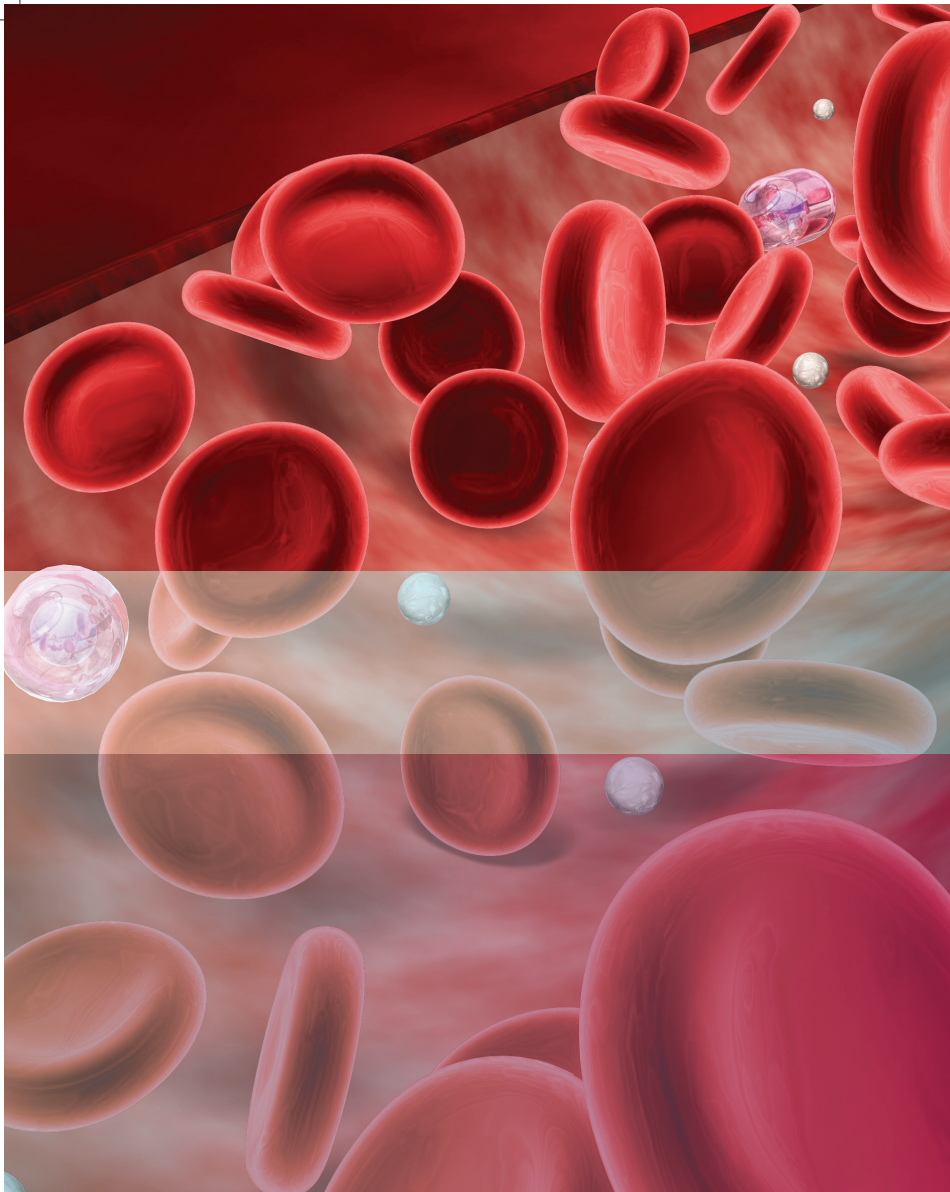




Thermo Scientific Signal
Blood Culture System



reliable, cost-effective, life-saving **detection of bacteria in blood**

Use this one-bottle, manual blood-culture system to help reduce morbidity and mortality, improving patient outcomes.

Thermo
SCIENTIFIC



Thermo Scientific Signal Blood-Culture System

Use the Signal™ blood-culture system to detect microbial growth, facilitating the rapid isolation, identification and antimicrobial susceptibility testing of cultured organisms.

One-bottle, manual blood-culture system	Minimizes laboratory costs
Effective with samples as small as 0.1mL	No requirement for special paediatric bottles
Unique broth medium	Enables the recovery of a wide range of aerobes, anaerobes and microaerophilic organisms
Integral growth indicator device	Allows easy identification of positive samples, improving patient outcomes
Eliminates the requirement for needles when extracting sample for subculture	Safe to work with
Organisms from other body fluids can also be recovered	Improves human patient and animal patient outcomes



Early detection of bacteraemia

Normally, the blood stream is sterile, but bacteria may enter the blood through broken skin, tooth extraction, or from a focus of infection within the body. These organisms are usually transient and removed by the body's natural host defences. If these defences become overwhelmed, a systemic infection results, which can involve many areas of the body.

Early detection of bacteraemia and its potential complications is of the utmost importance because of the high mortality rates associated with this condition. The earlier a patient is put onto appropriate therapy, the more favourable the outcome is likely to be.

The Signal system is a unique one-bottle system. Suitable for use with both adult and paediatric samples, it requires only the most basic laboratory equipment, making it suitable for high or low-level-usage laboratories. The Signal blood-culture system is manufactured to the International Quality Standard ISO 9001:2000 and is CE marked according to the In Vitro Diagnostic Directive 98/79/EC.



Small sample size

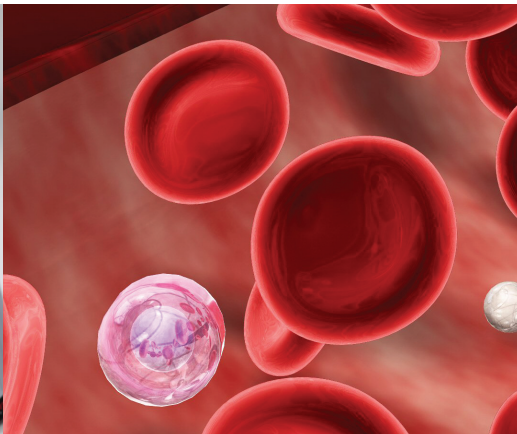
The number of organisms in a blood culture sample can be extremely small (<5 CFU/mL). Most conventional blood-culture systems rely on the detection of organisms grown in aerobic and anaerobic broth systems; however, this requires twice the amount of sample that a one-bottle system requires. This can be difficult and distressing, especially from very young and elderly patients. Therefore, the optimal volume to be tested from adult patients is 10mL. The Signal system has also been shown to be reliable with volumes as low as 0.1mL from paediatric patients (where the bacterial load is usually higher at around 5 CFU/mL).

Unique broth medium

The Signal system uses a unique broth medium. It enables a wide range of aerobes, anaerobes and microaerophilic organisms to be cultured in a single bottle. This optimizes the recovery of any potential organisms.

Easy to read

Blood-culture systems usually rely on the detection of by-products from bacteria to indicate a positive sample. The Signal blood-culture system detects gases formed during growth and replication of the organism. The gas production causes an increase in pressure in the sealed bottle, which forces some broth/blood mixture into the Signal device, giving a clear, visual indication of a positive sample. Samples for subculture, Gram-stain and susceptibility testing can easily be obtained without the use of needles or entry into the main sample. This easy access not only makes processing safer, but also prevents the introduction of contaminants into the chamber. This means the sample can be reincubated if a polymicrobial infection is suspected.



Additional capabilities

Although primarily designed for the culture of organisms from human blood samples, a number of publications have shown that the Signal blood-culture system is also effective at recovering organisms from other body fluids, including joint, abdominal and CAPD (Continuous Ambulatory Peritoneal Dialysis) fluids. It is also shown to be effective for veterinary use.

Simple to use

1. Inoculate up to 10mL of blood into the Signal blood-culture bottle.
2. Incubate the bottle at 37°C for one hour.
3. Insert the Signal growth-indicator chamber device.
4. Place the system on an orbital shaker for the first 24 hours of the seven-day incubation period.
5. Check regularly for positives. If a positive result is obtained, remove samples from the indicator chamber for further testing.

For full details of usage, please see the product instruction leaflet.



Safe and convenient

Samples are easy to remove from the indicator chamber in safety:

- no need to enter the bottle, reduced risk of laboratory-induced contamination
- venting device reduces the risk of aerosol formation
- sample is accessed through the screw top - no needles required
- no special disposal problems.



Case Study: Paediatric

J. M. De Los Rios Childrens Hospital, Caracas, Venezuela

The J. M. De Los Rios Childrens Hospital is based in Caracas, Venezuela. The hospital was founded in 1937, the first of its kind, and is one of the largest paediatric hospital in Venezuela. At the time of this case study, the hospital had 420 beds and performed approximately 4000 blood cultures each year.

Reduced contamination

Historically, blood cultures were performed using in-house Brain Heart Infusion Broth in tubes. However, this technique resulted in a high number of contaminants, especially *Bacillus subtilis*, causing an increased work load and an ambiguity with the results. When the hospital changed to using the Signal blood-culture system, it resulted in a significantly reduced number of isolates; on investigation this reduction was attributed to a reduction in contamination.

The Signal system is effective at isolating a wide range of organisms in a single bottle, which is useful, since small samples of blood are often received from paediatric patients. Many blood-culture systems require the sample to be split between aerobic and anaerobic bottles, thus the single bottle of the Signal optimizes the chances of recovering the causative organism from a small sample which may be received.

Although Signal is not a continuous monitoring system, a positive sample is clearly visible in the green chamber, and sampling is easy and safe through the lid on the top. A wide range of organisms has been isolated using this system (see Table 1).

Culture from other body fluids

In addition to blood culture, the Signal system is very useful for culturing other body fluids, including pleural, synovial, pericardial and peritoneal fluids. The Signal system is used in the hospital because one test can be used under a variety of circumstances – blood or body fluid, 10mL sample or low volume, suspected aerobic or anaerobic infection; this makes the system very easy to use. Although care still needs to be taken on collecting the sample, the number of contaminants was significantly reduced by the introduction of the Signal system, and a wide variety of clinically significant isolates are cultured through the bottle. The Signal blood-culture system is simple, safe and effective for the hospital's needs.

Table 1.

Organism	Number Isolated
<i>Staphylococcus aureus</i>	81
<i>Pseudomonas</i> spp.	51
<i>Streptococcus</i> spp.*	49
<i>Klebsiella pneumoniae</i>	41
Coagulase-negative staphylococci	39
<i>Enterobacter</i> spp.	39
<i>Enterococcus</i> spp.	38
<i>Escherichia coli</i>	33
Other Enterobacteriaceae	31
<i>Candida</i> spp.†	28
Anaerobes	21
<i>Acinetobacter</i> spp.	20
<i>Streptococcus pneumoniae</i>	19
<i>Stenotrophomonas maltophilia</i>	8
<i>Salmonella</i> spp.	8
<i>Haemophilus influenzae</i>	6
<i>Serratia marcesens</i>	5

* *Streptococcus* spp. include Group A, B, C and F streptococci, *S. sanguis*, *S. oralis* and *S. bovis*
† *Candida* spp. include *C. albicans*, *C. tropicalis*, *C. parapsilosis*, *C. lusitaniae* and *C. glabrata*



Case Study: Clinical

Chularat Hospital, Samut Prakarn province, Thailand.

The Chularat Hospital is located in Samut Prakarn province, in Thailand. In 2006, this medium-sized private hospital had 100 beds. There were four medical technologists and three assistants working the hospital laboratories, but no microbiology service was provided.

Before adopting the Signal blood-culture system, specimens for microbiological culture and susceptibility testing were sent to a central laboratory 20km away, in Bangkok. Consequently, it was at least three days before results were provided in the hospital. While this may have been an acceptable delay for many specimens, it was not for blood cultures, where rapid results have a direct influence on patient outcome.

Evaluation of a blood culture system

It was decided to evaluate some blood-culture systems for use on site at the hospital. In making their selection, the hospital had three key factors to bear in mind:

- As there was no medical microbiologist on site, the system had to be simple to use, easy to interpret, safe to handle and require minimal hands-on time.
- With limited budgets, running costs must be reasonable.
- Positive cultures would still need to be sent to the central laboratory in Bangkok for susceptibility testing and full identification. The chosen system would therefore need to allow sampling for Gram stain without risk of contamination.

Using these criteria, two blood-culture systems were evaluated - the Signal blood-culture system and the BD BACTEC 9050 (Table 2.)

Successful outcomes

The Signal blood-culture system was introduced to the Chularat Hospital in 2006 and has been hugely successful. The hospital cited these key advantages since the introduction of Signal:

- Improved patient management was been achieved, as appropriate microbial therapy could be administered promptly. This in turn resulted in a reduction in the morbidity and mortality rates, and patients being discharged from hospital more rapidly.
- Clinicians greatly appreciated the new service, as the laboratory could provide “real-time” reports on positive specimens, and results of Gram stains were obtained in 10 minutes.
- Cost savings were made, with fewer samples being sent to the central laboratory.

Table 2. Evaluation of two blood culture systems at the Chularat Hospital.

Topic	Comment	Preferred
Inoculation procedure	No difference	No difference
Interpretation of result	Positive indicated by audible sound signal on the BACTEC	BACTEC
Cost of reagents	BACTEC costs higher due to capital cost of machinery	Signal
Disposable costs	BACTEC required disposable syringe	Signal
Risk of sample contamination	Signal removes the positive sample from the indicator chamber	Signal
Suitability for purpose	Signal can be used for paediatric and adult samples, and for aerobic and anaerobic organisms	Signal
Ease of use	Signal requires only incubation, and was simpler to use than the automated equipment	Signal



Case Study: Veterinary

Royal Veterinary College, Department of Pathology and Infectious Diseases, Hawkshead Lane, North Mymms, Hertfordshire AL9 7TA, UK

The college is one of the largest veterinary schools in the country, comprising extensive large and small animal referral practices, as well as world-renowned research facilities. When this case study was taken, the Diagnostic Pathology Department, located at the Hawkshead Campus, received work coming from in-house clinicians and an extensive external client base. The majority of the microbiology work came from the small animal practice, although the volume fluctuates throughout the year, as some veterinary diseases are seasonal.



The Signal blood-culture system has been in use for many years. Before this, a system of rubber sealed bottles containing Brain Heart Infusion Broth was used. Blood cultures were received from animals with a history of pyrexia of unknown origin, suspected septicaemia cases and septic joints from both internal and external clients.

Organisms isolated from blood samples

A number of different organisms were isolated from horse, dog and cat samples, including:

Coagulase-negative staphylococci

Staphylococcus hyicus

Staphylococcus intermedius

Staphylococcus canis

Bacteroides spp.

Branhamella spp.

Acinetobacter spp.

Clostridium perfringens

Organisms isolated from fluid samples

Samples of various fluids were received in Signal bottles for culture, including synovial fluids, tracheal washes, peritoneal fluid, bursa fluid, sheath fluid and mass fluid. From these fluids, the following organisms were isolated:

Streptococcus canis

Staphylococcus intermedius

Escherichia coli

Coagulase-negative staphylococci

Alpha-haemolytic streptococci

Staphylococcus aureus

Enterobacter spp.

Bacillus spp.

Organisms isolated from tissue samples

Samples of tissue were occasionally received in Signal bottles for evaluation, including bone marrow and tendon sheath; the following organisms were isolated:

Escherichia coli

Anaerobe

Bordetella spp.

Coagulase-negative staphylococci

Enterococcus faecalis

Alpha-haemolytic streptococci

Bacillus cereus

Cost effective and reliable

With the volume of work coming through the laboratory, the expense of a fully automated system could not be justified. The Signal blood-culture system meets the College's requirements for a system that was reliable at isolating a range of organisms, was cost effective and efficient for low-volume usage.

How to order

The Signal Blood Culture System:

Pack contents: 20 bottles and 20 growth indicator devices.

Order code:

BC0100M

Accessories:

Pack of white disposable shaker/ incubator trays. (Each tray holds up to 10 bottles.)

Order code:

BC0104A

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Microbiology

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