

ESKAPE Pathogens

Understanding Nosocomial Risk Factors

The monitoring of water used in care homes and healthcare facilities is covered by several pieces of Health and Safety Guidance (HSG). The majority of the guidance is on the monitoring of Legionella and is supported by the Approved Code of Practice for Legionella (ACoPS) and Health Technical Memorandum (HTM), however, there are a range of other risk factors that need to be considered in nosocomial scenarios. The ESKAPE pathogens are emerging pathogens of concern. ALS Environmental are able to offer rapid identification of these bacteria using our revolutionary MALDI-ToF confirmation technique. The ESKAPE Pathogens are:

Enterococcus faecium

Enterococcus faecium, formerly known as Streptococcus faecium until its re-categorization in 1984, is a human pathogen that causes nosocomial bacteraemia, surgical wound infection, endocarditis, and urinary tract infections. The bacteria can survive for long periods of time inside hospitals on a variety of surfaces as well as in soil and sewage. Growth temperatures range from 10°C to 45°C in basic or acidic environments, and in environments which are isotonic or hypertonic. Ent. faecium can be highly drug resistant. The spread of the disease occurs between patients in hospitals due to transfer of the pathogen by hands or medical instruments. Also, antibiotic use can decrease the number of other intestinal bacteria that are susceptible to the antibiotic and decrease competition for the drug resistant Ent. faecium.

Staphylococcus aureus

The carriage of Staphylococcus aureus is an important source of nosocomial infection and community-acquired methicillin-resistant Staph. aureus (MRSA). Staph. aureus is common and often found in the nose or on the skin. Most of the time these bacteria do not cause any symptoms. The ability of the nasal passages to harbour Staph. aureus results from a combination of a compromised host immune system combined with the bacteria's ability to evade a host's innate immunity. The spectrum of Staphylococcus infections can range from skin abscess to life-threatening infections such as septicaemia or endocarditis.

Klebsiella pneumoniae

In nosocomial settings, Klebsiella bacteria can be spread through person-to-person contact or by contamination of the environment; it is important to note that the bacteria are not spread through the air. Patients in healthcare settings may be exposed to Klebsiella when they are on ventilators, or have intravenous catheters or wounds. Unfortunately, these medical tools and conditions may allow Klebsiella to enter the body and cause infection, which can be fatal in the immunocompromised.

STENOTROPHOMONAS

ALS Environmental are proud to be one of the few laboratories in the UK and Ireland to offer an analytical specialisation service for Stenotrophomonas species, which are of particular concern to healthcare facilities as they are a common water-borne organism. Although infection by this opportunistic bacteria is rare, cases of Stenotrophomonas maltophilia (S. maltophilia) are potentially lethal, following a request from one of our established clients we have developed a rapid technique to confirm and identify the colonies of Stenotrophomonas.

Anaerobic, ubiquitous, opportunistic organisms, S. maltophilia may be a particular burden to healthcare facilities due to the susceptibility of immunocompromised patients. Although it has no natural infection route to humans S. maltophilia infection can be facilitated by contaminated prosthetics such as catheters and intravenous lines. S. maltophilia's resistance to most antibiotics has proved fatal to severely immunocompromised hosts.



Traditional testing for Stenotrophomonas involves a general screen that produces presumptive results for the presence of members of the genus. This is usually followed by biochemical tests which indicate whether S. maltophilia is present.

ALS SERVICE OVERVIEW

UK and Ireland Locations



Contaminated Land
We understand the time pressures of large scale Remediation and Brownfield projects and are a member of the AGS. Our Coventry laboratory utilises state of the art analytical equipment with the backup of our sister laboratories across Europe to ensure that we deliver your projects on time every time

Acinetobacter baumannii

Acinetobacter baumannii is a rapidly emerging pathogen in the health care system. A. baumannii is usually introduced into a hospital by a colonised patient. Due to its ability to survive on artificial surfaces and resist desiccation it can survive and potentially infect new patients for some time. It is suspected that A. baumannii growth favours nosocomial settings due to the constant use of antibiotics by patients in the hospital and causes a wide range of infection including bacteraemia, pneumonia, meningitis, urinary tract infection, and wound infection. The organism's ability to survive under a wide range of environmental conditions, and to persist for extended periods of time on surfaces, make it a frequent cause of outbreaks of infection and an endemic, health care-associated pathogen.

Pseudomonas aeruginosa

The monitoring for Pseudomonas is covered in HTM04-01 Addendum. Serious infections of P. aeruginosa usually occur in the immunocompromised. Infections of the blood, pneumonia, and infections following surgery can lead to severe illness and death in these people. The highly susceptible nosocomial patients include those on breathing machines, premature babies and patients with wounds from surgery or from burns. Additionally, healthy people can also develop mild illnesses with Pseudomonas aeruginosa, especially after exposure to water. Ear infections, especially in children, and more generalised skin rashes may occur after exposure to inadequately chlorinated hot tubs or swimming pools.

Enterobacter species

The genus Enterobacter is a member of the coliform group of bacteria. Enterobacter species, particularly E. cloacae and E. aerogenes, are important nosocomial pathogens responsible for various infections, including bacteraemia, lower respiratory tract infections, skin and soft tissue infections. Risk factors for nosocomial Enterobacter infections include hospitalisation of greater than 2 weeks, invasive procedures in the past 72 hours, treatment with antibiotics in the past 30 days, and the presence of a central venous catheter. Specific risk factors for infection with nosocomial multidrug-resistant strains of Enterobacter species include the recent use of broad-spectrum cephalosporins or aminoglycosides and ICU care.

Stenotrophomonas Maltophilia

Stenotrophomonas maltophilia is an organism of low virulence which can frequently colonise fluids used in the hospital setting (eg. irrigation solutions, intravenous fluids) and patient secretions (eg. respiratory secretions, urine, wound exudate). S. maltophilia usually bypasses normal host's defenses to cause human infection. The growth of S. maltophilia from sites which would normally be sterile (e.g., blood) usually represents true infection; growth of S. maltophilia in microbiological cultures of respiratory or urinary specimens is therefore sometimes difficult to interpret and not always a proof of infection.

ALS Environmental are employing our latest technology in order to produce rapid species level identifications, this means that we do not report presumptive results, but instead provide a full list of the Stenotrophomonas species present in the sample. The full species breakdown for Stenotrophomonas is important as not all species are pathogenic to humans.

ALS Environmental's Microbiology Operations Manager, Pervinder Johal comments

"When our customers first approached us to analyse for Stenotrophomonas we began our research and development into validating a new method for this genus group. By utilising the latest technology we were able to provide a full speciation of Stenotrophomonas in under a month."

Species of the Stenotrophomonas genus are common in the environment and human infection is rare. However, infection risk of opportunistic pathogens such as the maltophilia species of Stenotrophomonas can be elevated in healthcare settings and other environments where immunocompromised patients, such as in care homes may be exposed. Despite the low infection rate, nosocomial outbreaks of S. maltophilia are of increasing concern in modern infection control because it can be difficult to treat effectively as it is resistant to most broad-spectrum antibiotics.

Quality

Providing customers with UKAS ISO 17025:2005, MCERTS and DWTS accredited data from our laboratories across the UK. We participate in a broad range of Proficiency Testing schemes and hold a DEFRA import licence for soils.

Did you know that?

- We are able to provide a broad range of additional services to help with your sampling including:
 - Internal refrigerated and tracked courier network
 - National portfolio of drop-off locations
 - Pre-Registration of samples via our "Pre-Reg" system
 - Dedicated customer service advisor
 - Online reporting via our WebTriage system

Legionella and Microbiology

Being members of the Legionella Control Association (LCA) we understand the emphasis placed on laboratory analysis for the Control of Legionella. With 3 methods for testing Legionella (including rapid PCR) and an understanding and appreciation of the implications of ACoP L8, HSG 274 and HTM04-01 we are your ideal analytical partner for all of your water hygiene monitoring requirements.

ALS Environmental are one of the first UK laboratories to validate and have accredited to ISO 17025:2005 and the Drinking Water Testing Standard (DWTS), accredit the rapid identification of positive Microbiological samples by Matrix Assisted Laser Desorption and Ionisation by Time of Flight Mass Spectrometry (MALDI-ToF MS). The ground breaking identification technique employed by ALS Environmental, known as MALDI-ToF, allows us to remove the need for presumptive data for bacteriological analysis, with all data reported as Colony Forming Units (CFU). The impact of MALDI-ToF confirmation on the ESKAPE Pathogens is highlighted in the table below.

Bacteria	Incubation Time	Confirmation: Traditional	Confirmation: MALDI-ToF	MALDI-ToF Saving
Enterococci	2 days	1 day	Minutes	1 day
Staphylococcus aureus	2 days	1 day	Minutes	1 day
Klebsiella pneumoniae	1 day	1 day	Minutes	1 day
Acinetobacter baumannii	1 day	1 day	Minutes	1 day
Pseudomonas aeruginosa	2 day	1 day	Minutes	1 day
Enterobacteriaceae	1 day	1 day	Minutes	1 day
Stenotrophomonas	1 day	1 day	Minutes	1 day
Legionella	10 days	2 days	Minutes	2 days
E.coli	1 day	1 day	Minutes	1 day
Coliforms	1 day	1 day	Minutes	1 day
Clostridium Perfringens	1 day	1 day	Minutes	1 day
Salmonella	4 days	2 days	Minutes	2 days
Listeria	4 days	2 days	Minutes	2 days

The instant confirmation of the ESKAPE bacteria allows infection control and water treatment to make rapid decisions on any potential remedial works that may need to be undertaken. The MALDI-ToF can be used to identify any positive bacteria, including Legionella.

Legionella

The MALDI-ToF confirmation of Legionella removes the presumptive stage, meaning that ALS Environmental report positive confirmed Legionella on the original read days (currently days 3, 7 and 10). This is 40% quicker than the traditional approach and is fully ISO 17025:2005 accredited. ALS Environmental have one of the world's largest Legionella species libraries held within our MALDI-ToF. With only 3 known species identifiable, two of these are Viable But Not Culturable (VBNC) and the final species is being sourced by our laboratory.

LEGIONELLA SPECIES TABLE

Name of species	Number of serotypes	Linked to humaninfection	Geographic origin	Common Matrix Type
Legionella anisa		YES	USA	Process, Drinking, Surface and Recreational
Legionella adelaidensis		Unknown	Adelaide in South Australia	Process Water
Legionella boblandensis		Unknown	Monbeliard in France	Process Water
Legionella birminghamensis		Unknown	Birmingham, Alabama, USA	Process Water
Legionella bozemanii (bozemaenae)	2	YES	Named after F.Marilyn Bozeman	Clinical Isolation
Legionella brunensis		Unknown	Brno, Czech Republic	Process Water
Legionella busanensis		Unknown	Busan in Korea	Process Water
Legionella carliata		YES	Northwestern University, Chicago, USA	Clinical Isolation
Legionella cherrii		Unknown	Minnesota, USA	Process Water
Legionella cinchonatisensis		YES	Cincinnati, Ohio, USA	Clinical Isolation
Legionella donaldsonii		Unknown		Process, Drinking, Surface and Recreational
Legionella drancourtii		Unknown		Amoebae
Legionella dresdensensis		Unknown	Dresden, Germany	Recreational and Surface Water
Legionella drozanskii		Unknown	Leeds, England, UK	Process and Drinking Water
Legionella dumoffii		YES		Clinical Isolation
Legionella erythra	2	YES	Seattle, WA, USA	Process Water
Legionella fairfieldensis		YES	Fairfield, Victoria, Australia	Process Water
Legionella fallonii		Unknown	Cruise ship in international waters	Process Water
Legionella feeleei		YES		Process Water and Clinical Isolation
Legionella geestiana		Unknown	Geest office building, London, England	Drinking and Process Water
Legionella genomospecies 1		Unknown		Unknown
Legionella gormanii		YES	Atlanta, USA	Soil
Legionella gratiana		Unknown	Savoy region in France	Recreational and Process Water
Legionella gresleisensis		Unknown	In France from the city Gexoux-les-Bains	Recreational, Drinking and Process Water
Legionella hackeliae		YES	USA, Pennsylvania	Clinical Isolation
Legionella impletiolei		Unknown	Japan	Soils near Trade Effluent Waters
Legionella israelensis		YES	In Gaash in Israel	Surface Water and Recreational Water
Legionella jamestownensis		Unknown	Jamestown, New York	Soil
Legionella jeonii		Unknown		Amoebae
Legionella jordanis		YES	Jordan River, Indiana, USA	Process, Trade Effluent and Untreated Sewage
Legionella lansingensis		YES	Lansing, Michigan, USA	Clinical Isolation
Legionella londinensis	2	Unknown	London, UK	Process, Recreational, Surface and Drinking waters
Legionella longbeachae	2	YES	Long Beach, California, USA	Soil and Compost
Legionella lytici		YES		Soil and Amoebae
Legionella mazaecherensis		YES		Drinking Water
Legionella massiliensis		Unknown	Marseille, France	Process Water
Legionella micdadei (= pittsburghensis)		YES	USA	Clinical Isolation and Drinking Water
Legionella moravica		YES	USA	Unknown
Legionella moravica		Unknown	Moravia, Czech Republic	Process Water
Legionella nagasakiensis		Unknown	Aomori, Japan	Clinical Isolation, Recreational and Drinking Water
Legionella naatarum		Unknown	London, UK	Drinking and Process Water
Legionella oakridgensis		Unknown	Oak Ridge, Tennessee, USA	Clinical Isolation and Process Water
Legionella parisiensis		YES	Paris, France	Clinical Isolation, Process and Surface Water
Legionella pittsburghensis		Unknown	USA	Clinical Isolation
Legionella pneumophila	15	YES	USA	Clinical Isolation, Surface and Recreational Water
Legionella pneumophila ssp fraseri		YES	Los Angeles, USA	Clinical Isolation
Legionella pneumophila ssp pascullei		YES		Clinical Isolation
Legionella pneumophila ssp pneumophila		YES	Philadelphia, USA	Clinical Isolation
Legionella quateirensis		Unknown	Quarteira, Portugal	Process and Drinking Water
Legionella quinlivanii	2	Unknown	Australia	Process Water
Legionella rowbothamii		Unknown		Process Water and Sludge
Legionella rubrilucens		YES	Los Angeles, California, USA	Drinking and Recreational Water
Legionella saintihelensi	2	YES	Mount St. Helens, Washington, USA	Clinical Isolation, Surface, Recreational and Ground Water
Legionella santicroci		Unknown	St. Croix, Virgin Islands	Drinking and Process Water
Legionella shakspereae		Unknown	Stratford-upon-Avon, England, UK	Process Water
Legionella spiliensis	2	Unknown	St. Helens, Oregon, USA	Recreational and Surface Water
Legionella steelei		YES	California, USA and South Australia	Clinical Isolation
Legionella steigerwaltii		Unknown	St. Croix, Virgin Islands	Drinking and Process Water
Legionella tauninensis		Unknown	Turin, Italy	Process Water
Legionella tuconensis		YES	Tucson, Arizona, USA	Clinical Isolation
Legionella tunisiensis		Unknown	Lake Sakbha, Tunisia	Recreational and Surface Water
Legionella wadsworthii		YES	Los Angeles, California, USA	Clinical Isolation
Legionella walertsi	2	Unknown	Adelaide, Australia	Drinking and Process Water
Legionella woolsleisensis		Unknown	Worsley, England, UK	Process Water
Legionella yabuuchiiae		Unknown	Japan	Soils

Waste Management

By working closely with some of the largest companies in this sector we are able to offer unrivalled analytical and administration services to ensure that your samples are processed swiftly and in line with the UKAS Deviating Sample Guidance.

Drinking Water

We are one of only a handful of commercial laboratories to have a dedicated Drinking Water Testing Specification (DWTS) accredited laboratory, based in Wakefield, Yorkshire. We are able to supply analysis to the Public and Private Drinking Water Regulations.

If you have any questions on our services or would like more information on ALS Environmental please call the Coventry laboratory on 02476 42 12 13 or visit our website.

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