Letters to the Editor

Detection of bacteraemia by an automated blood culture system

Many clinical microbiology laboratories in the UK and the USA are currently detecting bacteraemia using an automated C4 labelled substrates blood culture system (Bactec, Johnston Labs, Inc).

Positive blood cultures are initially detected by release of radioactive carbon dioxide into the gaseous space which exceeds a printout value of 40 cpm. We report two cases of endocarditis which, respectively, provide a cautionary reminder and a reassurance to clinicians and microbiologists who rely upon this blood culture system.

CASE 1
A 39-year-old woman was admitted with a ten-day history of malaise, joint pains, sweating attacks and rigors. On examination she was pyrexial and the tip of the spleen was palpable and an Osler’s node was seen on a finger. She had a mitral systolic murmur. Six sets of blood cultures were taken over 24 h and antibiotics were commenced using penicillin and gentamicin, a clinical diagnosis of infective endocarditis having been made. The temperature returned to normal within 24 hours of starting treatment and apart from a transient ischaemic attack on day 6 of treatment, no new symptoms or signs were noted.

Blood cultures were examined using the Bactec 460. On the fifth day of incubation one aerobic bottle gave a positive reading. Nothing was seen in the Gram film but Haemophilus parainfluenzae was grown in subculture the following day. All other blood culture bottles remained negative. All bottles were then subcultured onto conventional media and Haemophilus parainfluenzae was grown from a further two bottles from different sets on day 7. These two bottles persistently gave negative readings up to 21 days of incubation at which time one of the two bottles gave a low positive reading of 59 cpm. Haemophilus parainfluenzae was subcultured from both these bottles at 21 days of incubation.

CASE 2
A 28-year-old man with known mixed aortic valve disease presented with a three-month history of a 'flu-like illness with a sore throat, malaise and generalised aches and pains in his limbs. On examination he had a temperature of 37.7°C, hepatosplenomegaly and murmurs of aortic regurgitation and stenosis. A clinical diagnosis of infective endocarditis was made.

Seven sets of blood cultures were taken over three days. These were all processed using the Bactec 460 system: All sets were positive in the aerobic bottles on the first day of reading showing Gram positive cocci on Gram film.

Culture of the blood on standard media failed to produce growth at 24 h but a very scanty growth was visible at 48 h. The organism was alpha-haemolytic on sheep blood agar and optochin resistant and was subsequently identified as Streptococcus mitior. The patient was started on intravenous benzylpenicillin and metilimycin.

Minimal inhibitory concentration of penicillin was not assayable because the organism would no produce turbid growth in either glucose broth or thiglycollate broth. It was then tested and found to be 0.1% cysine dependent due to a pyridoxine deficiency.

The recent departure from traditional methods to automated technology in medical microbiology has inevitably led to an assumption of the veracity of the machine. This was illustrated by the first case described in which all except one blood culture bottle were believed to be culture negative. This might have led to a failure to appreciate the significance of H parainfluenzae in this case but a strong clinical suspicion overcame the inclination to believe the machine print-out.

The growing number of reports of nutritionally fastidious organisms causing disease creates concern among microbiologists about the laboratory's capacity to detect routinely their presence in clinical specimens.

The second case provides reassurance about the performance of an automated blood culture system in this context. The inclusion of either pyridoxine or L-cystein blood culture in the medium supported growth of the organism while traditional sheep blood agar failed to support growth in subculture.
Counts it is possible to calculate the number of each species present in the undiluted specimen.

In order to ensure that no organisms were being lost with this technique, endocervical swabs of five subjects were taken through a sterile Cusco's speculum at the same time as the aspirate. Each swab was broken into a bijou containing 2 ml of glucose broth and mixed vigorously by vortex mixer. The resultant suspension was diluted and plated out in an identical manner to the aspirate. After 48 h incubation the plates were examined and the isolates recovered by the two techniques were compared. In all five cases there was no qualitative difference in the organisms isolated. However, while the cervical flora obtained by aspiration can be accurately enumerated, that recovered from the swabs cannot since the volume of mucus on each swab is unknown.

Dithiothreitol is widely used in the liquefaction and homogenisation of sputum and has not been shown as inhibitory to the microbial flora of this secretion. Similarly, no antimicrobial activity was detectable following the treatment of cervical mucus. However, to exclude this possibility, a suspension of Neisseria gonorrhoeae, probably the most labile organism potentially isolated from the cervix, was prepared and diluted 1:1 with either dithiothreitol or glucose broth. The number of viable organisms in each suspension was estimated according to the method of Miles and Misra. No difference was noted. It is likely that since dithiothreitol does not inhibit the growth of the gonococcus it should not do so to any other more rigorous constituent of the cervical flora.

The method described is rapid, technically easy and precise. We recommend its use when quantitative assessment of the microbial flora of the cervix is required.

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References