SUMMARY
1. Epidemiological situations of tuberculosis in the world, in India as well as in Gujarat have been reviewed which give us a better understanding of the way in which tuberculosis behaves and maintains itself in the community and which help us to assess the magnitude of such a major public health problem. A fairly high prevalence of pulmonary tuberculosis in Gujarat stresses the need of studies on mycobacteria isolated from the patients with lung disease in Gujarat, leading ultimately to its effective control.

The genus *Mycobacterium* is today one of the best classified genera. The development of mycobacterial taxonomy has been reviewed and salient features of mycobacterial classification has been discussed. This provides a precise idea of the modern mycobacterial taxonomy which is absolutely necessary when one intends to differentiate and identify the mycobacteria isolated.

2. A review of the methods for differentiation and identification of the mycobacteria has been presented. Apart from the usefulness of various cultural and biochemical methods, the role of thin-layer chromatography of mycobacterial lipids and
polyacrylamide gel electrophoresis of cell-proteins in the identification of the mycobacteria has been discussed in detail as some strains of non-tuberculous mycobacteria (NTM) isolated in the present study, viz., *M. kansasii* and *M. fortuitum*, were also identified by these two methods.

3. *M. tuberculosis* is the most common mycobacterial pathogen isolated from human disease. Some other mycobacteria, i.e. NTM, have also been isolated frequently. Historical perspective leading to the recognition of NTM as human pathogen, and pulmonary as well as extrapulmonary infections caused by various NTM species have been reviewed to obtain the complete idea of clinical significance of various potentially pathogenic NTM species.

Isolation-rate and kind of NTM species isolated from the patients with lung disease in Gujarat were studied for four consecutive years and the following conclusions were drawn:

(a) The isolation-rate of disease-associated NTM was 0.13% and that of casual isolates was 0.26%.

(b) *M. kansasii*, *M. avium-intracellulare* and *M. fortuitum* were found to be associated with lung disease.

(c) *M. kansasii* strains with low catalase activity
generally do not appear to be significant clinically. However, in the present study, both the *M. kansasii* strains isolated were weakly catalase positive and it seems that low catalase activity does not always rule out the possible association of *M. kansasii* with lung disease.

(d) The prevalence of lung disease due to NTM in Gujarat at present is very low when compared with that reported in other parts of India as well as in other countries. But as found in U.S.A. and Japan, as the number of cases of tuberculosis declines, disease due to other mycobacterial species increases. Hence, with all our efforts to bring down the morbidity of tuberculosis in Gujarat, we must bear in the possibility of increase in NTM lung disease and therefore, a continued screening for NTM is desirable.

4. Phage typing of bacteria is a useful method for obtaining more precise characterization of bacterial strains in order to determine the mutual similarities and differences. Phage types of *M. tuberculosis* strains isolated in Gujarat were determined and discussed in comparison with those in other geographical areas. In Gujarat, 53.3% strains were of type A, 6.7% of type B and 40% of
type I. It was found that, in India, from north to south, there was a decrease in the prevalence of phage type A and an increase in the phage type I and B.

5. Surveys of primary antituberculosis drug resistance measure the tendency for resistant strains to accumulate within the community and assess the bacillary transmission in the community. Prevalence of primary drug resistance in Gujarat was studied for four years. The important findings are:

(a) Primary drug resistance to one or more drugs was found in 20% of M. tuberculosis strains tested.

(b) 14% strains were resistant to only one drug; more than half of these were resistant to isoniazid (INH) only.

(c) Multiple drug resistance was less frequent. 5.1% strains were resistant to two drugs and 0.9% strains were resistant to three drugs. INH-resistance was detected among all multiple drug resistant strains.

(d) Total resistance to INH, either isolated or combined, was 13.9%. This is of the greatest epidemiological value, since this drug is widely used and included in almost all regimens.
(e) No association was found between primary drug resistance and age or sex of the patients.

(f) Rifampicin (RMP) and pyrazinamide (Pz) resistance was not detected in any strain.

6. Rifampicin plays an important role in the modern treatment of tuberculosis. There have been reports from some parts of the world of the wide scale indiscriminate use of RMP and, in consequence, of high levels of initial rifampicin resistance, in addition to high levels of INH and streptomycin (SM) resistance. Prevalence of drug resistance, particularly RMP- resistance, among the treatment -failure and relapse cases was analysed for seven consecutive years. The important findings are:

(a) There was a marked increase in the INH -resistance from 34.5% in 1980 to 55.8% in 1986, while SM-resistance showed a slight fluctuation around 26% throughout the study period. RMP- resistance, however, increased significantly from 2.8% in 1980 to 37.3% in 1986 and there was a rapid increase in 1982-83.

(b) Because there is no prevalence of primary RMP-resistance in Gujarat, it can be presumed that resistance to this drug is almost entirely acquired among treatment-failure and relapse cases.
(c) The rise in RMP-resistant strains clearly indicates the increasing use of this drug in the chemotherapy of tuberculosis. In many cases, though it must be used with other ineffective drugs which subsequently leads to the emergence of RMP-resistance.

(d) In about 95% of RMP-resistant strains, RMP-resistance was combined with resistance to either INH or SM or both. This could mean that the high prevalence of primary INH and SM resistance might be responsible for the emergence of RMP-resistance.

(e) There is no prevalence of primary RMP resistance in Gujarat, even though, there is a considerable amount of acquired RMP-resistance in the community. This fact supports the view that RMP-resistant strains may lose their virulence. However, incidence of primary RMP-resistance in future will make the picture clearer.

It is clearly important to avoid the careless use of rifampicin.

7. Pyrazinamidase (Pzase) activity of \textit{M. tuberculosis} has been found to correlate with Pz-sensitivity. A study was conducted to compare the results of Pz
sensitivity testing and Pzase activity in clinical isolates of *M. tuberculosis* and to assess the reliability of the enzyme test as a test of sensitivity to Pz. The study showed a 100% predictive value for the negative Pzase test, since all the Pzase negative strains were found to be Pz-resistant. Pzase positivity showed a predictive value of 94.6% as seven out of 131 Pzase positive strains were classified as Pz-resistant. These seven strains, however, were a mixed population and contained 50-90% of sensitive organisms. Thus, Pzase test was found as a fairly reliable substitute for the qualitative determination of Pz-sensitivity. This overcomes the difficulty in growing the organisms at pH 5.5 as required in the standard method of Pz sensitivity testing.