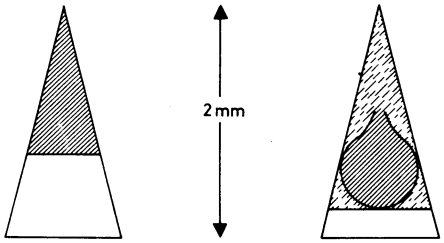
SHORT REPORTS

Reason for variable response to tine test

In comparative studies with the Mantoux test the tine method has shown false-negative rates of between 23% and 64%,[1-3] though studies on highly sensitised tuberculous patients have tended to show a closer correlation.[4 5] This inconsistency has remained unexplained by studies of the duration of application, skin temperature, and release of skin tension before removing the tine. I have looked at variability of the tuberculin coating, a factor not previously considered, as a cause of false-negative and diminished responses.

Microscopic inspection of tines shows that there are two characteristic types of tuberculin coating. Either the tip is covered uniformly to a depth of 1·25 mm, or a globule forms some 1·5-1·75 mm from the tip, leaving the tip itself bare or with diminished coating (figure). All four tines of a disc usually have one or other characteristic coating. Globular tine units ranged from six to 18 in any one container of 25.



Variable tuberculin coating of tines. Left tine is smooth coated with good tip cover, whereas tuberculin has retracted towards base of right tine, a globule has formed, and tip is poorly covered.

Patients, methods, and results

A series of tests were carried out on volunteers. Smooth-coated tines were selected from batch No 528-267, and one applied on each arm of 20 persons positive to a Mantoux test (5 tuberculin units of purified protein derivative) and read after 48 hours. All reactions were positive and similar between arms on each individual. The sum of the diameters of induration on each arm were 108 mm and 105 mm.

In the second test, smooth- and globular-coated tines were separated from the same batch and applied to opposite arms of volunteers known to be tuberculin positive. Again 20 paired tests were carried out and read after 48 hours. In seven persons the arms tested with globular-coated tines had a negative reaction, whereas the opposite arms tested with smooth-coated tines were positive. Where globular-coated units produced reactions, these were, with one exception, less than the opposite smooth-coated reaction. The sum of the diameters of induration from 20 smooth-coated tines was 148 mm and from the 20 globular-coated tines 82 mm. Analysis by the Wilcoxon signed-rank test indicates that dissimilar reactions of this order would arise less than one in 100 times by chance.

In the third test, globular- and smooth-coated tines were selected from batch No 528-267 and distributed randomly in pairs before application to opposite arms of 16 individuals. The distribution and identity of the pairs was unknown to the giver and reader (AJJ). In six cases the globular-coated tines gave negative results but smooth-coated tines gave positive results on the opposite arms. In one strongly sensitised individual, equal reactions of 10 mm were produced. In eight of the other nine persons, reactions from smooth-coated tines were greater than those from globular-coated tines. The sum of the diameters of induration from 16 smooth-coated tines was 90 mm, whereas it was 48 mm from the 16 globular-coated tines.

By the Wilcoxon signed-rank test less than 1% of studies would produce similar differences if there was no difference clinically between coatings. Of the 144 individual smooth-coated tines from the 36 tests in the second and third studies, two produced no visible reaction, but 37 of the 144 individual globular-coated tines produced no visible response.

Discussion

Correctly applied, tines penetrate 0·8-1·0 mm and deposit tuberculin when smoothly coated at the tip. On globular-coated tines most of the tuberculin is more than 1 mm from the tip (often 1·75 mm) and is not deposited in the skin. Even a small quantity of tuberculin deposited from globular-coated tines may be sufficient for a response in strongly-sensitised patients, which may account for satisfactory reports from chest and tuberculosis units. When the tine test is used for screening, however, globular coating of some of the tines is likely to lead to false-negative results.

I am indebted to Dr Andrew Johnson, Northern General Hospital, Edinburgh, for suggesting and carrying out the third study, and to Mr John Wise, physiology department, St George's Hospital Medical School, for statistical guidance.

Photographs of contrasting skin reactions and types of tuberculin coating, and detailed data, are available from the author, Department of Epidemiology and Preventive Medicine, St Mary's Hospital, London W2.

1 Bowder AA, Griffin AL. Tuberculin tines tests on medical wards. *Am Rev Respir Dis* 1972;**105**:299-301.
2 Food and Drugs Administration. *Federal Register, part II (skin test antigens)*. Bethesda: Department of Health, Education and Welfare, 1977.
3 Welke H, Irsigler GB, Kleeberg HH. The diagnostic value of the tine and Mantoux tests in a general hospital. *S Afr Med J* 1976;**50**:2073-6.
4 Snell NJC. A comparison of Mantoux and tuberculin tine testing in a chest unit. *Tubercle* 1979;**60**:99-104.
5 Bull PR, Drummond R, Price G. Tine and Mantoux tuberculin tests. *Br Med J* 1979;i:1712-3.

(*Accepted 15 November 1979*)

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Lactation and breast cancer

The belief that lactation reduces the risk of breast cancer is still widely held despite findings to the contrary in a large international epidemiological study.[1] The continuing confusion prompted us to examine the data on breast-feeding we have collected during a large case-control study of the possible relationship between oral contraceptives and breast cancer.

Patients, methods, and results

Our methods together with our main findings have been described elsewhere.[2] In brief, during the period December 1969 to August 1977 707 married women aged 16-50 years newly presenting with cancer of the breast were interviewed at eight teaching hospitals in London and Oxford and asked about their medical, obstetrical, menstrual, social, and contraceptive histories. Inquiries were also made about the duration of breast-feeding of each child. A control group of 707 married women suffering from various acute medical or surgical disorders or who had been admitted to hospital for certain elective surgical procedures were similarly interviewed. They were matched with the patients with breast cancer for age (within five-year groups except for the first 90 case-control pairs, who were matched within ±5 years), parity (within groups 0, 1-2, and 3 or more term births), and hospital of admission.

For the present analysis the matching was broken and the cases and controls were classified by exact parity (para 1—cases 121, controls 133; para 2—cases 256, controls 244; para 3—cases 142, controls 123; para 4—cases 58, controls 54). Women with a parity higher than 4 were few in number and were therefore omitted from the analysis. Since the first pregnancy seems to be of special importance in relation to the risk of breast cancer we concentrated initially on the feeding of the first child. Subsequently, we also considered the feeding of other children. Three main measures of lactation were taken into account: whether the woman had breast-fed at all, whether she had fed for more than 16 weeks, and the mean duration of feeding. The findings, considering the first child alone and then all children together, are summarised in the table. The differences between the breast cancer patients and the controls are small and inconsistent and none approaches statistical significance. Adjustment of the data for any possible