in the non-infected group showed negative reactions except 3 where positive infratuberculin reactions were obtained.

We were unable to relate any variation in the changes of positive reaction to the degree of severity of the tuberculous infection.

Reading teams in the mass campaign consisted of 54 persons, 45 of whom were Bantu nurses and 9 European. Both groups were fully qualified nurses and many were health visitors with post-basic qualifications. They were therefore competent observers of whom, however, only relatively few had any extensive experience in the reading of tuberculin test reactions. In fact we were firmly in favour of allocating persons to reading teams who were accurate observers but who had not had specific experience in skin

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hypersensitivity readings. Such observers we thought better able to base opinion on what they saw in relation to simple criteria laid down, without bias arising from correlation with previous experience, and, paradoxically, considered that as the readers became more experienced so would they less accurately apply the simple criteria drawn. This opinion was supported by later experience in the mass campaign and by the findings of Loudon et al.[33] They investigated inter-observer variation between readers, mostly inexperienced, in assessing Mantoux, Heaf and tine tuberculin tests, and found consistent reader bias apparently interpretive in origin. As the majority were inexperienced, they assumed that interpretive bias might have been reduced by experience, but the conspicuous degree of variation between 2 physicians of many years experience in reading the Mantoux test caused surprise. Likewise Griffith[34] in Heaf test studies found that 2 nurses trained in the same department disagreed on the grading of 21% of tuberculin-positive children (70 of 336), and that an experienced nurse on repeating her readings gave a different grading on the second occasion in 15% of the tuberculin-positive children. However, the difficulty was confined to borderline reactions between one grade of positivity and another with no difficulty in reading the tuberculin-negative children. The experience of our pilot study indicated that difficulty in this respect in reading reactions in the mass campaign

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would be minimal as cases were either clearly negative or positive with little gradation between the two.

Fig. III.

THE PILOT FIELD STUDY

Three weeks before the mass campaign we undertook a field trial in a small Bantu township of approximately 600 houses in the eastern sector, the only one of its kind remaining in Johannesburg. All the other Bantu residential areas are part of the single massive Bantu complex of over 70,000 houses, with trading and recreational amenities, lying to the south-west of the city, and in which the mass campaign of this study took place.

The trial was a small but accurate duplication of the propaganda, organisation, control and field procedures for the mass campaign. The purpose was to test the probable response to propaganda methods and the applicability of proposed field methods.

Two inoculating teams operated in the area for 1 day and were followed by 2 reading teams 24 hours later. Experience was gained of minor technical problems, but it was evident that the completed planning for the mass campaign required no modification, except for one obvious point overlooked which was the provision of returns to show the number of persons inoculated in the age group 0 to 20 years. On this account the figures for the pilot field study reflected

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in the statistical summary in Table IV show only the totals of persons of all ages who were inoculated, namely 2,100. The following day the reading teams traced 1,404 of these persons who were in the age group 0 to 20 years. In many instances the ages of vaccinees were not known and had to be assessed by the readers. They experienced no difficulty in applying the criteria of negative and positive response. A total of 573 of the 1404 reactions recorded were found to be positive, but a large proportion of the tuberculin-negative contacts and school and pre-school children vaccinated with B.C.G. during the previous 3 years had been in this township.

THE MASS CAMPAIGN

In view of previous experience[8,9] the campaign was conducted on a domiciliary basis with rapid progression of teams through the whole area in 18 working days between the scheduled dates 7 - 31 October 1963. Rapid progression was essential. It had been found difficult to sustain public interest under non-epidemic conditions for longer periods. Neither could the tempo of teams, the strain on depleted staff complement left to operate extensive routine medical services, nor the cooperation of school and creche personnel be extended for a longer time. Inoculation was offered to persons of all age groups but an absolute priority was the age group 0 to 20 years.

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PROPAGANDA METHODS

In mass diphtheria, whooping cough, tetanus, smallpox, poliomyelitis, and measles immunisation in this community of Bantu in all stages of transition toward the European way of life, propaganda methods had been satisfactory. They were based on realisation that, for the majority, methods suitable for the European were not optimal, and that posters, press and radio announcements were of limited value and often misinterpreted. Word of mouth by those who knew, namely Bantu medical, nursing and clinic personnel, informed people of status in the community, and families of those safely inoculated remained the paramount channel of information. It was essential that simple, accurate data be presented in a manner acceptable to the concepts of the people. Achievement of some understanding of requirement necessitated a degree of experience of African attitudes to disease, which vary from one area and race to another, but have an element of basic uniformity. Even in an urban area like Johannesburg, Bantu tradition and custom remain woven in the minds of the people. Endeavour to thrust entirely European concept against this fabric predetermines variable degrees of failure. It is necessary to respect and understand the reasons for attitudes and motivations of a still large number of Bantu, and to direct propaganda in a way that does not aim to penetrate the fabric of traditional concept, but to run parallel with it and gain support therefrom.

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In many places the old and basic concept of African medicine was that disease was not only an adverse process which affected the body or the mind, but anything which affected the well-being of the person, the family, homestead, crops, animals or other possessions. Thus disease included illness, injury, death, failures, accidents, misfortune and disaster. Disease within this meaning could have been caused by an act of Nature, incurring the wrath of the Ancestral Spirits, or the actions of jealous or ill-disposed persons. Many infectious diseases were considered to be due to natural causes, for example those against which immunisation campaigns had already been completed. Tuberculosis, however, was related to other causes such as the machinations of an ill-disposed person. Further, the disease affected not only the physical state of the sufferer, but caused disruption of the family, the homestead and a falling away of possessions. As an element of unfounded stigma attached to tuberculosis in earlier European thought, so it is sometimes said to bring "disgrace" to a Bantu family. Mothers bringing apparently well children for immunisation who were subsequently traced as tuberculotics as a result of positive reaction would be faced with this problem. Skilled educative procedures aimed at tuberculotics and their families in some instances meet an indefinable barrier which confuses the expert educator who fails to look sufficiently far back to see forward.

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Likewise, obstacles to protracted chemotherapy are formidable. However, as the obtaining of protection from adverse influence is fundamental to African medicine, immunisation procedures offered by modern techniques are perhaps the more easily acceptable. Many of these things may not be in the scope of this paper but, nevertheless, are significant when working in Bantu communities where medical propaganda methods require careful modification, especially in regard to tuberculosis. What might seem insignificant may be critical to the success of an undertaking.

As on previous occasion, the proposed conduct of the campaign and suggested propaganda methods were submitted to regularly held discussion groups attended by less senior medical field workers. Those members of the groups who were Bantu have invariably given an accurate estimation of the reaction of the community. The group drew attention to the necessity not to emphasize the relationship between simple immunisation, in which the people had evolved considerable trust, and subsequent follow-up of positive cases with associated family disruption in some instances, and that the two procedures should not run concurrently. It was essential that inoculation be offered to grandmothers as many mothers were away at work, were not able to care for their children for various reasons or children had reverted back to the maternal grandmother. In many cases grandmothers would not have brought

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children for inoculation but did so in view of obtaining inoculation for themselves. The sick, bearers of wrist bands indicating steroid therapy or sensitisation, and persons with obvious skin disorders were not inoculated in the campaign on medical grounds. Neither were pregnant women inoculated, not on medical grounds, but because it was likely that in a proportion of naturally occurring spontaneous abortion occurrence might have coincided with B.C.G. vaccination, been attributed thereto, brought the latter into disrepute and caused difficult problems of rumour. We further thought it wise that all inoculations be given by a medical officer.

As in preceeding campaigns no fee was charged and consent was required in all cases, introducing an essential element of trust in the minds of the people. Seventy thousand printed forms in 2 European and 2 Bantu languages were distributed to householders. They simply set out the threat of tuberculosis in the area, that vaccination strengthened and protected against the disease, that in those instances where persons were vaccinated and still contracted the disease it would tend to be mild, that they were to wait at their homes for the teams to come to them, they would be informed in advance of the arrival of a mobile inoculating team, and that a nurse would come to their homes to see whether the vaccination was protecting well, the nuance being that in cases with reaction further help would have to be brought

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to the individual. Precise explanatory letters were issued to all school principals, with the approval and cooperation of the Education authorities, and to creche supervisors. A medical officer visited each of the 160 schools and creches in the area and arranged exact appointments for the arrival of inoculating and reading teams. Schools were given forms to be issued to parents or guardians of children with consent forms which had to be signed and returned. No children in any institution were inoculated unless they presented with a signed consent form. Propaganda vans with public address systems patrolled each area for 2 days before the commencement of the campaign and gave details of the scheduled date and time of arrival of an inoculating team. Regular announcements were made at all clinics and information was disseminated by domiciliary health visitor, nursing and midwifery staffs. All private practitioners and hospitals in the area were informed by letter, and the attention of hospital authorities drawn to the increased necessity of checking whether a patient had been inoculated with B.C.G. vaccine in those instances where a positive tuberculin test was obtained during patient investigation.

Finally when an inoculating team reached a scheduled area during the campaign the team's transport van equipped with a public address system combed the area informing the related group of homes of the arrival of the team and

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place where it had set up operation.

THE ORGANISATION

The functioning of the organisation of 125 persons and 27 transport vehicles was uneventful and the reaction of the community exemplary. Six mobile domiciliary and 3 school and creche inoculating teams were employed. Each domiciliary team was covered by a team of 8 readers who visited the homes and recorded local reaction 24 hours after inoculation in persons aged 0 to 20 years, or as soon thereafter as possible in instances of intervention of weekends or a public holiday. Similarly each of the school and creche teams was covered by a team of 2 readers. Teams assembled at a field headquarters each morning and persons in charge of sections were briefed. A discussion group for collation of data and research was held each day.

Records have always constituted a bottleneck controlling the tempo of team operation. Further, it was essential that each individual could be related without delay to his or her record at a later stage. The method of taking immunisation to the community, instead of large numbers presenting at established centres, avoided uncontrollable crowds which on later analysis often showed that the apparently large numbers inoculated were fractional in relation to the total at risk. With the resultant better regulated flow of

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vaccinees adequate record keeping became more possible. A card system used in the first of our domiciliary campaigns proved particularly ineffective as it was almost impossible to relate any individual to a card for long periods after the campaign. An absolute requirement was retention of simplicity and limiting data to those which were completely essential. Measures could have been taken, not only to record totals of vaccinees in the age group 0 to 20 years, but also in the age groups 0 to 4 years, 5 to 10 years and 11 to 20 years. However, all that was fundamental during the campaign was the total of persons inoculated in the age group 0 to 20 years to assess the target for reading teams as a control of their success rate. Further assignment into age groups would not be necessary until the routine tuberculosis services, engaged on follow-up procedure, arrived at the recorded addresses of positive reactors. Unnecessary duplication would have added to the load of record keeping, and virtually meant that many persons would not have been immunised because of operative retardation due to collection of data more simply done at a later stage, and when actually required.

Loose-leaf, hard-covered record files were made in the Department, one for each of 92 areas within the residential complex. The loose leaves within this system had columns for entry of consent, names, house numbers, B.C.G. inoculation, history of tuberculosis in the home and reaction. Over 70,000

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house numbers were entered in files of the appropriate areas before the commencement of the campaign. Each domiciliary inoculating team carried approximately 15 of the files corresponding to their alloted areas of operation. A clerk entered information opposite the house number in the file of the area of domicile of each individual who presented to a team. He issued those up to and including 20 years of age with a blue ticket and those over 20 years with a pink ticket. No person presenting at an inoculation table was vaccinated unless in possession of a ticket which had to be placed in an ennumeration box. Tickets in these boxes therefore gave the daily total of persons inoculated and the numbers in the age groups 0 to 20 years and over 20 years.

Members of reading teams carried two folders. In one was inserted a specific map and schedule of house numbers to be covered each day. The other, a loose-leaf folder, had the criteria from the pilot reaction study attached to the back together with a photograph of a positive reaction (Fig. III). At the end of each day record sheets completed that day by domiciliary inoculating teams were removed from their files and inserted into the reader's folder who would be covering that area the next day. She entered the reaction of persons 0 to 20 years of age and whether there was a history of tuberculosis in the house. When she returned at the end of the day these sheets were returned to the files of the inoculating team. She was further required to submit a daily statistic

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sheet. The completed files of the domiciliary inoculating teams therefore constituted a final record to be delivered to the routine tuberculosis services to trace positive reactors through the names and addresses recorded for each.

School and creche records required collection at the time of inoculation of all consent forms signed by parents or guardians, which also showed the name and address of each child. As only children with signed forms were inoculated collection of a form was a record of inoculation. Consent forms were then placed in envelopes for each class or group, and retained by school or creche staff until the next day when staff issued them to reading teams. Reading teams entered the reaction to inoculation on each form. The forms together with statistic sheets were brought in every day, filed under schools, classes and creches, and constituted the record for subsequent follow-up procedure.

A detailed daily statistical analysis was kept of each inoculating team and every reader. Comparative analysis indicated where advice or assistance was needed. Further, by comparison with similar statistical records of previous campaigns, abnormal area response became obvious and received attention. A statistical review indicated those pockets of poorer response which received additional visits from the inoculating teams on the day after completion of their schedules.

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The task of compiling daily maps, routes and schedules for inoculating and reading teams before the commencement of the campaign was complex, but there was no instance of alteration or failure during the 18 working days of operation.

The freeze-dried percutaneous B.C.G. vaccine used was of 2 types: a British vaccine in ampoules of 25 mg./ml. moist weight and reconstituted by addition of 0.3 ml. of sterile water, and a Swedish vaccine reconstituted by addition of 0.5 ml. of prepared dissolving fluid issued with the ampoules. Vaccine looses potency if exposed to temperatures higher than a range of 4° to 10°C. Stock supplies were refrigerated at 4°C. and batches issued to teams for daily requirement. In the field, ampoules of vaccine and fluid were kept in fibre-glass bags, containing cans of previously refrigerated cooling agent, and suspended beneath operating tables for protection from the sun. Temperature readings in the field indicated satisfactory compliance with temperature range requirement. Reconstituted vaccine was used forthwith and care taken that amounts reconstituted should not exceed the number of vaccinees presenting at any given time. In our experience up to 18 adequate doses could be obtained from an ampoule of British vaccine and up to 25 from an ampoule of the Swedish. Criteria of adequacy were an unbroken film of vaccine between the skin and the whole area of the base plate of the multiple puncture apparatus and the appearance of satisfactory papules 10 to 20 days after inoculation. Gentle addition of

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reconstituting fluid was necessary to avoid troublesome frothing. The reconstituted vaccine was drawn into lcc Record syringes fitted with No. 18 hypodermic needles from which the bevelled points had been removed. The blunt ends prevented inadvertent pricking of arms during application over right deltoid insertions and tended to limit vaccine wastage from droplets extruded from needles by capillary action between applications. Medical officers retained a record of batch numbers of vaccine used in the various areas.

Percutaneous vaccine inoculation was obtained with Heaf's pattern multiple puncture apparatus supplied by the State Department of Health. The instrument used discharged a set of 20 needles through a perforated base plate applied to the skin. The needles were individually mounted in a removable needle block and were individually replaceable. Three depths of precise skin penetration of 1mm., 2mm. or 3mm. were obtainable by rotating a collar to the required setting. The needles were simultaneously discharged when pressure was applied to a plunger. A depth of penetration of 2 mm. was used throughout the campaign irrespective of age or skin texture. An inoculating team consisted of a record clerk, an untrained person to clean arms and marshal queues, a qualified nurse for reconstitution of vaccine, loading of applicator syringes and sterilisation of equipment, a clinic assistant to apply the vaccine and a medical officer to inoculate. School and creche teams, who were not

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slowed as were domiciliary teams by more detailed record requirement and more complex gathering of vaccinees, achieved rates of up to 360 inoculations per hour with this instrument. Assessed over the whole campaign including time taken for transport, establishment of new operating points and other interruptions, school and creche teams averaged 239 inoculations per hour and domiciliary teams 148 per hour. Sixty instruments were in use by teams; 6 to each domiciliary team and 8 to each school and creche team. This minimal number, without replacements, was necessary for the speed of the teams and to allow proper sterilisation and cooling. Various factors were determined during the pilot field study and the campaign in relation to the instrument and technique. The apparatus withstood hard but careful usage very well. Each was examined at the end of every day and worn or bent needles replaced (1024 needles during the campaign). A large capped screw which retained needles in position in the needle block required periodic tightening to prevent loosening of needles which affected depth of penetration. Faulty application of the base plate to the skin surface resulted in a partial pattern of needle penetration, especially encountered in obese subjects where tensing of the skin was difficult or in thin subjects where pressure tended to produce deflection to one or other side of the humerus. With high pressure usage the head of the instrument tended to work loose and resulted in needles not passing squarely through the perforations of the base plate but striking

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the edges of the perforations with the sides of the bevel of their points, resulting in premature needle wear. This was overcome by periodic tightening of the head, but, more effectively, by rotating the whole gun in a clockwise direction when applied to the vaccine on the skin before discharging the needles. This movement spread the vaccine effectively and, by friction of the base plate against the skin, kept the head of the apparatus firmly screwed to the barrel. Again under periods of stress, the collar which altered depth of penetration tended to move from its setting also contributing to interference with needle alignment and affecting depth of penetration. Teams adjusted to checking this point regularly. Toward the latter half of the campaign needles failed to discharge on depressing the plunger in several instances. This was at first attributed to operator fatigue but eventually increasing numbers of instruments ceased to function. It was found after extracting the plunger, that a disc, threaded into the barrel and against which the discharge mechanism operated, gradually worked loose. The suppliers of the instrument then provided a small tool which fitted into the barrel and into holes in the disc permitting easy tightening where necessary at the end of each day, and no further difficulty was encountered. The instruments withstood boiling well. There was evident variation in the pattern at the site of inoculation produced by different operators, in spite of all having had the same preparatory instruction.

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In previous immunisation campaigns, where inoculation of antigens was performed by subcutaneous injection, the threat of serum hapatitis infection was effectively controlled by providing a freshly sterilised needle for each person inoculated and avoiding drawback into syringes. Parallel technique was not possible with multiple puncture apparatus. Arms of those to be inoculated were cleaned with a mixture of ethyl alcohol 50%, ether 25% and water 25%, and queue movement so arranged that they were completely dry before inoculation. As the fluid constituted a fire hazard suitable precautions were taken and team transport carried sand buckets and fire extinguishers. Needles and base plates of instruments were immersed in the fluid in a container, were vigourously shaken, the plunger pumped several times to remove excess fluid and the remaining fluid removed with a sterile pledget of cotton wool before each inoculation. Instrument heads were not flamed in view of the experience of Hopper.[27] Serum hepatitis virus, which is variably estimated to be carried by approximately 5% of people, is not satisfactorily inactivated by alcohol and ether. At regular intervals fluid in which needles and base plates were immersed was discarded and the containers thoroughly boiled before recharging. Chlorine in solution has effect on the virus but would be detrimental to B.C.G. vaccine. Neither has the thermal death point of the virus been finally determined. Autoclaving in the field

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was desirable but totally impracticable. Accordingly, block barriers to the potential spread of virus were introduced by thorough boiling of each multiple puncture apparatus after it had completed 25 successive inoculations. The person applying vaccine notified the nurse responsible for vaccine reconstitution and sterilisation of equipment, at the end of every 25 applications. The nurse then removed the multiple puncture apparatus in use and replaced it with a boiled instrument which had been allowed to cool. Boilers were heated by gas camping stoves which have proved convenient, economical and efficient in all campaigns.

The experience of the reading teams was varied. As this was the first operation of its kind it was necessary to make provision for the possible maximum of commitment which was assessed at 60 readings per day for each of the 54 members of the reading teams. In practice it was found that the load per reader was considerably less, and averaged 45 readings a day. The average of homes falling to each reader covering mobile domiciliary inoculation teams was 28 houses a day often scattered throughout her area of operation. In instances where readers completed a daily schedule more rapidly than anticipated they were allocated routine nursing duties for the remainder of the day. In view of these factors it was possible that fewer readers could have been employed, but statistics failed to record frustration and fatigue. Readers reported that the more the readings performed during a day the less their fatigue. In

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many homes parents stated that only some of the children had been taken for inoculation as this was the first time that an immunising campaign was offered for tuberculosis and they wished to test effects on a few. They were impressed that medical services came back to read the portent of the procedure. Reading by school and creche teams was quick and easy in view of organised groups passing in file before each reader. The criteria of negative and positive reaction at 24 hours were found precisely satisfactory. Readings at 48 hours were a little more obvious and still easily read at 72 hours. At a study group which analysed reader and public reaction, a number of readers stated that they felt more confident of their reading ability at the beginning of the campaign than at the end, which supported our previous contention.

UNTOWARD REACTION

Apart from 2 instances of evanescent micro-papular eruption which was possibly related to inoculation, no cases of established untoward reaction had been reported to the clinic services up to the time of writing (4 weeks after the campaign).

STATISTICAL RESULTS

Final statistical analysis is summarised in Table IV. A total of 160,298 inoculations was given to all age groups in the mass campaign. In addition 2,100 persons were inoculated in the pilot field study. A total

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of 124,997 persons was inoculated in the priority age group 0 to 20 years, being 71.4% of the calculated target of 175,000 people in the age group living in these areas. Of those in this age group, in whom the reaction to percutaneous B.C.G. inoculation was to be assessed 24 hours later, 91,966 persons were traced and the reactions recorded by the reading teams. Reading teams therefore traced 73.6% of their possible target. A total of 12,759 positive reactions was recorded.

Table IV

The total of positive reactions obviously included conversion to positivity from previous B.C.G. vaccination, which has been relatively limited in these areas, instances of exposure to infection without clinical disease and previously diagnosed cases who happened to present for inoculation. The relationship to active pathology will not be determined until investigation of positive reactors is completed in the scheduled follow-up procedure.

In general, progression of reading teams was made to parallel that of mobile domiciliary teams so that inoculations done late on one day would not be read the morning of the next, but in the afternoon, to provide an interval not shorter than 24 hours. In some areas intervention of weekends or a public holiday resulted in reaction not being read until 48 or 72 hours had elapsed. Analysis of the percentage of positive and negative reactions 24, 48 and 72 hours after inoculation throughout the campaign showed insignificant differences and

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suggested that there was no valid variation in reading assessment at these times. However, the shorter the time after inoculation the easier it was to trace the vaccinee.

Reference to Table IV reflects an apparently considerable lag between children inoculated in schools and creches on one day and the number of these read by reading teams on the next. In fact, when these lags were analysed in relation to all the schools and creches in the area over the whole campaign, the rate of inoculated children not traced at each institution was suprisingly small. Scholars over 20 years of age are not infrequent in these areas, but the totals of persons over 20 years of age inoculated by school and creche teams also included teaching and supervisory staff who wished to be vaccinated.

FOLLOW-UP PROCEDURE

Record files of inoculating teams reflecting the names and addresses of positive reactors have been distributed according to the area each covered to the subsidiary tuberculosis clinic serving that area. The totals of positive reactors allocated on this basis is shown in Table V. It is proposed that investigation will be pursued as expeditiously as possible by domiciliary staff at the subsidiary clinics, by a mobile X-ray service and referral to the Tuberculosis Master Clinic in the area for radiological

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Investigation where necessary.

Table V

Therapy will be conducted in accordance with the directive of the State Department of Health. Attempt will be made to persuade persons over 20 years of age to submit to X-ray examination and B.C.G. maintenance immunisation of the newborn will be introduced. On completion, the follow-up phase of the project will form the subject of a final communication.

SUMMARY

1) Aspects of tuberculosis control and application to the Bantu residential areas of Johannesburg are discussed.

2) A study to establish field criteria of local hypersensitivity reaction to percutaneous B.C.G. inoculation is described.

3) A mass campaign of percutaneous B.C.G. inoculation without prior tuberculin testing is outlined.

4) The field experience of reading local hypersensitivity reaction 24 hours after inoculation is described.

Views of the authors do not necessarily reflect opinion of the State Health or Johannesburg City Health Departments.

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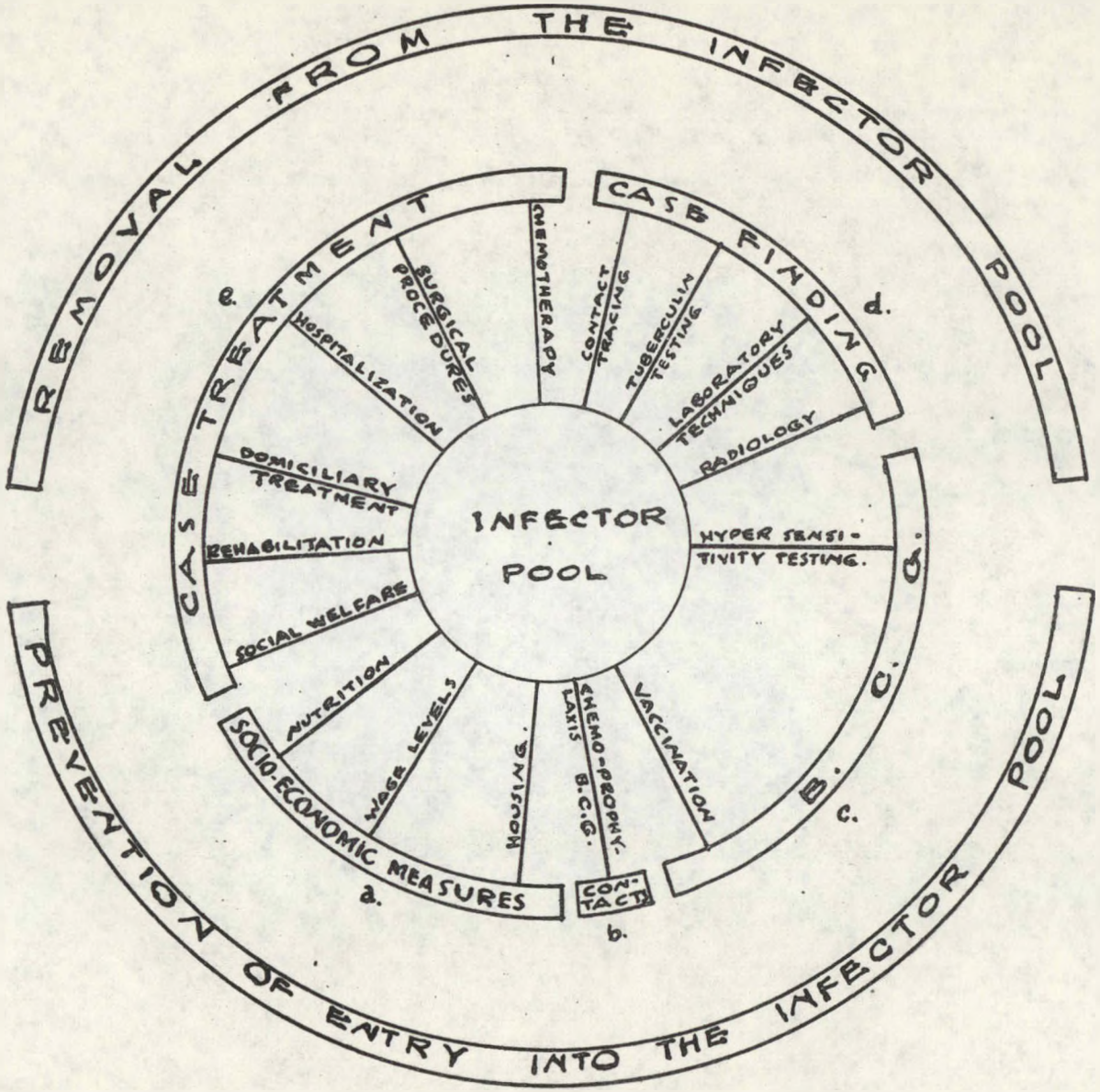
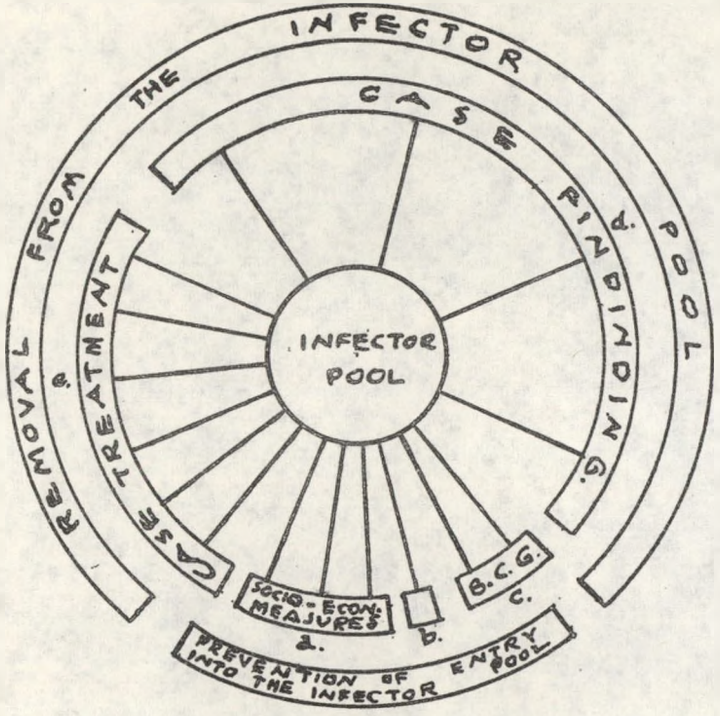
A.


REMOVAL FROM THE INFECTOR POOL
CASE TREATMENT
CASE FINDING
d.
e.
CHEMOTHERAPY
SURGICAL PROCEDURES
HOSPITALIZATION
DOMICILIARY TREATMENT
REHABILITATION
SOCIAL WELFARE
NUTRITION
CONTACT TRACING
TUBERCULIN TESTING
LABORATORY TECHNIQUES
RADIOLOGY
INFECTOR POOL
HYPER SENSI-TIVITY TESTING.
B. C. G.
c.
VACCINATION
CHEMO-PROPHY-LAXIS
B.C.G.
HOUSING
WAGE LEVELS
SOCIO-ECONOMIC MEASURES
a.
NON-CONTACT
b.
PREVENTION OF ENTRY INTO THE INFECTOR POOL

B.

FIG. I.

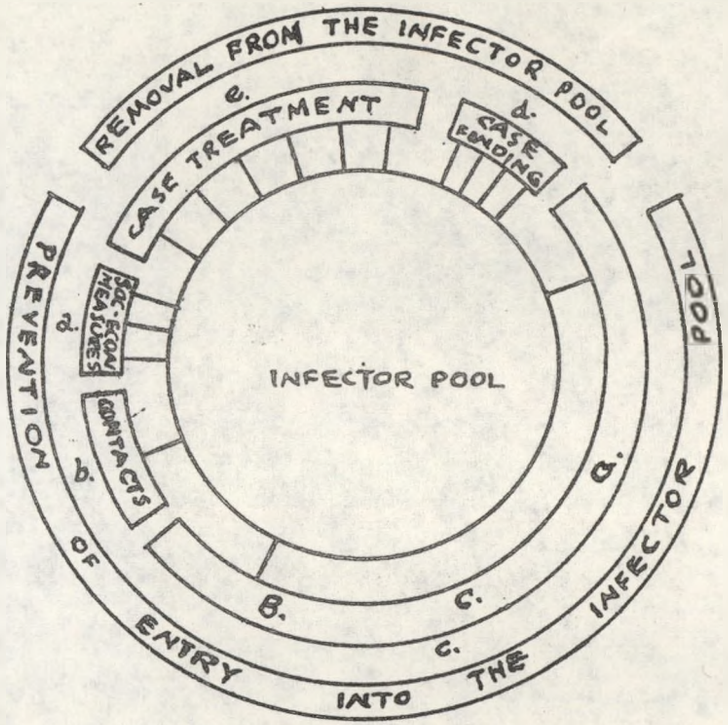
A.



B.

AFFLUENT METROPOLITAN GROUP.

A.



B.

UNDEVELOPED TRIBAL GROUP.

FIG. II.

Fig. III. A positive reaction.

TABLE I.

INCIDENCE OF TUBERCULOSIS

		REPUBLIC OF SOUTH AFRICA.		JOHANNESBURG. (cases amongst miners excluded)	
		CASES NOTIFIED.	RATE PER 100,000 OF POPULATION.	CASES NOTIFIED.	RATE PER 100,000 OF POPULATION.
1960	BANTU	50,224	462•4	2,990	606
	EUROPEAN	1,221	39•6	154	42
1961	BANTU	49,233	443•1	2,712	536
	EUROPEAN	1,224	39•1	150	41
1962	BANTU	53,801	473•6	3,002	613
	EUROPEAN	1,261	39•6	157	42

The notification rates for Johannesburg are higher than those for the Republic as a whole. This is expected as the latter rates are affected by the less stringent application of case-finding procedures in the rural areas.

TABLE II.

PULMONARY TUBERCULOSIS IN JOHANNESBURG

	1958		1959		1960		1961		1962	
	N.R.	D.R.	N.R.	D.R.	N.R.	D.R.	N.R.	D.R.	N.R.	D.R.
EUROPEANS	47	4	51	4	37	5	37	4	38	4
COLOUREDS	753	60	428	43	331	23	449	18	523	44
ASIATICS	146	15	115	4	101	8	158	25	233	4
BANTU	696	44	636	50	527	35	514	34	591	30
ALL RACES	429	28	382	30	319	22	320	22	364	20

N.R. = Notification Rate.
D.R. = Death Rate.

TABLE III.

		High Risk (Active) 20 Subjects	Intermediate Risk (Inactive) 20 Subjects	Less Risk (Potential) 20 Subjects
A. Infection	Tuberculin Test	+	+	+
	Clinical Signs	+	-	-
	*Bacteriological Investigation	+	-	-
	Radiological Investigation	+	+	-

* In young children bacteriological investigation was waived.

B. Non-Infection	Tuberculin Test	-
	Clinical Signs	-
	Bacteriological Investigation	-
	Radiological Investigation	-

TABLE IV.

STATISTICAL SUMMARY.

B.C.G. INOCULATION AND PRELIMINARY DIAGNOSTIC CAMPAIGN.

7 - 31 OCTOBER 1963.

OCTOBER 1963	TOTAL INOCULATED.									TOTAL REACTIONS READ.						
	A. MOBILE TEAMS.			B. SCHOOL AND CRECHE TEAMS			TOTAL A AND B.			A. MOBILE TEAMS.		B. SCHOOL AND CRECHE TEAMS		TOTAL A AND B POSITIVE	TOTAL A AND B NEGATIVE	TOTAL REACTIONS READ
	0-20YRS	OVER 20 YEARS	TOTAL	0-20YRS.	OVER 20 YEARS	TOTAL	0-20YRS.	OVER 20 YEARS	TOTAL	POSITIVE	NEGATIVE	POSITIVE	NEGATIVE			
7	2,774	1,501	4,275	3,067	58	3,125	5,841	1,559	7,400							
8	3,587	1,860	5,447	2,874	57	2,931	6,461	1,917	8,378	163	1,580	149	2,862	312	4,442	4,754
9	4,437	2,027	6,464	3,524	73	3,597	7,961	2,100	10,061	138	1,899	205	2,064	343	3,963	4,306
11	3,661	1,857	5,518	3,174	68	3,242	6,835	1,925	8,760	285	2,528	469	2,834	754	5,362	6,116
14	3,152	1,411	4,563	3,231	67	3,298	6,383	1,478	7,861	230	1,664	469	2,268	699	3,932	4,631
15	4,159	2,085	6,244	3,537	74	3,611	7,696	2,159	9,855	172	1,656	306	2,756	478	4,412	4,890
16	4,614	2,073	6,687	3,207	53	3,260	7,821	2,126	9,947	286	2,338	393	2,810	679	5,148	5,827
17	4,041	2,169	6,210	4,006	60	4,066	8,047	2,229	10,276	217	2,019	426	2,763	643	4,782	5,425
18	4,030	2,059	6,089	3,410	60	3,470	7,440	2,119	9,559	329	2,239	633	2,996	962	5,235	6,197
21	3,306	1,619	4,925	3,545	81	3,626	6,851	1,700	8,551	322	2,276	527	2,492	849	4,768	5,617
22	4,272	2,011	6,283	3,131	61	3,192	7,403	2,072	9,475	287	2,384	598	2,490	885	4,874	5,759
23	3,546	1,913	5,459	3,855	62	3,917	7,401	1,975	9,376	209	2,229	576	2,487	785	4,716	5,501
24	4,455	2,441	6,896	3,530	64	3,594	7,985	2,505	10,490	266	2,010	697	2,978	963	4,988	5,951
25	4,407	2,410	6,817	3,560	79	3,639	7,967	2,489	10,456	252	1,837	659	2,485	911	4,322	5,233
28	2,445	1,096	3,541	3,294	54	3,348	5,739	1,150	6,889	315	2,161	562	2,569	877	4,730	5,607
29	4,303	2,111	6,414	3,255	67	3,322	7,558	2,178	9,736	246	1,492	398	2,725	644	4,217	4,861
30	4,187	2,400	6,587	2,984	56	3,040	7,171	2,456	9,627	338	2,462	648	2,439	986	4,901	5,887
31	1,750	1,170	2,920	667	14	681	2,417	1,184	3,601	369	2,191	620	2,224	989	4,415	5,404
	57,126	34,213	101,339	57,851	1,108	58,959	124,977	35,321	160,298	4,424	34,965	8,335	44,242	12,759	79,207	91,966
						PILOT FIELD STUDY										
9.9.63.			1,234			866			2,100							
10.9.63.										186	398	387	433	573	831	1,404
						GRAND TOTAL.										
			102,573			59,825			162,398	4,610	35,363	8,722	44,675	13,332	80,038	93,370

/AML.

TABLE V.

FOLLOW-UP PROCEDURE : ALLOCATION OF POSITIVE REACTORS TO CLINICS.

SUBSIDIARY TUBERCULOSIS CLINICS	POSITIVE REACTORS		
	SCHOOLS AND CRECHES	DOMICILIARY	TOTAL FOR EACH CLINIC
1 (M)	1,548	705	2,253
2 (J)	1,586	1,898	3,484
3 (O)	1,830	471	2,301
4 (S)	2,112	970	3,082
5 (P)	1,259	380	1,639
	8,335	4,424	12,759

Illegitimacy: please see page 4.

R.1718.

BANTU CUSTOM AND MEDICAL ADMINISTRATION
(SHORT NOTES)

I.W.F. SPENCER.
M.B., B.CH., D.P.H., D.T.M. & H.

A. The Background of Bantu Belief and Custom

(a) The Approach to Living.

(b) The Concept of the Cause, Manifestation, Diagnosis and Treatment of Disease.

B. The Impact on a Transitional Bantu Community.

C. Principles of Application to Bantu Patients and Staff.

- - - - - - - - - -

A. THE BACKGROUND OF BANTU RELIEF AND CUSTOM:

(a) THE APPROACH TO LIVING:

There are fundamental differences between the Bantu approach to living and that of the European. Even in those instances where Bantu have adopted Westernisation the difference of philosophy and culture, though modified, remains apparent. A large proportion of Bantu are in a sociological stage of transition from tribal concept to modern civilisation.

Some of the basic forms of their approach to living are outlined e.g. forms of authority, evaluation in terms of cattle and currency, religious and ritual matters, collective responsibility, division of tasks, marriageable status etc. In transitional urban and advanced rural communities some European ideas are accepted (e.g. clothing) and others less accepted or discarded (e.g. banking of money, sale of cattle). Whilst in many instances there is a combination of European and Bantu customs (e.g. a Christian marriage with the paying of lobola or a Christian monogamic marriage in the town and a previous polygamic marriage in the homelands).

(b) THE CONCEPT OF THE CAUSE, MANIFESTATION, DIAGNOSIS AND TREATMENT OF DISEASE:

The modern European concept and treatment of disease is largely based on scientific evaluation but still often requires a degree of faith and belief on the part of the afflicted in respect of treatment. The basic Bantu concept is based on faith and tradition. Faith and belief do not necessarily require demonstration. African medicine attains definite results not all of which are bad. There are many variations depending on language, tribe and geographical factors but, to avoid confusion, the outline given is of a pattern relatively common to all.

Some understanding of the African concept of disease is fundamental to medical administration or practice involving Bantu. It is necessary in order to understand and not ridicule certain occurrences and behaviour patterns. Practical experience quoted later in the lectures illustrates the variable degree of understandable persistence of Bantu concept in the majority irrespective of the degree of Europeanisation.

/Basically, ...

Basically, African medicine defines disease not only as an adverse process which affects the body or the mind, but anything which affects the well-being of the person, the family, homestead, crops, animals and other possessions or the tribe. Thus disease includes illness, injury, death, failures, accidents, misfortune, calamities and disaster.

Disease within this meaning may be caused by

1. An act of Nature.

2. Incurring the wrath of the Spirits of the Ancestors.

3. The actions of jealous or ill-disposed persons.

Diseases thought to be due to natural causes include the common cold, certain stomach upsets, a proportion of accidents and the infectious diseases. Being due to an act of Nature no divination by an expert is necessary, in order to determine the cause of the condition.

The Wrath of Ancestral Spirits may be incurred in various ways including failure to perform certain rites or the breaking of taboos. Diseases due to this cause may be recognised by the head of the family or shown by a Witchdoctor diagnosis after divination. The accepted mode of communication with Ancestral Spirits is through the medium of dreams.

Jealous or ill-disposed persons afflict their victims by using charms spells or rites. They may know how to cast a spell themselves, they may buy a charm from one who knows and carry out directions, or they may employ an expert in the form of a witchdoctor or sorcerer to carry out the procedure for them. These experts may use charms, spells or rites but frequently call the "Familiars" to effect their purposes. Discovery of the cause in this group of diseases usually requires the employment of a witchdoctor, diviner. (There is a degree of specialisation in the ranks of the witchdoctors e.g. diviners, sorcerers, herbalists, prophets, those skilled in giving protection from adverse influences, rain makers and others).

The "Familiars" are spirits which are usually harmless but are supposed to come to certain persons when called. They then constitute one of the methods by which the victim may be bewitched. The "Familiar" may achieve this object by the casting of spells or by appearing to the victim. The mere vision of one of them may lead to severe illness, death or other disaster if no appropriate treatment is given at the same time. The "Familiars" tend to differ from tribe to tribe, but are more or less the same with variation mainly of name because of differences of language. In these lectures several of the "Familiars" are described and their methods of action outlined e.g. Tikoloshe-U-Hili. Examples are given of effects on patient attitudes and results of lack of understanding by European medical, nursing and administrative personnel.

Charms spells and rites are made to work by placing preparations anywhere where the victim is wont to frequent, by surreptitiously introducing a charm or potion into food, by treating an effigy of the person, or by treating something from the intended victim's body e.g. nail clippings, hair clippings, excreta, washing water, sanitary towels or the like. Tribal taboos are thus strict in regard to the disposal of body wastes. There is understandable fear amongst more simple Bantu lest organs or limbs removed surgically fall into the hands of other persons. Retention by the hospital of, for example, an X-ray plate similarly causes anxiety. Should evil befall because

/any ....

any of these things be used for bewitchment by casting of spells, then the only hope of correction would depend upon recovery of the lost material and treating it according to custom.

The power of suggestion is so efficiently utilised that those who consider themselves bewitched present serious and bizarre symptomatology and may terminate without post-mortem examination revealing any evidence of pathology.

In those conditions arising from other than natural causes the diagnosis is made by obtaining the services of a witchdoctor to determine whether the ancestors have been offended or who caused the bewitchment. A high fee is accepted as being related to efficient diagnosis and treatment. The witchdoctor is expected to and succeeds in determining why he is being consulted. The less advanced Bantu consider that the asking of questions and taking of a full history in a medical examination predetermines the worthlessness of his consultant. The witchdoctor is a profound psychologist. An outline is given of the successes failures and adverse effects attained by the various specialities in this cult. Generally divination is performed by two methods; either the method of consent or by bone throwing, which are described.

Treatment follows the principle of removing the cause by "smelling out" the person responsible for the bewitchment or appeasing the Ancestral Spirits by prescribed offerings or rituals. The person "smelled out" is persuaded in different ways to release the victim, or may be submitted to an ordeal to prove innocence or otherwise. In some cases where guilt is established punishment is meted out. In treating the patient various compounds and brews are administered in several ways such as introduction through the well known short multiple cuts in the skin usually made over the afflicted part. In addition to these things the efficient practitioner or specialist of African medicine can offer protection for the future by prescribing offerings to the Ancestral Spirits, by giving medicinal protection or by the provision of counter-magic in the form of fetishes, amulets or talismans (e.g. the black application over the closing fontanelle of an infant, the cords and threaded objects around the head, neck, trunk or limbs of the infant, the abdominal bands of women etc.) Further, certain experts are able to fix the homestead, crops, or beasts gainst threat of adversity, and give protection against lightning.

The African concept of disease is logical within its own frame-work. Because of effects seen by the people (and by European medical personnel who have practised in tribal and even urban Bantu areas) it is perfectly understandable that even sociologically advanced Bantu under proper medical treatment will often consult and use the teachings of their people in case the misfortune known to occur should befall them.

The African concept of disease had advantages in that it held together the community and fear of consequence maintained tribal law and taboo, which were often not unsound in relation to the needs of the community. High skill is often shown in many aspects such as bone-setting and psychological application. However, profound disadvantages are the barrier to progress occasioned by related cruelty, superstition and fear, delay in accepting modern therapy whilst a disease process is still curable, and others which are clearly manifest.

/B. THE .....

B. THE IMPACT ON A TRANSITIONAL BANTU COMMUNITY:

Various observations, studies and experiences are described in respect of the impact of Bantu custom on a relatively, recently urbanised Bantu community, and comparison made with experience obtained in providing medical services to a tribal community.

A study is quoted of a series of 500 B.B.A.'s encountered in an urban Bantu midwifery service attending approximately 12,000 confinements per annum, in which 20% were due to faults in the medical service, and 80% due to factors in the patient situation. Of these latter factors persistence of Bantu custom and election to have a B.B.A. to permit observance of various customs without interference by the medical service was a major issue.

The basic dietary pattern of the Shangaan in their homelands is described and the persistence of these habits in an emergent urban community outlined. The necessity in a health visitor service to modify basic dietary pattern only where necessary is stressed. Further the Bantu health visitor is in many instances so indoctrinated by European teaching that she tends to ridicule rather than to retain that which is good and modify or accommodate to what is unsatisfactory.

The tendency of the urban Shangaan to cling to tribal custom at every level is significant. For example, as in the homelands, the Shangaan mother will wherever possible avoid separation from her infant by the work situation. It has been observed that Shangaan babies appear better nourished than babies of other tribal groups in an urban area though they are on very similar feeds. The absence of rejection of the infant by the Shangaan mother may be a deciding factor.

In a marriage or union contracted in the townships where no lobola has been paid the man has not "paid for the womb" and in many instances, in accordance with tribal custom, the child reverts to the grandparents. Because of this reason, and because many mothers are forced to work by economic circumstance, children are left in the care of frequently disinterested grandmothers or on the streets. The problem of provision of suitable places of daily care for such children is always urgent.

* Statistics may quote that the illegitimacy rate in an urban Bantu community may be 40%, completely ignoring the fact that the Bantu concept of illegitimacy may be different from that of the European and that, in certain cases, proof of the ability to bear children is a pre-requisite to marriage.

The bearing of children is closely knit with religious and traditional concept. Urban Bantu should be approached with great caution in respect of family planning and advice given only where asked for. As did their forefathers, even so the urban Bantu tend to consider that "the elephant is not aware of his trunk" i.e. the burden of additional children is not noticed being part of the whole.

The patterns of development of tribal and urbanised Bantu children and European children are discussed.

The impact of various other matters is indicated e.g. initiation ceremonies, virginity, a woman remaining a minor, clothing for the new-born, neglect of a twin as related to death of twins in tribal areas, rituals, mental health patters of the Bantu etc.

* This does not deny the high rate of assessed illegitimacy in Soweto (±40%), but does emphasize the need for caution in assessing the occurrence in other communities against European concept of what constitutes illegitimacy.

/A brief .....

A brief outline is given of obstetrical experience in a tribal area - expected date of delivery, miscalculation, accoucheurs and methods, impacted labour in the bush and complications, custom in regard to placental retention and severence and ligature of the cord. In addition comment is made on other medical matter in a tribal practice regarding witchdoctors, payment of fees, setting of fractures, trachoma and pensions etc. These aspects are described for possible relation to attitudes encountered in more sociologically advanced Bantu communities.

There is acceptance that the major portion of the Bantu population is moving rapidly toward Europeanisation and their needs by the day approach the needs of the European. These needs must be fulfilled as they arise, but it is essential to remember the right of the Bantu to be different, to be Bantu and not Europeans, and to respect that part of their culture which they may wish to retain.

C. PRINCIPLES OF APPLICATION TO BANTU STAFF AND PATIENTS:

Experience has shown that Bantu tend to have certain differences from the European in pathological and psychological reaction to disease. Similarly their culture produces a modified reaction to a European environment.

Attention is drawn to examples of interesting differences e.g. difficulty of recognition of the third dimension represented on a flat plane. In respect of disease the Bantu patient has a courageous and philosophical acceptance of pain, a fatalistic outlook especially where they consider there is supernatural influence, they take anaesthetics well but fear to submit thereto, they fear the removal of tissues, are prone to primary carcinoma of the liver, have poor resistance to respiratory disease but face sepsis well, they develop keloid easily, are good acute traumatic surgical risks but poor risks when surgery is undertaken for chronic conditions and they resist shock well but when they succumb to it they do so suddenly. They regret that the doctor is unable to make a diagnosis, as does the witchdoctor, without asking questions.

Recent surveys in a large urban Bantu community and in a large hospital serving it show an amazing adherence to tribal belief in respect of disease. Of course a much greater adherence persists in rural areas and homelands. High educational levels do not necessarily eradicate preconceived belief.

The modifying factors touched upon in these lectures apply not only to the Bantu patient but to all levels of administrative contact with Bantu staff. The Bantu have abilities which are different from, in some respects better and in others inferior to those of Western man. We should not consider as abilities only those which happen to be rated highly in European culture. The higher the educational level the more important the recognition and respect for a separate background of Bantu cultures and values. The less advanced the level the more important the retention of courtesy based on understanding of the reasons for reaction and behaviour patterns. For example Bantu more recently emergent from a tribal background may fail to stand in the presence of superiors because it is customary to crawl, kneel or sit before their chieftains, they place their hands together when receiving something because custom demanded that they show that the other hand held no weapon of assault, thanks may not be given in words but in small actions ill-perceived by the European, they respect a thorough knowledge and fluent use of a Bantu language but tend to abhor the use of "Fanagalo" preferring the medium of an interpretor as it is their custom to have speech with superiors through a third person.

/Tribute is .....

Tribute is paid to the Bantu nurse for great achievement. Criticism has been levelled against her for unwillingness to take responsibility, a limited sense of loyalty, resentment of authority, harshness to patients and for a limited spirit of service. With progress these criticisms are becoming less valid. Custom may have an influence on the attitudes of Bantu nurses to a varying degree. Tribal custom decreed that the traditional place for women was in the background, authority is linked with heredity, rank and age, and service and loyalty is confined to a circumscribed group. There remains a lurking anxiety of scorned tribal belief and custom. Many may have seen what could be achieved by unfaltering belief in the supernatural.

In your approach to Bantu patients and staff I recommend:-

(1) Recognition that there are differences of background, belief, custom, psychological and pathological reaction between Bantu and European. So may there be between Latin and Saxon.

(2) Adoption of an unbiased and dignified approach based on some understanding and respect for the reasons for the differences.

(3) Acceptance of the right of other people to be different.

/AML.

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