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A simple test for penicillinase in sputum

DAVID E. ROBERTS From the Cardiothoracic Institute, Brompton, London

Enterobacteria are frequently isolated from the sputum of patients receiving prolonged chemotherapy for chronic chest infections. Although these organisms are usually regarded as non-pathogenic they are capable of being 'indirectly pathogenic' because of their ability to produce penicillinase. Maddocks and May (1969) showed that ampicillin was inactivated by enterobacteria but that the prior administration of cloxacillin inhibited penicillinase and ampicillin was then successful in eradicating the underlying H. influenzae infection.

It is clearly of value to identify the presence of penicillinase in sputum and the test described here is a very simple one which can be undertaken by any bacteriology laboratory. Its principle is to identify the presence of penicillinase by demonstrating an inhibition of the effect of ampicillin upon sensitive staphylococci. It is hoped that this test may become more widely used, not only as a guide to chemotherapy but also as a preliminary screening test in antibiotic trials carried out in patients with purulent sputum. It is especially valuable when there has been a failure to respond to ampicillin or amoxycillin therapy: if the test shows that sputum contains penicillinase, the use of the combined ampicillin with cloxacillin regimen, as suggested by Maddocks and May, is indicated.

Materials

CULTURE MEDIUM
DST Agar from Oxoid Ltd, London SE1.

TEST ORGANISM
Staphylococcus aureus, Oxford strain.

AMPICILLIN DISCS
Diamed Diagnostics Ltd, Liverpool.

Method

The use of pancreatin to liquify sputum must be avoided because it destroys penicillinase. In this laboratory liquefaction is carried out using an ultrasonic generator (Soniprobe 1130 from Dawe Instruments Ltd, Acton, London) at an output setting no. 4 for one minute. If this instrument is not available liquefaction can equally well be achieved by means of glass beads.

A DST agar plate is poured in a 90 × 15 mm petri dish containing approximately 16 ml of medium. An overnight broth culture of the Oxford strain of Staph. aureus is diluted to 1/100 and seeded onto the surface of the medium. After drying a hole is punched in the agar using a 6 mm tube: the unplugged end of a Pasteur pipette is suitable for the purpose.

Liquefied sputum is pipetted into this hole and is allowed to diffuse into the agar at room temperature. After one hour a 25-μg ampicillin disc is placed on the surface of the agar about 20 mm from the edge of the hole and the plate is then incubated for 18 hours at 37°C.

Results

The presence of penicillinase in sputum is shown by a growth of staphylococci within the inhibition zone surrounding the ampicillin disc. On a plate contain-

Fig  A positive result is shown

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Letters to the Editor

The Use of SI Units

Dr Baron and associates (J. clin. Path., 1974, 27, 590) recommends the use of SI units because they form a coherent system and are being introduced throughout pure science in publications and teaching. In Denmark they were recommended some years ago by the Danish Society of Clinical Chemistry and the Danish Society of Internal medicine, but they have so far mostly been introduced in central laboratories and are far from universally accepted. Several clinicians feel that the advocates of SI units ought to have investigated whether the introduction of the SI system would mean a real benefit to patients or not; also feel that those urging the use of SI units have been hypnotized by the scientific coherence of the system and have forgotten that their job is not pure science but primarily for the benefit of patients. Further it seems to have been overlooked that the inconvenience to doctors and other health workers—especially the more mature ones in responsible posts—will require many meetings, many irritating telephone calls, and much paper—which all means money at a time when the resources available for the health sector are decreasing. Further it seems biologically doubtful to express concentrations in serum and urine in Moles because most substances to not react there but only on the cellular level. The shift to the SI system may even in some cases be dangerous, as for blood urea (conversion factor 1 mM = 6 mg/100 ml) and blood sugar (conversion factor 1 mM/l = 18 mg/100 ml), and it is certainly easier for nurses to remember that the normal fasting blood sugar is <100 mg/100 ml than 5.55 mMol/l. And what is the benefit of this to the patient? For drug analyses it may even seem a little ridiculous to express concentrations in moles as the patients receive drugs in grains, grams or milligrams!

TORBEN K. WITH
Svendborg Hospital, Denmark

SI Units

Professor Baron and his colleagues are to be congratulated on their article, 'The use of SI units in reporting results obtained in hospital laboratories'. It must have involved tedious labours and in general their recommendations will surely gain wide support. It is all the more unfortunate therefore that their work should be marred by the recommendation to report thyroxine iodine rather than thyroxine. Many laboratories currently measure thyroxine by specific methods, standardized against thyroxine, not iodine, and already report thyroxine. It is difficult to justify the use of thyroxine iodine on scientific grounds. Other reservations about their recommendations, such as inconsistent attention to significant figures as in serum calcium, and occasionally unnecessary use of decimals, as in serum urate, in contravention of their own rules, are more trivial. The lack of definite guidance on blood pH or hydrogen ion concentration, and no mention of SI conventions for plasma drug concentrations, are also unfortunate. Excellent though it is in most respects, it is to be hoped that their paper will be a basis for discussion and amenable to amendments, but not the final word.

A. M. BOLD
R. HOFFENBERG
D. R. LONDON
T. P. WHITEHEAD
P. WILDING
Queen Elizabeth Hospital,
Queen Elizabeth Medical Centre,
Birmingham

Problems in the Introduction of SI Units

IN REPLY TO DR T. K. WITH

We note that on successive lines of his letter he refers to concentration expressed in mM, mM/l and mMol/l, thereby illustrating the need for standardization of symbols on an agreed international basis! Units and symbols in medicine have developed empirically and have become illogical and conflicting. This has lead to confusion both in communications between hospitals concerning records of patients, and in comparing published information in journals. It is partly to avoid this that the Systeme Internationale is being introduced. As the scientific world outside medicine is using these units it is also necessary for us to change in order that we speak the same language. The change to SI units is therefore concerned, amongst other things, with communications, and with the removal of barriers to a flow of knowledge from one branch of science to another.

Dr With's arguments could be applied to any change in medicine or daily life. The change from mass concentration to equivalents (for electrolytes) was accomplished successfully despite similar objections and prophecies of doom and was generally accepted although ambiguities were left. The use of the mole scale will eliminate these. It was not so long ago that haemoglobin was reported as 'per cent' (of what!). There was initial resistance and foreboding, but acceptance of the change to g/100 ml rapidly became universal.

There would seem to be some advantage in expressing not only blood concentrations of drugs, but eventually also drug dosages, in molar terms; though use of molar concentrations does not invalidate the use of metric doses. Traditionally dosages have been given in grains, teaspoonfuls, etc, but nobody then expressed assay results in these

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ing 16 ml of agar, a 25-μg ampicillin disc consistently gives an inhibition zone of about 40 mm diameter using the Oxford strain of Staphylococcus aureus.

The figure shows a positive result of this test. Sputum from a patient with cystic fibrosis has been shown to have strong penicillinase activity by a unilateral reduction of the zone of inhibition.
A simple test for penicillinase in sputum.

D E Roberts

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