Microbiologist

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Globalization

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- Vector-borne disease and climate change
- MERS-CoV — an update
- Historical perspectives: the history of microscopy

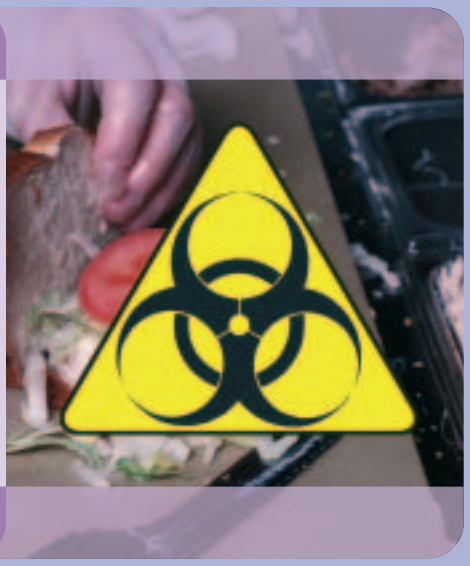
SfAM events in 2014

Save the dates!

Wednesday 15 January 2014

Winter Meeting

- **Food contamination: the food handler's role**
- **Biodefence**
  - Including the Denver Russell Memorial Lecture



The Royal Society, London, UK

Wednesday 30 April 2014

Spring Meeting

- **Control of infection: current status and future prospects**

The Sheffield Hilton Hotel, Sheffield, UK

30 June – 3 July 2014

Summer Conference

- **Zoonoses**
  - In conjunction with the Med-Vet-Net Association
  - Including the *Journal of Applied Microbiology* (JAM) Lecture

The Grand Hotel, Brighton, UK

For further information on these events please visit www.sfam.org.uk/en/events/index.cfm or contact Sally Hawkes ■ Email: sally@sfam.org.uk ■ Telephone +44 (0)1933 382191

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Editor: Nancy Mendoza. nancy@sfam.org.uk

Contributions: These are always welcome and should be addressed to the Editor at: nancy@sfam.org.uk

Advertising: Nancy Mendoza. Tel: +44 (0)1234 350302. email: nancy@sfam.org.uk

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Society for Applied Microbiology, Bedford Heights, Brickhill Drive, Bedford MK41 7PH, UK.
Tel: +44 (0)1234 326661. Fax: +44 (0)1234 326678.

www.sfam.org.uk

editorial

Nancy Mendoza reviews the content of this issue of *Microbiologist*

This year has so far seen the coldest spring for more than 50 years, followed by a scorching heatwave in July. But far from overindulging in the quintessentially British pastime of talking about the weather, this issue of *Microbiologist* focuses on the impact of globalization in a world where people and animals move over long distances, and the environment is changing.

Milder weather in northern Europe over recent years has extended the reach of vector insects, including the *Culicoides* biting midges that transmit bluetongue and Schmallenberg viruses (see page 8). But this isn't the whole story, say Kayleigh Hansford and Jolyon Medlock (see page 13); the strategies adopted by humans to cope with changes to temperature and rainfall are also having an impact. So, control strategies aimed at preventing vector-borne diseases must consider the consequences of all aspects of environmental change on insects and ticks.

Schmallenberg virus, which affects ruminant animals, is just one of a number of newly emerged viruses. The apparent rise in new viruses is at least partly because we are getting better at recognizing the emergence of previously unidentified diseases. At a recent Public Health England conference on Middle East Respiratory Syndrome Coronavirus (MERS-CoV) (see page 18) delegates heard that at least one brand new human respiratory virus has been identified each year for the past 15 years.

Following the SARS outbreak in 2003, networks of professionals in public health, clinical medicine and virology had been established, and were able to respond rapidly when a man with SARS-like symptoms was hospitalized in September 2012 following a visit to Saudi Arabia. MERS-CoV, as it later became known, was identified as an unknown coronavirus.

Although MERS-CoV has not so far shown signs of becoming pandemic, there are some critical questions left to answer, including what is the prevalence of mild illness? At the time of writing, serological screening is not yet possible and there are concerns about the impact of pilgrims returning from Saudi Arabia after Ramadan and the Hajj.

But it's not all global doom and catastrophe to report; the S*f*AM Summer Conference was well attended and took delegates on a journey through the wonders of lactic acid bacteria and *Bifidobacterium* and *Actinobacteria*. We also partnered with *Science Showoff* once again to deliver a satellite public engagement event in the community, raising money for a local charity (Terrence Higgins Trust, Cardiff).

Next year we'll be in Brighton (30 June to 3 July 2014) and in collaboration with Med-Vet-Net on a theme of '*Zoonoses*'. But before then we have the Winter Meeting (15 January 2014, London — see page 37), focusing on "*food contamination: the food handler's role*" and "*biodefence*"; a special meeting to mark a century of the activated sludge sewage treatment process (1 April 2014, Manchester — see inside back cover); and the Spring Meeting on '*Control of infection: current status and future prospects*' (30 April 2014, Sheffield). More information can be found in the events section of the S*f*AM website (www.sfam.org.uk/en/events/sfam-events).

And finally, to congratulate *Microbiologist's* regular Editor, Lucy Harper, on the safe arrival of her baby boy. I'm Nancy Mendoza and I'll be looking after *Microbiologist* while Lucy is away. I'm also covering the Communications Manager role at S*f*AM. You can read more about me on the S*f*AM website here: www.sfam.org.uk/en/about/staff.cfm

Nancy Mendoza

MERS-CoV podcast

A podcast featuring speakers from the Public Health England MERS-CoV conference on 9 July 2013 is available on the S*f*AM website:

http://www.sfam.org.uk/en/sfam-online/micropod.cfm/MERS-CoV

contribute

We are always looking for enthusiastic writers who wish to contribute articles to the magazine on their chosen microbiological subject.

For further information please email the editor, Lucy Harper at: **nancy@sfam.org.uk**

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contact point

Society for Applied Microbiology
Bedford Heights, Brickhill Drive, Bedford MK41 7PH, UK.
tel: +44 (0)1234 326661 ■ **fax:** +44 (0)1234 326678
email: communications@sfam.org.uk ■ **www.sfam.org.uk**

society office staff

CHIEF EXECUTIVE OFFICER: Philip Wheat
email: pfwheat@sfam.org.uk
tel: +44 (0)1234 326661

COMMUNICATIONS MANAGER: Nancy Mendoza
email: nancy@sfam.org.uk
tel: +44 (0)1234 350302

COMMUNICATIONS OFFICER: Clare Doggett
email: clare@sfam.org.uk
tel: +44 (0)1234 327679

MEMBERSHIP & FINANCE CO-ORDINATOR:
Julie Wright
email: julie@sfam.org.uk
tel: +44 (0)1234 326846

EVENTS ORGANIZER: Sally Hawkes
email: sally@sfam.org.uk
tel: +44 (0)1933 382191

ADMINISTRATOR: Julie Buchanan
email: julieb@sfam.org.uk
tel: +44(0)1234 326661

proofreader

Liz Rees **email:** liz@lizrees.co.uk
www.lizrees.co.uk

Microbiologist editorial group

FEATURES EDITORS:
Louise Fielding **email:** lfielding@uwic.ac.uk

Philip Hexley **email:** philip.hexley@hotmail.com

Nick Jakubovics **email:** nick.jakubovics@newcastle.ac.uk

Clare Taylor **email:** cl.taylor@napier.ac.uk

REGULAR CONTENT EDITOR:
Louise Hill-King **email:** louise@hill-king.com

executive committee

COMMITTEE MEMBERS

PRESIDENT: Professor Martin Adams, School of Biomedical & Molecular Sciences, University of Surrey, Guildford, Surrey GU2 7XH
email: m.adams@surrey.ac.uk

VICE PRESIDENT: Professor Christine Dodd, Division of Food Sciences, School of Biosciences, University of Nottingham, Sutton Bonington Campus, Loughborough, Leicestershire LE12 5RD
email: christine.dodd@nottingham.ac.uk

GENERAL SECRETARY: Professor Mark Fielder, School of Life Sciences, Kingston University, Penrhyn Road, Kingston upon Thames, Surrey KT1 2EE
email: m.fielder@kingston.ac.uk

MEETINGS SECRETARY: Dr Andrew Sails, PHE Microbiology Services Newcastle Laboratory, The Medical School, Royal Victoria Infirmary, Newcastle NE1 4LP
email: andrew.sails@phe.gov.uk

TREASURER: Mr Steve Davies, Microbiology Department, Northern General Hospital, Herries Road, Sheffield S7 5AU
email: steve.davies@sth.nhs.uk

ORDINARY COMMITTEE MEMBER UNTIL JULY 2014

Dr Clare Taylor, School of Life, Sport & Social Sciences, Edinburgh Napier University, Sighthill Campus, Sighthill Court, Edinburgh, EH11 4BN
email: cl.taylor@napier.ac.uk

ORDINARY COMMITTEE MEMBERS UNTIL JULY 2015

Mr Mark Reed, Pro-Lab Diagnostics, 7 Westwood Court, Neston Cheshire CH64 3UJ
email: mreed@pro-lab.com

Dr Sally J Cutler, School of Health and Biosciences, University of East London, Stratford Campus, Romford Road, London E15 4LZ
email: s.cutler@uel.ac.uk

Dr Nick Jakubovics, Oral Biology, School of Dental Sciences, Newcastle University, Newcastle upon Tyne NE2 4BW
email: nick.jakubovics@newcastle.ac.uk

Dr Samantha Law, NCIMB, Ferguson Building, Crabstone Estate, Bucksburn, Aberdeen AB21 9YA
email: s.law@ncimb.com

ORDINARY COMMITTEE MEMBERS UNTIL JULY 2016

Professor Valerie Edwards-Jones, School of Healthcare Science, The Manchester Metropolitan University, John Dalton Building, Chester Street, Manchester, M1 5GD
email: v.e.jones@mmu.ac.uk

Dr Brendan Gilmore, School of Pharmacy, 97 Lisburn Road, Queen's University Belfast, Belfast, BT9 7BL
email: b.gilmore@qub.ac.uk

Dr Brian Jones, Pharmacy and Biomolecular Sciences, Moulsecoomb, Brighton, BN2 4GJ
email: B.V.Jones@brighton.ac.uk

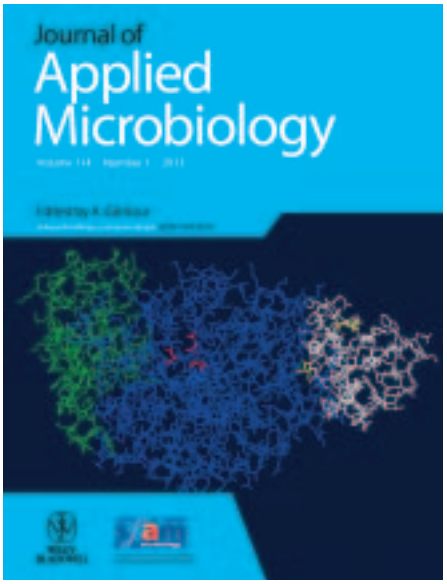
Professor John Threlfall, PHE Colindale, 61 Colindale Avenue, London, NW9 5EQ

president's column

SfAM President, **Professor Martin Adams** celebrates the continuing success of the Society's journals

In 1665, the Royal Society published the first issue of *The Philosophical Transactions* of the Royal Society of London, the oldest surviving scientific journal and the one in which Antonie van Leeuwenhoek published his first observations of microscopic life. Unfortunately, the world had to wait a further 273 years before the appearance of the first journal from SfAM, although I am reliably informed that quite a number of new journals were published by others in the intervening years. At SfAM, we are generally of a very forgiving frame of mind and certainly do not bear a grudge against the Royal Society for pipping us to the post, and this is apparent from our continued use of their magnificent premises in Carlton House Terrace for our annual Winter Meeting.

Since it first appeared in 1938, our journal has undergone a couple of name changes before settling to its current title, *Journal of Applied Microbiology* (JAM), and the breadth of topics covered has increased enormously. The first issue in 1938 was composed of papers relating entirely to dairy microbiology, reflecting the interests of the Society at that time. Today, Members not only enjoy access to JAM and its sister journal, *Letters in Applied Microbiology* (LAM), which publish papers spanning the full spectrum of applied microbiology, but three other outstanding journals dedicated specifically to aspects of environmental microbiology and microbial biotechnology.



Food microbiology has always been a particular strength of the Society and is a frequent topic in our meetings programme. This has also been reflected in JAM which has published some seminal papers on the subject over the years. (At this point I have an image of numerous colleagues nodding sagely in agreement while thinking of their own papers.) One example that does, however, spring to mind is the paper by David Mossel and Maurice Ingram entitled "***The Physiology of the Microbial Spoilage of Foods***" published in 1955, nearly 60 years ago, which reflected the change in thinking about food microbiology at that time, and had a considerable influence on its later development and how food microbiologists go about their business today. JAM continues to be read by food microbiologists everywhere, but has also attracted a wider audience in applied microbiology more generally.

This year we reached a landmark in the evolution of our journals when the number of full text downloads from JAM exceeded one million in a single year (compared with a figure of just over 600,000 in 2010). This incredible figure is clear testimony to the perceived value of the papers we publish and the hard work put in by our Chief Editors and the Editorial Board Members to ensure their scientific quality and relevance. LAM is seeing similar increasing popularity and a rapid rise in the number of article downloads, reaching almost half a million in 2012.

To celebrate the continued success of JAM and LAM we have now introduced the annual JAM lecture, to be presented at the beginning of our Summer Conference. The idea is that we invite an eminent speaker, who has had a close association with the journal, to present a lecture of current relevance related to their work. All Members are welcome but for those unable to attend, the lecture is also videoed and available for subsequent viewing online. This follows the successful practice adopted with the *Environmental Microbiology* Lecture which has proved such an outstanding success with over 20,000 viewings of past lectures. The inaugural JAM lecture was presented at this year's Summer Conference in Cardiff by Peter Setlow of the University of Connecticut focusing on his 45 years working on Bacillus endospores, entitled "***When sleepers wake: the germination of bacterial spores***" and got the lecture series (and the conference) off to an excellent start.

Going back briefly to van Leeuwenhoek, he published 122 articles in the Transactions of the Royal Society making him the most published author in the first 70 volumes. This puts many of us to shame considering he also had a day job. However, it appears that he did publish one of his letters, on microorganisms in the mouth, on two separate occasions nine years apart in volumes 14 and 17; although, in his defence, they were different translations with slightly different illustrations (http://lensonleeuwenhoek.net/pubs.htm). I feel sure our Chief Editors would probably look askance at that kind of practice today, but somehow I feel inclined to forgive him.

Martin Adams
President of the Society

ceo's column

Philip Wheat reports on the latest developments within the Society

I am writing this piece just after this year's Summer Conference in Cardiff. It is pleasing to report that we had filled all our allocated bedrooms at both hotels for the conference, well in advance of the closing date — something to remember for next year! The 2013 Summer Conference was a great success with delegates commenting on the quality of the speakers as well as the fantastic social programme. Look out for a report in a future issue of *Microbiologist*.

Whilst on the subject of Society meetings, I can announce that the Postgraduate Early Career Scientists (PECS) group are holding their second annual meeting (31 October 2013, Charles Darwin House, London). The PECS group have organized the whole event and this year's topic will cover "***Getting published and the peer review process***". In addition to a panel session covering this topic, there will be an opportunity to hear students present their own research findings. There will also be opportunities for students to showcase their work by poster presentation too. Full details of the meeting can be found at: www.sfam.org.uk/en/pecs/autumn-meeting.

I am also pleased to announce two new meeting initiatives for 2014. Firstly, we have organized an additional meeting to our normal winter, spring and summer schedule. The one and a half day meeting will take place 1–2 April 2014 at Lancashire County Cricket Ground, Manchester. The topic to be covered is "***Control of waterborne disease: a century of the activated sludge sewage treatment process***". The meeting is designed to coincide with the Chartered Institute of Water and Environmental Management meeting, which celebrates 100 years of the activated sludge sewage treatment process. Full details of the event can be found at http://www.sfam.org.uk/en/events/meetings-diary.cfm/activatedsludge.

The second new initiative to announce is that next year's Summer Conference will be held in collaboration with the Med-Vet-Net Association (MVNA). The MVNA consists of institutions from 12 countries in Europe, whose primary focus is public health and veterinary diseases. The institute member for the United Kingdom is the Animal Health and Veterinary Laboratories Agency. The meeting will take place from 30 June – 3 July 2014 in Brighton. The topic will be "***Zoonoses***" with several research areas to be covered. They include: risk research, host pathogen interactions, epidemiology and surveillance, detection and control. As well as these scientific sessions there will be the normal Society events such as the Annual General Meeting, W H Pierce Prize lecture, New Lecturer Research Grant lecture and the second annual lecture to celebrate the *Journal of Applied Microbiology*, which will be presented by an invited prestigious speaker. In addition, there will be ample opportunity for poster presentations. As well as the scientific sessions a full social programme has also been organized.

The Society last held a conference in Brighton in 2010 and once again I can report that the Grand Hotel in Brighton will be the 2014 venue for both the conference and the majority of the hotel accommodation we offer. The prestigious Grand Hotel is on the seafront of Brighton and, since we were there in 2010, has undergone a full refurbishment. To avoid disappointment I urge Members to book their place at the meeting as soon as possible. The MVNA will have between 50–70 delegates, so I anticipate the meeting to be very well attended.

I would also like to remind Members that if they require any financial assistance to attend any of the meetings described previously they should consider the various grants (**President's Fund**, **Scientific Meeting Attendance Grant** and, for Student Members, **Summer Conference Studentships**) which are on offer. Already this year we have had a record number of applications for all our grants so, the process of obtaining a grant has become a lot more competitive. However, with over £250000 in 2013 allocated in the grant budget, Members do still stand a very good chance of being successful in their application. A word of warning though, Members must comply with all the terms and conditions of the particular grant they apply for, and these must be read carefully before an application is submitted. Full details of all our grants can be found at http://www.sfam.org.uk/en/grants--awards.

Finally, the Trustee's Annual Report for 2012 was approved at a meeting of the Trustees on the 1 July 2013. The report was accepted by Members who attended the Annual General Meeting on the 3 July 2013 (see page 40). Any Member can view the electronic version of the report by visiting the Members' area of the website (http://www.sfam.org.uk/en/utilities/member-login.cfm). If an individual Member wishes to receive a hard copy, please contact Julie Buchanan (membership@sfam.org.uk) who will gladly post out a copy to any Member who makes this request.

Philip Wheat
Chief Executive Officer

Figure 1. *Adult Culicoides spp feeding. Each insect is approximately 1.5mm in length. Culicoides sonorensis (inset) is a major vector for bluetongue virus in the USA and has been shown to be capable of transmitting Schmallenberg virus (SBV)*

Schmallenberg virus: emergence of a novel pathogen in Europe

During summer and autumn of 2011, dairy cows in North Rhine-Westphalia and the Netherlands showed clinical signs of an infection, which lasted a few days. These included increased body temperatures (>40°C), impaired general condition, anorexia and reduced milk yield (by up to 50%), raising concerns that bluetongue virus (BTV) may have returned to the region.

The first recorded outbreak of bluetongue (BT) in northern Europe (caused by serotype 8) had started only five years earlier (2006) in the Maastricht region of the Netherlands and Belgium, before spreading across almost all of Europe, killing many thousands of animals (mainly sheep). The BT outbreak was successfully eradicated between 2008 and 2010 by a combination of acquired immunity (post infection) in surviving animals and massive vaccination campaigns in the affected countries.

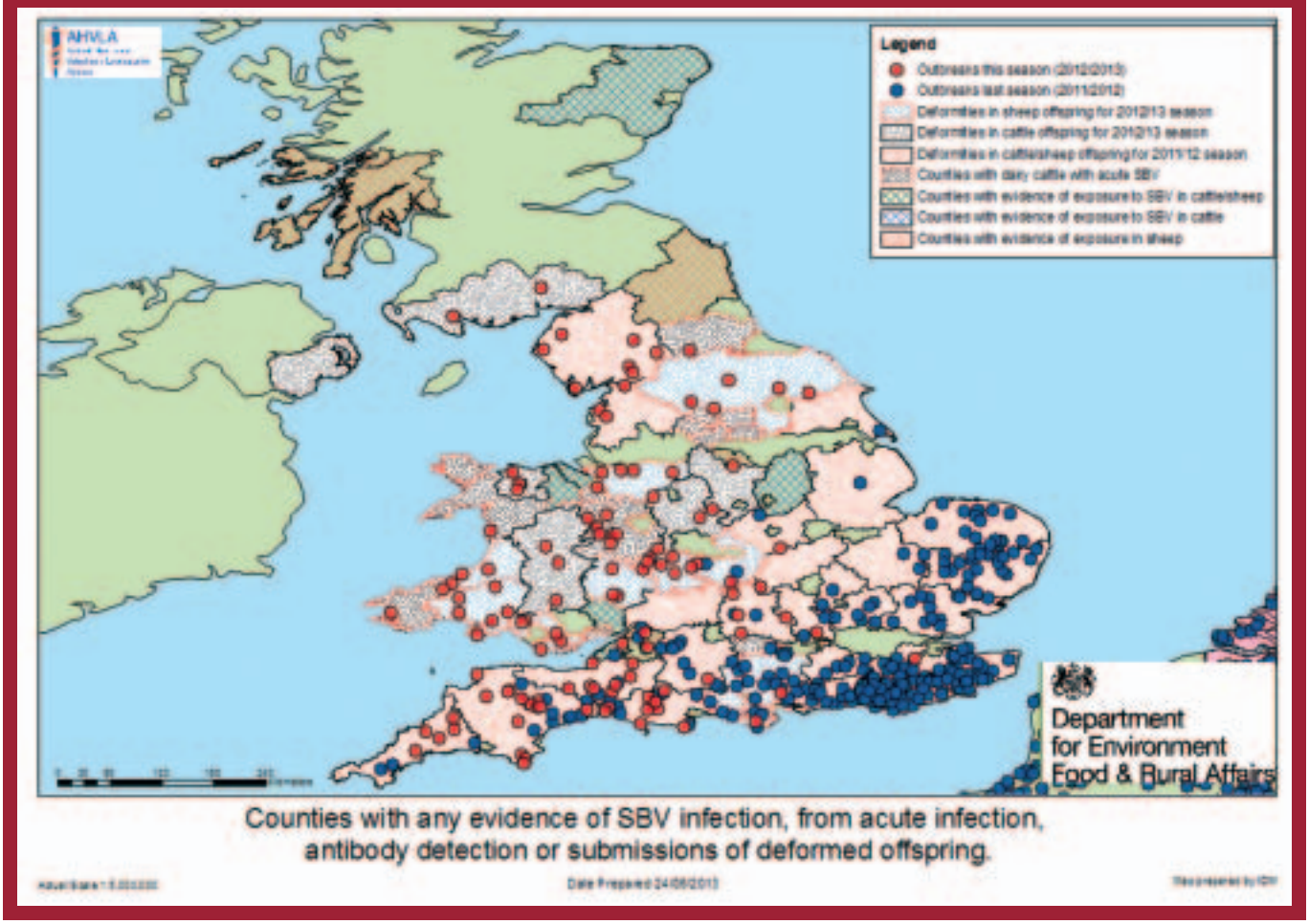
The possibility that the new disease outbreak in Germany was caused by BTV (or one of the other well-known endemic and emerging viruses) was excluded using existing serological and nucleic acid-based diagnostic methods. Samples of blood from an infected cow near the city of Schmallenberg were therefore used to generate in-depth nucleotide sequence data, and a metagenomics approach identified sequences belonging to a previously uncharacterized *Orthobunyavirus*. Full analyses of the three, negative-sense, single-stranded RNA genome segments, and comparisons to established databases showed that the 'Schmallenberg virus' (SBV) is a member of the Simbu serogroup of Orthobunyaviruses, and is related to Akabane, Aino, Simbu and Shamonda viruses, that are endemic across much of Africa and Asia (Hoffman *et al.*, 2012; Beer *et al.*, 2013). SBV represents one of the first economically important veterinary viruses to have been identified by sequencing and metagenomic analyses and is an important milestone in the detection and characterization of emerging viral pathogens. Scientists at the Friedrich-Loeffler-Institut (FLI) in Germany rapidly shared data and PCR-based diagnostic assays for SBV with other laboratories, and are to be complimented on a remarkable demonstration of open and effective scientific collaboration. Assays for neutralizing antibodies have been developed for SBV and diagnostic ELISA for the detection of antibodies to the virus are commercially available for surveillance.

Phylogenetic analyses show that the genome segments of SBV and other Simbu group viruses have been exchanged (reassorted) during their evolution and emergence. Consequently, SBV contains a unique combination of genes and represents a genuinely novel virus strain. The close similarities in part of its genome to the Shamonda virus, suggests that SBV may have originated from sub-Saharan Africa. It is interesting to note that the European strain of BTV-8 is most closely related to a BTV-8 strain isolated in Nigeria during 1982 (Maan *et al.*, 2008).

How did Schmallenberg virus and BTV-8 get to northern Europe ?

SBV is transmitted between its ruminant hosts by biting midges (*Culicoides* spp.). A number of other insect-borne viruses, including multiple different BTV serotypes (BTV-1, 2, 4, 6, 8, 9, 11, 16 and 25), which are also transmitted by adult *Culicoides*, have recently emerged in Europe. Changes in climate and land use may be making the entire region more suitable for their transmission, but a virus still needs to be introduced before it can spread. Midges are easily blown on the wind, allowing disease outbreaks to be spread across long distances. Both BTV-8 and SBV are thought to have been introduced into the UK via infected windborne midges from outbreaks on mainland Europe. BTV-1 and 4 have also spread from North Africa to the Iberian Peninsula in this manner. However, there

Figure 2. *Map showing the current distribution of known SBV cases in the UK. It should be noted however, that the level of surveillance is very limited and it may have spread to areas currently indicated as uninfected*



is no evidence for either BTV-8 or SBV having spread incrementally from southern to northern Europe. While the route of introduction of these strains is currently unknown, a possibility is that they were carried by infected insects present in shipments of plants. The Netherlands is a major centre for international flower imports (e.g., from sub-Saharan Africa), which are cut and packed at night under bright lights, kept cool and then flown to their destinations. Midges attracted to the bright lights could be trapped within these shipments then released upon unpacking. Unfortunately, since introduction events of arboviruses can be extremely rare and almost never directly observed, the actual routes of introduction will probably never be known for certain.

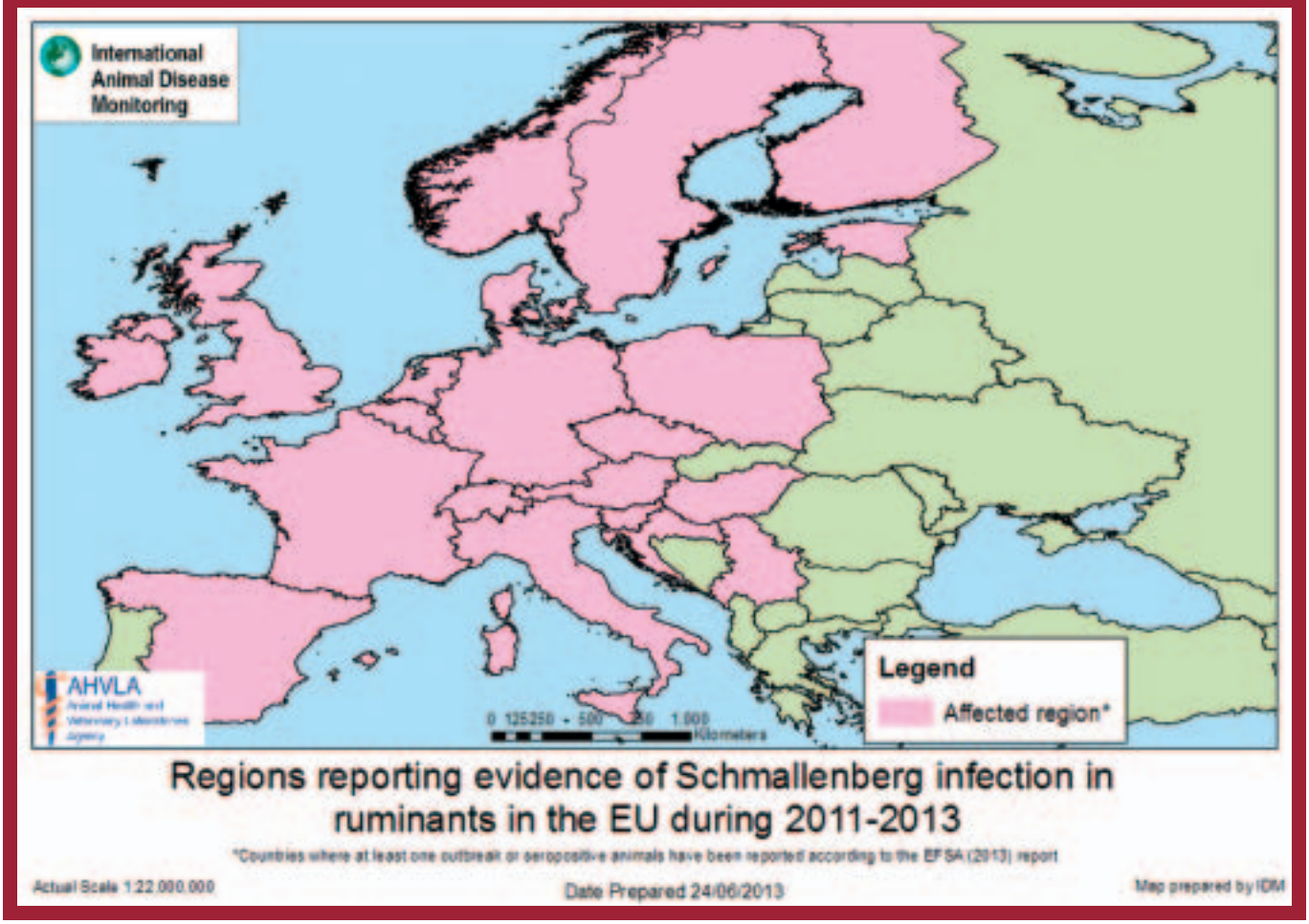
As a consequence of the bluetongue outbreaks in NW Europe, many countries routinely operated *Culicoides* collections during 2011 and retrospective testing in Denmark confirmed the presence of Schmallenberg virus RNA in October 2011 (Rasmussen *et al.*, 2012). SBV was subsequently detected in the heads of adult *Culicoides*, belonging to species that are abundant on European farms (*C. chiopterus*, *C. scoticus* and *C. obsoletus*), collected in the Netherlands during September/October 2011 (Elbers *et al.*, 2013). Most recently, *Culicoides sonorensis* from North America were successfully infected with SBV in the laboratory and will act as the primary laboratory model for replication of the virus (Veronesi *et al.*, 2013). In contrast, attempts to isolate SBV RNA from field-caught mosquitoes, or to artificially infect common European mosquito species with SBV in the laboratory, have been unsuccessful.

Schmallenberg: the disease

Infection with SBV causes mild clinical signs in adult ruminants, which frequently passes unnoticed. However, SBV can cross the placenta, causing severe developmental problems in the foetus. Infection during the very early stages of pregnancy often leads to early abortion or reabsorption of the foetus. Infection during the second month in sheep (with highest risk estimated as days 25 to 50) or the third to sixth month in cattle (with highest risk estimated as days 62 to 173) can have severe teratogenic effects, particularly damaging the central nervous system (with brain deformities and marked damage to the spinal cord) as well as bent limbs and fixed joints (torticollis, scoliosis, arthrogryposis, enlarged thymus, hypoplasia of the central nervous system, hydranencephaly, ankylosis, scoliosis, porencephaly and subcutaneous oedema). Some animals are born with a normal outer appearance but have nervous signs such as a 'dummy' presentation (hydrocephaly) or blindness, ataxia, recumbency, an inability to suck or fits.

Infections during the later stages of

Figure 3. *Distribution of known SBV infections across Europe*



pregnancy (after development of the foetus' immune system) are largely thought to result in development of a protective immune response and less, if any, physical damage. Teratogenic effects are common in sheep and cattle, and occasional in goats. Although the disease is not notifiable and is considered to have a low overall economic impact, it has caused up to 50% losses in some affected flocks. This may reflect efficient local spread of the virus during the high-risk period, in flocks with highly synchronized pregnancies, and problems may be reduced in groups of animals with more asynchronous pregnancies, or pregnancies during winter when there are fewer adult *Culicoides* to transmit the virus.

Infection with SBV generates a short-lived viraemia (day one to four post infection) in cattle or sheep, providing the opportunity for trans-placental transmission. The virus can persist in the spleen of infected sheep for at least one month post infection (detected by RT-PCR), as well as in the lymph nodes and testes, generating a robust immune response. Infection causes a significant rise in body temperature (four degrees), which may affect male reproductive performance. However, the detection of infectious virus in semen may be of much greater concern post infection and may itself contribute to long-term persistence, as well as reduced reproductive performance. Although the Oropouche virus (another Simbu serogroup, *Orthobunyavirus*) causes disease in humans in the Caribbean and parts of South America, intensive serological studies of groups thought to be at elevated risk of exposure (veterinarians and animal handlers) in mainland Europe failed to detect any serological evidence of SBV infection, and it is not considered to represent a zoonotic risk.

Strategies to control virus spread, by eliminating or reducing vector populations, are not thought to have been effective during the European BT outbreaks and vaccination is considered to be the most effective control measure. Inactivated vaccines have recently been developed and are now commercially available for SBV. These are similar in basic design to those previously used very successfully to combat BTV-1 and BTV-8 in northern Europe. The virus is grown in cell culture (e.g., BHK cells) then chemically inactivated to provide a source of viral antigens. Consequently, the vaccinated animal develops antibodies to all of the viral proteins making it difficult to differentiate infected animals from vaccinated animals (DIVA), potentially compromising further surveillance. However, vaccination-challenge studies indicate that these SBV vaccines generate good levels of neutralizing antibodies and can prevent viraemia, protecting the unborn foetus. They are also considered likely to supress the virus transmission cycle by protecting naïve hosts from initial infection, as well

as removing the circulating viraemia in the host and preventing subsequent infection of insect vectors.

The first commercial SBV vaccine was licensed for use only 477 days after the virus was first isolated and most of this time was necessary for the licensing process. However, some countries may choose not to accept semen or ova from seropositive animals, meaning that without a 'DIVA vaccine', vaccination could have local and international trade implications.

The risks of other arboviruses emerging in Europe

More than 550 arboviruses have been identified, most have RNA genomes and belong to the *Bunyaviridae*, *Flaviviridae*, *Togaviridae*, *Reoviridae*, *Rhabdoviridae* and *Orthomyxoviridae* families.

Other orbiviruses: based on the recent emergence and spread of BTV in Europe, two other important orbiviruses, that are also circulating in Africa and are transmitted by adult *Culicoides*, are thought to represent important risks to European livestock species. The first is the African horse sickness virus (AHSV), which causes African horse sickness (AHS) recognized as one of the most severe and lethal diseases of horses, causing up to 100% fatality in naïve animals, often within four days of infection. Earlier outbreaks of AHS in the Iberian Peninsula were caused by AHSV serotypes 4 or 9. AHSV is currently circulating in Ethiopia and the Gambia.

The other virus is the epizootic haemorrhagic disease virus (EHDV), which can cause high levels of fatality (up to 100%) in certain deer species, but may also cause severe clinical signs in cattle. EHDV has not previously been detected in Europe, but has recently caused disease outbreaks in Israel and Morocco. Other orbiviruses, such as Palyam virus or Peruvian horse sickness virus may also have the potential to emerge and spread to other continents.

Chikungunya virus (CHIKV) is an alphavirus of the family *Togaviridae*. The virus caused a massive outbreak of human disease on the French island of La Reunion in 2006, and has since caused smaller outbreaks in Italy and the Netherlands. Other viruses of this family present in Europe include Sindbis virus (SINV) and Ockelbo virus.

West Nile virus (WNV) is a member of the family *Flaviviridae* (Japanese encephalitis serocomplex). WNV is transmitted by *Culex* spp. mosquitoes, is maintained in its avian hosts, and has a wide 'global' distribution, causing disease outbreaks that affect equines, birds and humans. WNV has caused infections in numerous European countries around the Mediterranean basin since the late 1950s and is now considered endemic in Italy, Greece and France, as well as the USA. Bird and mosquito species able to support the spread of WNV further north have been identified in most northern European countries, including the UK. Other viruses of the family include dengue virus (DENV) and louping-ill virus (LIV). LIV has been isolated from field samples in the UK.

Rift Valley fever virus (RVFV) is a phlebovirus of the *Bunyaviridae*. The virus, first isolated during an outbreak in Kenya (1931), primarily infects livestock causing high mortality rates among newborn animals and abortions in pregnant animals, with large economic losses. In humans, RVFV commonly causes flu-like febrile illness, although fatal cases of encephalitis and haemorrhagic fever have been documented — for example, in the 1978 outbreak in Egypt, 200,000 human infections with 600 deaths were recorded. Primary transmission vectors for RVFV include mosquitoes (*Aedes* spp.), although many other species are also competent to transmit the virus. Until recently RVFV was limited to sub-Saharan Africa. However, RVFV has emerged in new territories including Saudi Arabia and Yemen. The presence of competent vectors together with a naïve animal population in Europe, could potentially allow spread of RVFV although the speed and persistence of incursions is difficult to predict. Other members of the *Bunyavirus* family include 'Nairobi sheep disease virus' (NSDV), 'Crimean-Congo haemorrhagic fever virus' (CCHFV), SBV, Akabane virus and sandfly-transmitted Toscana virus.

The increased risk posed by the arboviruses in Europe has been clearly illustrated by recent events with BTV and SBV. It is uncertain if SBV will persist long-term (like the Akabane virus in Australia) or if a combination of vaccination and natural burn out will lead to its eradication from the region. However, recent detection of the live South African vaccine strain of BTV-14 in northern Europe (during 2012 and 2013) demonstrates that problems with emerging arboviruses will continue. What will arrive next?

references

- Beer, M., Conraths, F.J., and van der Poel, W. H. (2013). 'Schmallenberg virus'— a novel *Orthobunyavirus* emerging in Europe. *Epidemiol Infect*. 2013 Jan, **141**(1):18. doi: 10.1017/S0950268812002245. Epub 2012 Oct 10.
- Elbers, A. *et al*. (2013). Schmallenberg virus in *Culicoides* spp. biting midges, the Netherlands, 2011. *Emerging Infectious Diseases*, 2013, Jan. doi: 10.3201/eid1901.121054.
- Hoffmann, B. *et al*. (2012). Novel *Orthobunyavirus* in cattle, Europe, 2011. *Emerging Infectious Diseases*, 18(3). doi: 10.3201/eid**18**03.111905.
- Maan, S. *et al*. (2008). Sequence analysis of bluetongue virus serotype 8 from the Netherlands 2006 and comparison to other European strains. *Virology*, **377**(2), pp308–318.
- Rasmussen, L. D, *et al*. (2012). Culicoids as vectors of Schmallenberg Virus. *Emerging Infectious Diseases* 18(7): 1204–1206. doi: 10.3201/eid**18**07.120385.
- Veronesi, *et al*. (2013). Implicating *Culicoides* biting midges as vectors of Schmallenberg virus using semi-quantitative RT-PCR. *PLoS ONE* **8**(3): e57747. doi/10.1371/journal.pone.0057747.

Peter Mertens[1], Anthony Wilson[1], Rennos Fragkoudis[1], Helen Roberts[2] and **Simon Carpenter[1]**

[1]The Pirbright Institute, [2]Animal Health and Veterinary Laboratories Agency

Assessing the risk of vector-borne disease to UK public health in the face of climate change

Introduction

Vector-borne diseases (VBDs) present challenges to both veterinary and public health, and changes in the spread and transmission of VBDs is said to be due to a number of factors, one of which is climate change. VBDs can be affected by changes such as increased or decreased temperature or rainfall owing to the direct effects these have on invertebrate vectors and the pathogens they transmit. However, the complexity of VBDs means that climate change alone does not drive transmission cycles. Other ecological, physical and socio-economic factors need to be considered (Medlock & Jameson, 2010; Wardekker *et al.*, 2012; Kilpatrick & Randolph, 2012; Semenza *et al.*, 2012).

In the UK, there are a number of key climate change adaptation strategies linked with biodiversity initiatives, which will result in landscape changes. Such changes include wetland expansion, flood alleviation, urban drainage, green corridor initiatives in towns and cities, and the creation of salt marsh and grazing marsh to alleviate the impacts of coastal erosion and sea-level rise. These, coupled with the direct factors driving disease transmission, will impact the risk of VBDs in the UK. This combinational effect will be complex and in order to understand such changes, there is a requirement for nationwide and targeted vector surveillance, as well as research into evidence-based mitigation strategies to protect against potential VBDs, particularly in locations affected by environmental change.

Medical entomology and zoonoses ecology

In an increasingly connected world, through both travel and trade, as well as an expanding global human population, and greater consequent contact between humans and domestic animals, the requirement for the detection and quantification of the risk of infections, including VBDs, is paramount to ensure that health and environmental systems adopt the correct strategies to protect public health from novel issues.

During the first decade of the 21st century, Europe witnessed unexpected outbreaks of bluetongue virus in northern countries (Purse *et al.*, 2008), the continued spread of the exotic mosquito *Aedes albopictus* (Figure 1), which is a potential vector of several arboviral diseases, and the emergence of Chikungunya virus (CHIKV) in Italy (Rezza *et al.*, 2007). Crimean-Congo haemorrhagic fever virus (CCHFV) has also, for the first time, caused clinical disease in humans in both Turkey (Karti *et al.*, 2004) and Greece (Papa *et al.*, 2008). New foci of the tick-borne encephalitis virus (TBEV) have been reported further north in Scandinavia (Haglund, 2002). Usutu virus (USUV) has emerged in Austria (Weissenböck *et al.*, 2002), Hungary (Bakonyi *et al.*, 2007) and Spain (Busquets *et al.*, 2008) and outbreaks of West Nile virus (WNV)

Figure 1. *Current known distribution of Aedes albopictus in Europe (ECDC, 2013)*

continue to appear in France (Guidice *et al.*, 2004), Hungary (Krisztalovics *et al.*, 2008) and Romania (Hubálek & Halouzka, 1999), and have also emerged in Italy (Savini *et al.*, 2008) and Greece (Papa *et al.*, 2011). An increase in Lyme borreliosis incidence has also been reported in many European countries and more recently, a large-scale dengue virus outbreak in Madeira has confirmed the virus' re-establishment in Europe (Sousa *et al.*, 2012). These events present new challenges to public health in Europe and remind us to remain vigilant and prepared.

In order to assess the risk of VBDs to UK public health, an ecological understanding of vectors and zoonotic disease transmission cycles is vital. This requires a clear understanding of the ecological and biological drivers for disease transmission, and how climate and habitat change may impact upon this. The Medical Entomology and Zoonoses Ecology group (MEZE), part of Public Health England's (PHE) Emergency Response Department, conduct risk assessment and surveillance to assess the public health significance of potential VBDs, and the impact of climatic and environmental change to gain an understanding of risk at a national level. MEZE also develop ecological, evidence-based strategies to minimize human-vector exposure at a local level.

Direct effects of climate change on vectors, their pathogens and vertebrate hosts

Warmer drier summers, wetter milder winters and longer growing seasons, as well as more frequent extreme weather events such as heatwaves and flooding, all have the potential to directly affect the occurrence of VBDs. This will impact directly on the invertebrate vector in relation to its seasonality and abundance, the pathogen and its development in the vector, and the population dynamics and survival rates of vertebrate hosts for both the vector and pathogen; creating a complex transmission cycle. To understand the impact on vectors, there is a requirement to understand which potential vector species are present in the UK, their current distribution and whether their range is expanding. The role of exotic species in vector-borne disease transmission in Europe necessitates an understanding of the pathways for these species to be imported into the UK and an assessment of their potential for establishment, and whether the public are becoming more exposed to vector biting.

To address some of these issues, PHE has been running a tick and mosquito surveillance scheme since 2005, with results, to date, of the tick scheme being recently published (Jameson & Medlock, 2011). Data on tick and mosquito distribution, and biting incidence is submitted to the schemes by the public,

GPs, veterinarians, environmental health officers, wildlife charities and ecologists, as well as amateur naturalists. PHE now have baseline data on potential vector species and comparison with historical data (1880–2004) shows evidence of expansion of some of these vectors, particularly the Lyme borreliosis vector, *Ixodes ricinus* (Figure 2). Submissions have also led to the detection of non-native tick species, the expansion of geographically restricted species to new foci (Jameson & Medlock, 2009), the discovery of new (previously overlooked and extinct) mosquito species (Medlock & Vaux, 2009; Golding *et al.*, 2012), as well as the detection of previously unrecorded rickettsial pathogens in British ticks (Tijsse-Klasen *et al.*, 2011).

To facilitate the detection of exotic mosquito species, PHE has been working with the Association of Port Health Authorities and Salford University to conduct surveillance at 11 UK seaports and airports, the importance of which is outlined in the WHO International Health Regulations. This work is supported by spatial risk mapping/modelling work to aid our understanding of the potential for establishment and seasonal activity of exotic vectors such as *Ae. albopictus* in the UK (Medlock *et al.*, 2006) and continental Europe (Caminade *et al.*, 2012). This work concludes that *Ae. albopictus*, which has successfully travelled from Asia to Europe via North America, could establish in the current British climate, with adult activity occurring over four months in some regions. With predicted future changes in climate, conditions in the UK will likely become more suitable for this mosquito and over a larger number of regions (Caminade *et al.*, 2012). The importation of used tyres and wet-footed plants are the most likely routes by which such species could enter the UK as eggs. In line with similar activities in continental Europe, PHE have therefore, been conducting surveillance at imported tyre sites for exotic mosquitoes since 2010 (Figure 3).

PHE has also been working with the Chartered Institute of Environmental Health (CIEH) to assess the incidence of mosquito nuisance-biting reported to local authorities (LAs) across the UK, a follow-up to previous surveys conducted in 1985 and 1996. PHE, in conjunction with CIEH, actively encourages environmental health officers to submit mosquitoes for identification, particularly as endemic species are often misidentified and reported as exotic species. Results from a 2009 survey suggest that 26% of LAs have responded to nuisance mosquito issues in the last 10 years, and 14% within the last year. This constitutes a threefold increase in LAs reporting such issues compared with the 1996 survey (Medlock *et al.*, 2012a).

Figure 2. *Ixodes ricinus (Lyme borreliosis vector). Left to right: larvae, nymph, male, female*

Indirect effects of climate change on ticks and mosquitoes: adaptation for biodiversity

Ecologists are already reporting changes in the distribution and abundance of various wildlife species in the UK, and attributing these to a change in climate. There are concerns now that owing to the fragmentation of habitats in the UK during the last century, the possibility for natural dispersal and migration of some of the rarer, or more ecologically defined, species is limited and that many species will not be able to adjust to climate change, leaving only remnant populations surviving in isolated ark communities. In coastal areas, the prospects of sea-level rise, storm surges and ageing sea defences are posing challenges to protected coastal habitats. To ensure that wildlife species can adapt, a raft of strategies has been initiated in recent years which includes identifying sites for the creation of new wetlands, through expansion of existing wetlands onto neighbouring arable farmland, restoration of old wetlands and the creation of salt-marshes, and coastal realignment projects to soften the impact of saltwater incursions.

Landscape scale ecological networks are also promoting enhanced management of existing habitats and connectivity between these habitats to ensure that we 'restore, recreate and reconnect'. These strategies also extend into urban areas through the development of urban green space/corridors and sustainable urban drainage. There is no doubt that all these initiatives should be supported as their value for wildlife is without question. In addition, they assist in improving the well-being of local communities, thus contributing to public health. However, it is possible these initiatives could contribute to an increase in available habitat for ticks and mosquitoes, and in greater proximity to human habitation and recreational spaces. In the case of ticks, the numbers of deer (the principal host of *I. ricinus* ticks) are increasing and are now more frequently associated with peri-urban areas. This may explain the increase in garden-tick problems reported to PHE (Jameson & Medlock, 2011). In addition to these 'landscape design' strategies, are natural events such as flooding and there has already been an increase in reports to NHS Direct of mosquito biting, associated with these events.

Mosquitoes and wetland expansion

PHE is working closely with DEFRA, the Wildlife Trusts, Natural England, the Environment Agency, the Food and Environment Research Agency and local land managers to begin to understand the impacts of wetland management schemes on ticks and mosquitoes, and

begin to develop environmentally sensitive evidence-based vector mitigation strategies. In relation to wetlands, PHE have, for example, been conducting intensive field-based research on the impact of wetland expansion (Figure 4) and management on mosquitoes in Cambridgeshire (Medlock & Vaux, 2011; 2013). This is being used to inform and update ongoing PHE public health risk assessments on disease risk.

Ticks and habitat connectivity

Strategies such as improved connectivity between habitats, woodland management for biodiversity, and urban green corridors act to increase the ecotonal habitat (i.e., the habitat interface favoured by tick hosts) and peri-urban wildlife, facilitating an increased abundance and spread of deer. This may also lead to an increase in abundance and distribution of ticks, and an increased exposure to humans of ticks in peri-urban areas. Whatever the driving forces, the expansion of *I. ricinus* ticks in the UK is now well established and PHE have been working to translate some of the national tick data into landscape (Medlock et al., 2008) and habitat scale (Medlock *et al.*, 2012b) maps through the identification of ecological and environmental factors that determine tick hotspots. This work is now being extended to urban areas in order to better understand how borrelia (the agent of Lyme disease) prevalence rates in ticks might be impacted by ecological variables within a landscape, habitat and urban setting. The occurrence of *I. ricinus* across landscapes and within woodlands is determined by vertebrate host availability and microclimate; the latter being influenced by vegetation structure and soil/bedrock permeability, as well as by various topographical features that impact environmental exposure. These field-validated findings are now being used to provide evidence-based guidance to the public to help reduce their exposure to ticks and guidance to land managers in ensuring that tick hotspots can be mitigated using existing woodland/habitat management strategies across a range of rural and peri-urban habitats.

Conclusion

In conclusion, the status of vector-borne disease risk has changed dramatically in Europe during the last 10 years. Climate change *per se* is only likely to be partly responsible for this. Particularly in the UK context, the impact of climate change on arthropod vectors should be considered more broadly than in respect to just changes in temperature and rainfall. In light of the strategies being implemented to adapt to climate change, including changes in land management, there exist possible future conflicts between biodiversity-enhancing strategies and potential VBD risk that require evidence-based approaches. It is fair to conclude that our adaptation strategies to climate change may impact on vectors and associated pathogens more significantly than changes in weather and climate alone. This illustrates the importance of close working between PHE and its sister agencies in the environmental and veterinary sectors, as well as sharing data across Europe (Medlock *et al.*, 2013).

Figure 3. *Larval sampling at tyre depots for detection of invasive species and potential aquatic habitats.* ***(a)****: drains collecting rainwater and leaf litter;* ***(b)****: larvae of UK endemic species found in tyres;* ***(c)****: temporary flooding/pooling of water;* ***(d)****: leaf litter substrate in rainwater collecting in tyres*

Figure 4. *Wetland expansion will impact upon UK mosquito species*

further reading

■ Bakonyi, T., Erdélyi, K., Ursu, K., Ferenczi, E., Csörgo, T., Lussy, H., Chvala, S., Bukovsky, C., Meister, T., Weissenböck, H., and Nowotny, N. (2007). Emergence of Usutu virus in Hungary. *Journal of Clinical Microbiology*, **45**(12), pp3870–3874.

■ Busquets, N., Alba, A., Allepuz, A., Aranda, C., and Ignacio Nuñez, J. (2008). Usutu virus sequences in *Culex pipiens* (Diptera: Culicidae), Spain. *Emerging Infectious Diseases*, **14**(5), pp861–863.

■ Caminade, C., Medlock, J. M., Ducheyne, E., McIntyre, K. M., Leach, S., Baylis, M., and Morse, A. P. (2012). Suitability of European climate for the Asian tiger mosquito *Aedes albopictus*: recent trends and future scenarios. *Journal of the Royal Society*, Interface / the Royal Society, **9**(75), pp2708–2717.

■ ECDC. (2013). Exotic mosquito distribution maps. Available at: http://ecdc.europa.eu/en/activities/diseaseprogrammes/emerging_and_vector_borne_diseases/Pages/VBORNET_maps.aspx Accessed 24/06/2013.

■ Giudice, P. D., Schuffenecker, I., Vandenbos, F., Counillon, E., and Zeller, H. (2004). Human West Nile virus, France. *Emerging Infectious Diseases*, **10**, pp1885–1886.

■ Golding, N., Nunn, M. A., Medlock, J. M., Purse, B. V., Vaux, A. G., and Schafer, S. M. (2012). West Nile virus vector *Culex modestus* established in southern England. *Parasites & Vectors*, **5**, p32.

■ Haglund, M. (2002). Occurrence of TBE in areas previously considered being non-endemic: Scandinavian data generate an international study by the International Scientific Working Group for TBE (ISW-TBE). *International Journal of Medical Microbiology*: *IJMM*, **291** Suppl 33, pp50–54.

■ Hubálek, Z., and Halouzka, J. (1999). West Nile fever- a re-emerging mosquito-borne viral disease in Europe. *Emerging Infectious Diseases*, **5**(5), pp643–650.

■ Jameson, L. J., and Medlock, J. M. (2011). Tick surveillance in Great Britain. *Vector borne and zoonotic diseases* (Larchmont, N.Y.) **11**(4), pp403–412.

■ Jameson, L. J., and Medlock, J. M. (2009). Results of the HPA tick recording scheme. *Veterinary Record*, 165:154 doi:10.1136/vr.165.5.154-a.

■ Krisztalovics, K., Ferenczi, E., Molnár, Z., Csohán, Á., Bán, E., Zöldi, V., and Kaszás, K. (2008). West Nile virus infections in Hungary, August-September. *Euro Surveillance*, **13**(45).

■ Karti, S. S., Odabasi, Z., Korten, V., Yilmaz, M., Sonmez, M., Caylan, R., Akdogan, E., Eren, N., Koksal, I., Ovali, E., Erickson, B. R., Vincent, M. J., Nichol, S. T., Comer, J. A., Rollin, P. E., and Ksiazek, T. G. (2004). Crimean-Congo hemorrhagic fever in Turkey. *Emerging Infectious Diseases*, **10**(8), pp1379–1384.

■ Kilpatrick, A. M., and Randolph, S. E. (2012). Drivers, dynamics, and control of emerging vector-borne zoonotic diseases. *Lancet*, **380**(9857), pp1946–1955.

■ Medlock, J. M., and Jameson, L. (2010). Tick surveillance in Great Britain. *Vector Borne Zoonotic Dis*., 2011, Apr, **11**(4):403-12. doi: 10.1089/vbz.2010.0079. Epub 2010 Sep 17.

■ Medlock, J. M., and Vaux, A. (2009). *Aedes* (*Aedes*) *geminus* Peus (Diptera, Culicidae) – an addition to the British mosquito fauna. *Dipterists Digest*, **16**, pp147–150.

■ Medlock, J. M., and Vaux, A. G. C. (2011). Assessing the possible implications of wetland expansion and management on mosquitoes in Britain. *European Mosquito Bulletin*, **29**, pp38–65.

■ Medlock, J. M., and Vaux, A. G. C. (2013). Colonization of UK coastal realignment sites by mosquitoes: Implications for design, management, and public health. *Journal of Vector Ecology*, **38**(1), pp53–62.

■ Medlock, J. M., Avenell, D., Barrass, I., and Leach, S. (2006). Analysis of the potential for survival and seasonal activity of *Aedes albopictus* (Diptera: Culicidae) in the United Kingdom. *Journal of Vector Ecology: Journal of the Society for Vector Ecology*, **31**(2), pp292–304.

■ Medlock, J. M., Barrass, I., Kerrod, E., Taylor, M. A., and Leach, S. (2007). Analysis of climatic predictions for extrinsic incubation of Dirofilaria in the United Kingdom. *Vector borne and zoonotic diseases* (Larchmont, N.Y.), **7**(1), pp4–14.

■ Medlock, J. M., Hansford, K. M., Anderson, M., Mayho, R., and Snow, K. R. (2012a). Mosquito nuisance and control in the UK — A questionnaire based survey of local authorities. *European Mosquito Bulletin*, **30**, pp15–29.

■ Medlock, J. M., Hansford, K. M., Bormane, A., Derdakova, M., Estrada-Peña, A., George, J.-C., Golovljova, I., Jaenson, T. G., Jensen, J.-K., Jensen, P. M., Kazimirova, M., Oteo, J. A., Papa, A., Pfister, K., Plantard, O., Randolph, S. E., Rizzoli, A., Santos-Silva, M. M., Sprong, H., Vial, L., Hendrickx, G., Zeller, H., and Bortal, W. V. (2013). Driving forces for changes in geographical distribution of *Ixodes ricinus* ticks in Europe. *Parasites & Vectors*, **6**(1), p1.

■ Medlock, J. M., Pietzsch, M. E., Rice, N. V. P., Jones, L., Kerrod, E., Avenell, D., Los, S., Ratcliffe, N., Leach, S., and Butt, T. (2008). Investigation of ecological and environmental determinants for the presence of questing *Ixodes ricinus* (Acari: Ixodidae) on Gower, South Wales. *Journal of Medical Entomology*, **45**(2), pp314–325.

■ Medlock, J. M., Shuttleworth, H., Copley, V., Hansford, K. M., and Leach, S. (2012b). Woodland biodiversity management as a tool for reducing human exposure to *Ixodes ricinus* ticks: a preliminary study in an English woodland. *Journal of Vector Ecology: Journal of the Society for Vector Ecology*, **37**(2), pp307–315.

■ Papa, A., Maltezou, H. C., Tsiodras, S., Dalla, V. G., Papadimitriou, T., Pierroutsakos, I., Kartalis, G. N., and Antoniadis, A. (2008). A case of Crimean-Congo haemorrhagic fever in Greece, June 2008, *Euro surveillance*, **13**(33).

■ Papa, A., Xanthopoulou, K., Gewehr, S., and Mourelatos, S. (2011). Detection of West Nile virus lineage 2 in mosquitoes during a human outbreak in Greece. *Clinical Microbiology and Infection: the official publication of the European Society of Clinical Microbiology and Infectious Diseases*, **17**(8), pp1176–1180.

■ Purse, B. V., Brown, H. E., Harrup, L., Mertens, P. P. C., and Rogers, D. J. (2008). Invasion of bluetongue and other orbivirus infections into Europe: the role of biological and climatic processes. *Revue scientifique et technique* (International Office of Epizootics), **27**(2), pp427–442.

■ Rezza, G., Nicoletti, L., Angelini, R., Romi, R., Finarelli, A. C., Panning, M., Cordiolo, P., Fortuna, C., Boros, S., Magurano, F., Silvi, G., Angelini, P., Dottori, M., Ciufolini, M. G., Majori, G. C., and Cassone, A. (2007). Infection with CHIKV in Italy: an outbreak in a temperate region. *The Lancet*, **370**(9602) pp1840–1846.

■ Savini, G., Monaco, F., Calistri, P., and Lelli, R. (2008). Phylogenetic analysis of West Nile virus isolated in Italy in 2008. *Euro surveillance*, **13**(48).

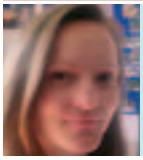
■ Semenza, J. C., Suk, J. E., Estevez, V., Ebi, K. L., and Lindgren, E. (2012). Mapping climate change vulnerabilities to infectious diseases in Europe. *Environmental Health Perspectives*, **120**(3), pp385–392.

■ Sousa, C. A., Clairouin, M., Seixas, G., Viveiros, B., Novo, M. T., Silva, A. C., Escoval, M. T., and Economopoulou, A. (2012). Ongoing outbreak of Dengue type 1 in the autonomous region of Madeira, Portugal: preliminary report. *Euro surveillance*, **17**(49).

■ Tijsse-Klasen, E., Jameson, L. J., Fonville, M., Leach, S., Sprong, H., and Medlock, J. M. (2011). First detection of spotted fever group rickettsiae in *Ixodes ricinus* and *Dermacentor reticulatus* ticks in the UK. *Epidemiology and Infection*, **139**(4), pp524–529.

■ Wardekker, J. A., de Jong, A., van Bree, L., Turkenburg, W. C., and van der Sluijs, J. P. (2012). Health risks of climate change: an assessment of uncertainties and its implications for adaptation policies. *Environmental Health: a global access science source*, **11**, p67.

■ Weissenböck, H., Kolodziejek, J., Url, A., Lussy, H., Rebel-Bauder, B., and Nowotny, N. (2002). Emergence of Usutu virus, an African mosquito-borne flavivirus of the Japanese encephalitis virus group, central Europe. *Emerging Infectious Diseases*, **8**(7), pp652–656.




Kayleigh M. Hansford (left) and **Jolyon M. Medlock** (right), Public Health England

MERS-CoV — an update

Figure 1. *Timeline of three novel coronavirus cases, United Kingdom, December 2012 to February 2013*

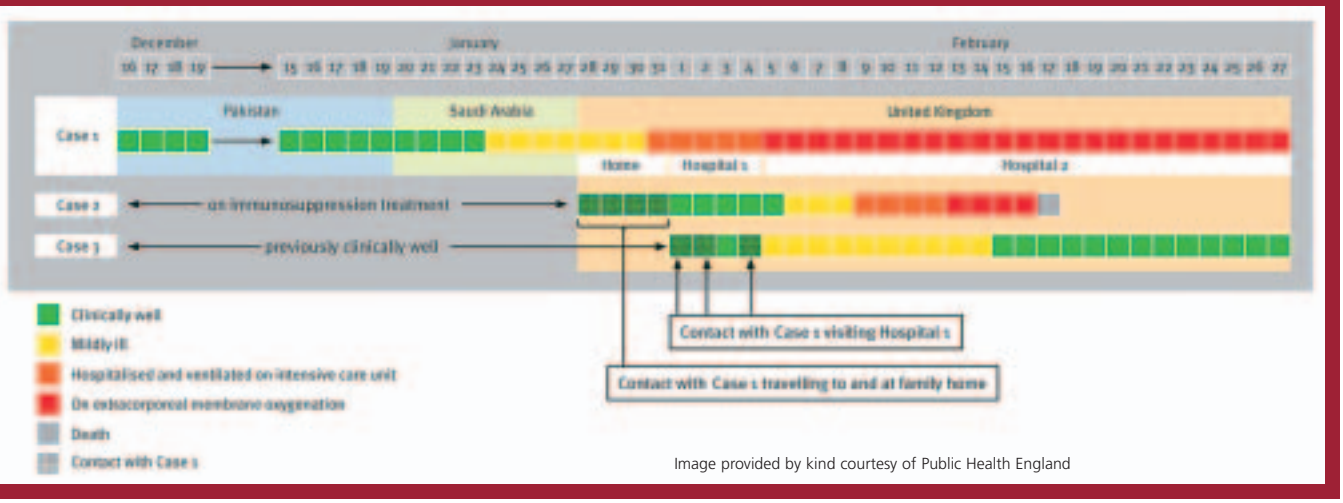


Image provided by kind courtesy of Public Health England

On 14 September 2012, a notification was sent to the Health Protection Agency's (now Public Health England) Imported Fever Service. A man was suffering with an unidentified respiratory illness that looked very much like SARS (severe, acute, respiratory syndrome) and media reports reflected this concern.

The man had developed mild respiratory symptoms on 2 September whilst in Qatar, following a visit to Saudi Arabia. These initial symptoms, Richard Pebody, Consultant Epidemiologist at Public Health England (PHE), told a conference in London on 9 July 2013, had then regressed. But a week later he was hospitalized in Qatar and in respiratory distress.

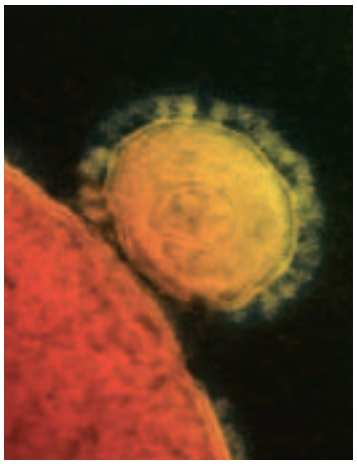
On 11 September he was flown by air ambulance to an intensive care unit in London. All the tests for common causes of respiratory illness, including seasonal coronavirus, were negative. And then something quite serendipitous occurred: on 20 September there was a report posted on the ProMED update service describing the detection and identification of a new human coronavirus. The patient was a Saudi national who had become unwell in June 2012 and subsequently died.

Staff at PHE's Colindale laboratory and colleagues in Birmingham picked up the news. They began to screen the patient for coronaviruses and although there was a positive result, they weren't able to attribute the illness to any specific sub-type. Monica Galiano and colleagues at Colindale sequenced the viral genome and compared it with a sequence from the June 2012 case, which had been produced at the Erasmus Medical Centre in the Netherlands; there was a very high degree of similarity. This was the same coronavirus sub-type and the second confirmed case.

Subsequently, on 21 September, the local, regional and national emergency responses were mobilized. Risk assessments were carried out and advice on infection control around the new case was given. This included respiratory isolation in a negative pressure room and appropriate personal protective equipment (PPE) for healthcare workers. Contacts of the patient were identified and a case definition agreed to target screening.

The movements and behaviours of the patient prior to the onset of illness contained two potentially significant features: one, he had recently returned from travelling in the Middle East, and two, whilst travelling he had been in contact with farm animals. Otherwise, there was little to go on and little hope. Indeed, the patient spent several months on extracorporeal membrane oxygenation (ECMO) support and subsequently died in late June 2013.

So, as of September 2012 we have a SARS-like illness, seemingly centred around Saudi Arabia and with a clear ability to travel. The memory of SARS, said Dr Brian McCloskey, Director of Global Health at PHE, has made us sensitive and prepared for the emergence of new respiratory illness. Moreover, as Ab Osterhaus, Head of the Virology Department at Erasmus, reported, there has been at least one new human respiratory virus identified each year for the past 15 years, and we are getting better at finding and characterizing them from only a small number of cases. However, the question still on everyone's minds was whether this had the potential to cause a pandemic of fatal illness.



The 'first few hundred' approach to identifying contacts was applied in the UK case. Any contacts with symptoms were put into respiratory isolation and samples were taken for testing. Sixty-four people were identified who had been in close contact with the case. Eight of these were family and friends, and 56 were healthcare workers from two London hospitals. None of the family and friends went on to develop respiratory symptoms, but 13 healthcare workers were identified as possible secondary cases with mild symptoms.

Testing of upper respiratory tract swabs indicated that none were positive for MERS-CoV. Paired sera were also taken from most of the close contacts and again no evidence of infection was present.

Surveillance of returning travellers with respiratory illness began immediately in September 2012. Of particular concern was the upcoming Hajj in late October, which would see up to 40,000 UK citizens visit and then return from Saudi Arabia within a short period of a couple of weeks. The case definition at that time consisted of severe undiagnosed respiratory illness and a history of travel in the Middle East. Fortunately, no new cases were identified in travellers returning to the UK following the Hajj.

So far so good, but in February 2013 a middle-aged UK resident returned to Birmingham after several months spent in Pakistan and Saudi Arabia. He had a history of chronic heart disease and had initially been diagnosed with influenza A. After failure to improve with treatment for flu, MERS-CoV was flagged as a possible diagnosis. He was transferred from Birmingham to Manchester for ECMO support and died later in March.

Follow-up identified 92 contacts among the patient's friends and family as well as healthcare workers. Twenty contacts were from a household setting and of those, one developed respiratory symptoms and was subsequently diagnosed with MERS-CoV. Fifteen of the household contacts also visited the patient in hospital of whom five developed respiratory symptoms, but none were positive for MERS-CoV. Thirteen other hospital visitors were also identified as close contacts, one of whom developed mild symptoms and tested positive for MERS-CoV.

At this point, the UK had its first tiny cluster of MERS-CoV cases and clear evidence of an index case with two secondary cases. The household case was in a younger man who was immuno-compromised due to a regime of anti-cancer therapy. He experienced a short and fatal illness over less than two weeks. The hospital visitor was a case of mild illness, which resolved after 10 days.

This 'England2_CoV' virus genome was sequenced and published by PHE on 18 February 2013. When compared with England1_CoV and the original EMC2012 genome, the similarity in this group of novel coronaviruses was greater than 99.6%, making it extremely unlikely that they were not closely related.

Case numbers have continued to rise, albeit steadily, and the genome sequences have enabled development of PCR tests to complement paired sera sampling. Eighty percent of identified cases have been in Saudi Arabia and all cases, elsewhere in the world, have spent time in the Middle East within the two weeks prior to the onset of symptoms. So the geographical epicentre of the outbreak is clear, but one critical uncertainty is the source — is there an animal reservoir, for example?

The closest relatives of the virus appear to be bat coronaviruses however, it seems very unlikely to have come directly from bats and no infection has so far been detected in bats or any other animal. However, Ab Osterhaus is convinced that a natural host reservoir will be identified, as was the case in SARS. In the first UK case, the patient had recently had contact with farm animals, but in case two, there were no reports of recent contact. Osterhaus recommends widespread serological screening of animals in the region to rapidly identify the source and complement ongoing research into the behaviour and movements of affected individuals.

Much remains unknown, but at present MERS-CoV is not looking likely to become pandemic. Advice on infection control and patient management is evolving, and information on the source of initial human infection is eagerly awaited.

MERS-CoV remains a serious disease and any major outbreak of severe disease would put serious strain on healthcare resources, with most patients to date requiring ECMO support. As such, it will teach us much about what is needed to deal with future human respiratory viruses as there will certainly be more on the tails of SARS and MERS-CoV.

what do we know?

- New sub-type of coronavirus.
- Nearest relatives are bat coronaviruses.
- 80 human cases identified worldwide since September 2012 (data correct 8 July 2013).
- 44 people have died.
- Most cases have been in Saudi Arabia (65 cases, 38 deaths).
- Index cases outside Saudi Arabia have all travelled in the region.
- Identified cases are predominantly middle-aged and older men with pre-existing conditions making them more susceptible to the complications of MERS-CoV infection.
- Those patients with severe illness have experienced respiratory complications, often requiring extracorporeal membrane oxygenation (ECMO).
- Cases of mild illness or asymptomatic infection have been identified in contact follow-up screening and have tended to occur in younger age groups.
- Follow-up is recommended to 14 days after exposure.
- Excretion of virus continues for up to 40 days.
- Positive test results have generally come from lower respiratory tract samples but, have also been found in samples from upper respiratory tract, blood, urine and stool.
- Testing is currently by PCR.
- Several viral genomes have been sequenced.
- The search for an intermediate animal reservoir continues, but the virus is expected to be zoonotic.

A podcast featuring speakers from the Public Health England MERS-CoV conference on 9 July 2013 is available on the *Sf*AM website: http://www.sfam.org.uk/en/sfam-online/micropod.cfm/MERS-CoV

Nancy Mendoza
Communications Manager, Society for Applied Microbiology

historical**Perspectives**

The history of microscopy

Hand lenses were being used by dealers in textiles in the early seventeenth century but it was not until the middle of this century that Robert Hook used two lenses to produce the first compound microscope. He described his findings in the superb book *Micrographia or some Physiological Descriptions of Minute Bodies made by Magnifying Glasses with Observations and Inquiries thereupon in 1665*.

The Royal Society was founded in 1662 and Hook made many demonstrations of his findings to the Society. But the resolution and magnification of his microscope were limited and it was Antonie van Leeuwenhoek of Delft, who made instruments with a single spherical lens, who was able to achieve magnifications capable of seeing bacteria (Figure 1). Brian Ford has written a study of van Leeuwenhoek in a beautifully produced book (Ford, 1991). A fascinating review of the life and work of van Leeuwenhoek was produced in an edition of S*f*AM *News* — the forerunner of *Microbiologist* magazine (Postgate, 2001). van Leeuwenhoek communicated his findings by letter and many of these were addressed to the Royal Society. One such letter was sent in 1674 and on the back of the final page a series of sections of plant and animal material were attached in an envelope, which remained unknown and

Figure 1. *Replica of one of van Leeuwenhoek's microscopes*

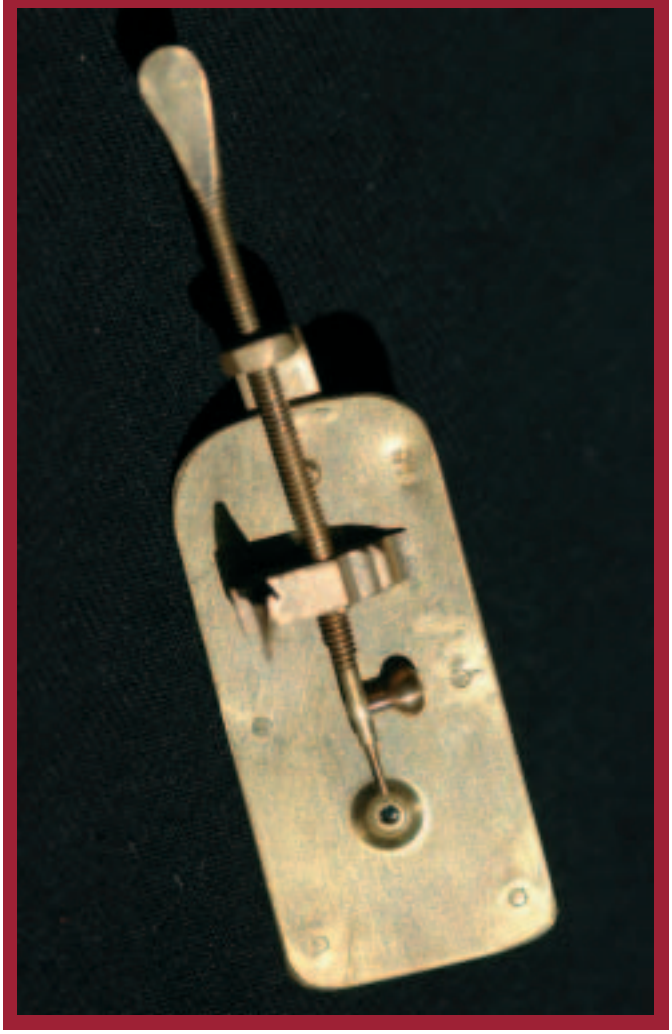


Figure 2. *The International of 1901*

Figure 3. *Watson System 70 of 1965*

Figure 4. *Vickers Dissecting Microscope*

unacknowledged until discovered and studied by Brian Ford (Ford 1981).

A superbly illustrated monograph on the history of photography using a light microscope has been produced by Dr Brian Bracegirdle (Bracegirdle, 2012). The range of compound microscopes of the nineteenth century in the collection of the Science Museum of London has also been reviewed and illustrated (Bracegirdle, 2005). At the beginning of the twentieth century elegant brass instruments were produced (Figure 2) and by the middle of the century companies such as Watson and Vickers were producing affordable microscopes which could be used to equip teaching laboratories of universities. Hardly a day goes by without me using my Watson System 70 (Figure 3), which was produced in 1965, and my Vickers dissecting microscope (Figure 4). The dissecting microscope is more than a binocular instrument for each eye piece has its own objective and the optics are arranged so that the image is both the right way up and moves in the expected direction (the normal compound microscope produces an image which is both inverted and moves in the opposite direction to that expected). The dissecting microscope also has a large working distance allowing for manipulation of the subject being studied.

Figure 5. *Olympus BH-2 of 1980*

Figure 6. *Adipic acid crystals between crossed polars*

The manufacture of research microscopes moved to the continent, where Leitz and Zeiss had extensive factories, and to Japan. The Olympus BH-2 (Figure 5) is a fine example of a Japanese instrument of the late twentieth century which was introduced in 1980. In America Bausch and Lomb were manufacturing microscopes for both research and general laboratory use in the mid 1950s, an example of which is described by Brian Wilkinson (2012). Many materials, both biological and inorganic, rotate polarized light and the use of polarized light has been popular with microscopists for many decades as has dark field illumination. Figure six shows crystals of adipic acid viewed through crossed polars. For dark field illumination the condenser is set to focus the light source onto the subject to be studied. A black disc with a diameter which just blocks the light reaching the object being studied is placed in the filter holder and the condenser diaphragm is fully open. The objective is then looking into a cone of darkness but any objects on the slide will produce a visible image.

When we move into the twenty first century the availability of antibodies labelled with a range of fluorescent dyes has made it possible to label specific structures in a cell and study them with highly specialized instruments designed for fluorescence lifetime imaging microscopy. Although it is possible to study very fine detail with the light microscope, resolution is ultimately limited by the wavelength of visible light, although microscopes have been designed to use ultraviolet light which allows the study of structures smaller than the resolution of the ordinary light microscope. The electron microscope overcomes these limitations and allows studies even down to the resolution of molecules — but that is another story.

references

- Bracegirdle, B. (2005). *Microscopy at the Science Museum*: 4 19th century Compound Microscopes. *Quekett Journal of Microscopy,* **40**, pp15–31.
- Bracegirdle, B. (2010). *A History of Photography with the Light Microscope*. Hobbs the Printers Ltd. ISBN 978-0-9564591-1-4.
- Ford, B. J. (1981). The van Leeuwenhoek Specimens. *Notes and Records of the Royal Society of London,* **Vol. 36**, pp 37–59.
- Ford, B. J. (1991). *The Leeuwenhoek Legacy*. London. Farrand Press and Bristol, Biopress Ltd.
- Postgate, J. (2001). Historical account of the life and work of the Dutch Microbiologist Antonie van Leeuwenhoek — the father of Microbiology. Society for Applied Microbiology *News*, **Vol 2**, No. 4, pp11–13.
- Wilkinson, B. (2012). The Bausch & Lomb TBV 'Dynoptic' Microscope of the 1950s. *Balsam Post,* Issue **94**, pp38–42.

Maurice Moss
University of Surrey

bio**Focus**

Mark Downs reviews the first three years of the Society's work and achievements

www.societyofbiology.org

As *Sf*AM readers know, the Society of Biology completed its first three years at the end of September 2012. There have been many developments and the team has grown by almost threefold as our policy work, careers support, professional development, public engagement and membership have expanded. As with all organizations who have Members who are both organizations and individuals there is always an inherent tension between delivering generic charitable and policy work for Member Organizations, and specific benefits and support for individuals. Hopefully, we have managed to get this balance about right? But, looking ahead to the next three years there needs to be a clear strategy that allows the Society to continue to be a unifying voice for the biological sciences, whilst supporting the core individual membership of 13,000 biologists. The way we hope to go about this and the targets we have set ourselves are available in the Society's new three-year plan, which is available to download from the "about us" area of our new website.

The June strategy meeting of the Society of Biology Council took the discussion further in the context of the annual review of resources available to support the vision. As ever, the discussion was lively with some great ideas for ways to improve what we do. One of the clear decisions to emerge, however, was the need for us to do more to engage at a strategic level with Member Organizations such as *Sf*AM. As part of that process, and with a view to a new President joining the Society in May 2014, the Society's current President, Professor Dame Nancy Rothwell, plans to host two dinners for the Presidents and CEOs of Member Organizations to discuss how we can deliver further support before the end of her presidency. In the meantime, if Members of *Sf*AM have specific proposals or ideas, please do let me know by emailing markdowns@societyofbiology.org.

There are already plenty of cases of good practice where collectively we are achieving much more than any of us could deliver by ourselves. A good example is the work of Dr Stephen Benn and his work with UK parliaments and devolved administrations, especially Westminster. *Sf*AM is one of nine professional bodies involved in helping the Society of Biology press the case for science with parliamentarians. This year's LINKS day was a particular success focusing on science and diversity. The Attlee Suite in Portcullis House was packed to overflowing to hear two excellent panel discussions and the views from both the Minister for Universities and Science, and the Labour opposition spokesperson. We were fortunate that again the Speaker of the House was prepared to give up his time to open the event, whilst the chair of the Select Committee on Science and Technology, Andrew Miller MP, hosted much of the discussion with his colleagues from the Liberal Democrat and Conservative party, Julian Huppert MP and Stephen Metcalfe MP, respectively. To tie in with the event, the Select Committee announced a new inquiry into diversity and science. They would welcome your views.

Biology overall, and *Sf*AM as one of the core sponsors, achieves very high profile with parliamentarians as a result of this collective pan-science parliamentary engagement. There was great attendance from both MPs and peers, and a full report can be found on the Society's website.

Other areas which have seen particular success include careers advice and public engagement events, where having a single biology stand has created a focus for visitors to discuss the full breadth of bioscience topics. We plan more of these events over the next three years and hope to hold a large, high-profile public engagement event for Members and the general public covering a wide range of bioscience issues for the non-specialist.

For individual Members, the Society's focus will be on improving access and support for teachers, and providing a far more comprehensive training provision to underpin our professional registers such as chartered biologist, chartered scientist and registered technicians. The half day or full day training packages will cover a wide range of topics from generic areas, such as presentation skills to the more specialist training required for an expert witness. We plan to hold these events around the UK and welcome suggestions on training that would benefit *Sf*AM Members. The training will be heavily subsidized, charged at £150 per day for external candidates, half price for Members of our Member Organizations and £20 per day for individual Members of the Society. The courses will also contribute (at a higher rate) to the CPD requirement for professional registrations.

Becoming less London centric is something which the Council of the Society is keen to achieve. Our branches deliver around 100 events per year across the UK and our part-time member of staff in Scotland is helping to grow our engagement there. Within the new three-year plan we set out our ambition to have regional staff in each of the countries of the UK including two to three within England. A modest start to this, which is inevitably subject to funding restraints, will be a new part-time position in England from this autumn. To complement the work of our branches and to encourage more local engagement, the Society will also be introducing a new regional grants programme for Members to deliver events local to them. Details of the programme and the other changes outlined will be available very shortly. Please do send us your suggestions.

Dr Mark Downs, PhD, FSB
Chief Executive, Society of Biology

journal**Watch**

News about the Society's journals

Impact Factor update

Microbial Biotechnology has had its second Impact Factor this year, and has increased from 2.534 to 3.214, while the Impact Factors for the other *Sf*AM journals have remained steady:

Environmental Microbiology:	5.756
Environmental Microbiology Reports:	2.708
Journal of Applied Microbiology:	2.196
Letters in Applied Microbiology:	1.629

Highlighted Articles from the SfAM journals

Journal of Applied Microbiology

Molecular methods for strain typing of *Candida albicans*: a review

Candida albicans is one of the most medically important fungi because of its high frequency as a commensal and pathogenic microorganism causing superficial, as well as invasive, infections. In this review, the main molecular methods used for *C. albicans* strain typing are summarized, and their advantages and limitations are discussed with regard to their discriminatory power, reproducibility, cost and ease of performance.

http://onlinelibrary.wiley.com/doi/10.1111/jam.12132/abstract.

Isolation, molecular characterization and antimicrobial susceptibilities of isolates of *Mycoplasma agalactiae* from bulk tank milk in an endemic area of Spain

This study demonstrated the importance of the appropriate selection of antimicrobials for the treatment of contagious agalactia (CA). Thirteen mycoplasma isolates were obtained from samples of sheep milk taken from bulk tank and large silos, and identified as *Myc. agalactiae* by PCR-DGGE. The isolates were typed by PFGE, SDS-PAGE and immunoblot. The *in vitro* activity of 13 antimicrobials of veterinary interest was tested against these isolates. Results showed that the most effective compounds against *Myc. agalactiae* *in vitro* were clindamycin, an antibiotic not previously described as a suitable CA treatment, with MIC values of <0·12µg/ml, and quinolones

with MIC values <0·12–0·5μg/ml, which are used as standard treatments against CA.

http://onlinelibrary.wiley.com/doi/10.1111/jam.12176/abstract.

Letters in Applied Microbiology

Gene silencing in *E. coli* using antisense RNAs expressed from doxycycline inducible vectors

A gene-silencing method using antisense RNAs in *E. coli* is described, which facilitates the investigation of bacterial gene function. In particular, the method is suitable for comprehensive analyses or phenotypic analyses of genes essential for growth. Here, we describe expansion of vector variations for expressing antisense RNAs, allowing choice of a vector appropriate for the target genes or experimental purpose.

http://onlinelibrary.wiley.com/doi/10.1111/lam.12066/abstract.

Frequency of indicator bacteria, *Salmonella* and diarrhoeagenic *E. coli* pathotypes on ready-to-eat cooked vegetable salads from Mexican restaurants

This is the first report regarding microbiological quality and *Salmonella*, enteropathogenic *E. coli* (EPEC), enterotoxigenic *E. coli* (ETEC) and Shiga toxin-producing *E. coli* (STEC) isolation, from ready-to-eat cooked vegetable salads from Mexican restaurants. Ready-to-eat cooked vegetable salads could be an important factor contributing to the endemicity of EPEC, ETEC, STEC and *Salmonella* caused gastroenteritis in Mexico.

http://onlinelibrary.wiley.com/doi/10.1111/lam.12063/abstract.

Microbial Biotechnology

What is health?

Classical medical research is disease focused and still defines health as the absence of disease. Languages, however, associate a positive concept of wholeness with health as does the WHO health definition. Newer medical health definitions emphasize the capacity to adapt to changing external and internal circumstances. Since the health impact of the human gut microbiome is currently a topical research area, microbiologists should be aware of the problems in defining health.

http://onlinelibrary.wiley.com/doi/10.1111/1751-7915.12063/abstract.

Bioremediation: a genuine technology to remediate radionuclides from the environment

Radionuclides in the environment are a major human and environmental health concern. Like the Chernobyl disaster of 1986, the Fukushima Daiichi nuclear disaster in 2011 is once again causing damage to the environment: a large quantity of radioactive waste is being generated and dumped into the environment, and if the general population is exposed to it, this may cause serious life-threatening disorders. Bioremediation has been viewed as the ecologically responsible alternative to environmentally destructive physical remediation. Microorganisms carry endogenous genetic, biochemical and physiological properties that make them ideal agents for pollutant remediation in soil and groundwater.

Attempts have been made to develop native or genetically engineered (GE) microbes for the remediation of environmental contaminants including radionuclides. Microorganism-mediated bioremediation can affect the solubility, bioavailability and mobility of radionuclides. Therefore, we aim to unveil the microbial-mediated mechanisms for the biotransformation of radionuclides under various environmental conditions as developing strategies for waste management of radionuclides. A discussion follows of '-omics'-integrated genomics and proteomics technologies, which can be used to trace the genes and proteins of interest in a given microorganism towards a cell-free bioremediation strategy.

http://onlinelibrary.wiley.com/doi/10.1111/1751-7915.12059/abstract.

Environmental Microbiology

Comparative metagenomic and rRNA microbial diversity characterization using archaeal and bacterial synthetic communities

Next-generation sequencing has dramatically changed the landscape of microbial ecology; large-scale and in-depth diversity studies being now widely accessible. However, determining the accuracy of taxonomic and quantitative inferences, and comparing results obtained with different approaches are complicated by incongruence of experimental and computational data types, and also by lack of knowledge of the true ecological diversity. Here, we used highly diverse bacterial and archaeal synthetic communities assembled from pure genomic DNAs to compare inferences from metagenomic and SSU rRNA amplicon sequencing. Both Illumina and 454 metagenomic data outperformed amplicon sequencing in quantifying the community composition, but the outcome was dependent on analysis parameters and platform. New approaches in processing and classifying amplicons can reconstruct the taxonomic composition of the community with high reproducibility within primer sets, but all tested primers sets lead to significant taxon-specific biases. Controlled synthetic communities assembled to broadly mimic the phylogenetic richness in target environments can provide important validation for fine-tuning experimental and computational parameters used to characterize natural communities.

http://onlinelibrary.wiley.com/doi/10.1111/1462-2920.12086/abstract.

An arbuscular mycorrhizal fungus significantly modifies the soil bacterial community and nitrogen cycling during litter decomposition

Arbuscular mycorrhizal fungi (AMF) perform an important ecosystem service by improving plant nutrient capture from soil, yet little is known about how AMF influence soil microbial communities during nutrient uptake. We tested whether an AMF modifies the soil microbial community and nitrogen cycling during litter decomposition. Our results suggest that the AMF primarily took up N in the inorganic form, and N export is one mechanism by which AMF could modify the soil microbial community and decomposition processes.

http://onlinelibrary.wiley.com/doi/10.1111/1462-2920.12081/ abstract.

Environmental Microbiology Reports

A cadherin-like protein influences *Bacillus thuringiensis* Cry1Ab toxicity in the oriental armyworm, *Mythimna separata*

Cadherins comprise a family of calcium-dependent cell adhesion proteins that act in cell-cell interactions. Cadherin-like proteins (CADs) in

the midguts of some insects act as receptors that bind some of the toxins produced by *Bacillus thuringiensis* (Bt).

We cloned a CAD gene associated with larval midguts prepared from *Mythimna separata*. The full-length cDNA (MsCAD1, GenBank Accession No. JF951432) is 5,642 bp, with an open reading frame encoding a 1,757 amino acid and characteristics typical of insect CADs. Expression of MsCAD1 is predominantly in the midgut tissue, with the highest expression in the 3rd- to 6th-instars and lowest in newly hatched larvae.

Knocking-down MsCAD1 decreased Cry1Ab susceptibility, indicated by reduced developmental time, increased larval weight and reduced larval mortality. We expressed MsCAD1 in *E. coli* and recovered the recombinant protein, rMsCAD1, which binds Cry1Ab toxin. Truncation analysis and binding experiments revealed that a contiguous 209-aa, located in CR11 and CR12, is the minimal Cry1Ab binding region. These results demonstrate that MsCAD1 is associated with Cry1Ab toxicity and is one of the Cry1Ab receptors in this insect. The significance of this work lies in identifying MsCAD1 as a Cry1Ab receptor, which helps us to understand the mechanism of Cry1Ab toxicity and of potential resistance to Bt in *M. separata*.

http://onlinelibrary.wiley.com/doi/10.1111/1758-2229.12036/abstract.

Identification of biomass utilizing bacteria in a carbon depleted glacier forefield soil by the use of ^{13}C DNA stable isotope probing

As Alpine glaciers are retreating rapidly, bare soils with low organic C and N contents are becoming exposed. Carbon availability is a key factor regulating microbial diversity and ecosystem functioning in these soils. The aim of this study was to investigate how bacterial activity, community structure and composition are influenced by organic carbon availability. This study examines the important role of both fungal and algal biomass in increasing the carbon pool in recently deglaciated bare soils.

http://onlinelibrary.wiley.com/doi/10.1111/1758-2229.12027/abstract.

Melissa McCulloch
Wiley-Blackwell

In the 34th of a series of articles about statistics for biologists, **Anthony Hilton** & **Richard Armstrong** discuss:

The Kolmogorov–Smirnov (KS) test

StatNote 34

Introduction

The Kolmogorov–Smirnov (KS) test is a non-parametric test which can be used in two different circumstances. First, it can be used as an alternative to chi-square (χ^2) as a 'goodness-of-fit' test to compare whether a given 'observed' sample of observations conforms to an 'expected' distribution of results (KS, one-sample test). An example of the use of the one-sample test to determine whether a sample of observations was normally distributed was described in StatNote 1 (Hilton & Armstrong, 2005a). Second, it can be used as an alternative to the Mann–Whitney test (StatNote 4, Hilton & Armstrong, 2006) to compare two independent samples of observations (KS, two-sample test). Hence, this StatNote describes the use of the KS test with reference to two scenarios: (1) to compare the observed frequency (F_o) of soil samples containing cysts of the protozoan *Naegleria* collected each month for a year with an expected equal frequency (F_e) across months (one-sample test), and (2) to compare the abundance of bacteria on cloths and sponges sampled in a domestic kitchen environment (two-sample test).

Scenarios

Cysts of Naegleria (one-sample test)

The amoeboid protozoan *Naegleria* is a ubiquitous organism occurring in the majority of soils. It exists both in an active form and as encysted individuals. Studies suggest that the proportion of encysted individuals in soil may vary with time through the year (Cutler & Crump, 1935). Hence, a study

was carried out to estimate the frequency of occurrence of soil samples with cysts collected each month for a year to determine if there was evidence of a seasonal effect on the degree of encystment. Thirty, 1g soil samples were collected each month and the frequency of samples in which cysts of *Naegleria* were identified, listed in Table 1.

Abundance of bacteria on cloths and sponges (two-sample test)

Given the intrinsic structural and compositional differences between cloths and sponges, a study was carried out to determine if one material provided a more favourable environment for bacterial survival than the other (Hilton & Armstrong, 2005). A total of 20 'in-use' dishcloths and 20 sponges were collected from domestic kitchens, and the aerobic colony count from each material determined in the laboratory. In StatNote 1, these distributions were tested for normality and it was concluded that the cloth data exhibited a marked deviation from normal whereas, the sponge data more closely fitted a normal distribution. However, the data as a whole did not conform closely enough to a normal distribution to use a parametric 't' test described in StatNote 3 (Hilton & Armstrong, 2006). The Mann–Whitney test could be used on these data but a good alternative is the KS two-sample test, which is an efficient method of analysis regardless of the underlying distribution of the data. The data are illustrated in Table 2.

How is the analysis carried out?

Theory: one-sample test

The statistical model underlying the KS one-sample test assumes a continuous distribution but in practice, the test is often applied to data from discrete distributions and continuous data divided into groups. The null hypothesis (H_0) must be fully specified in advance and the parameters are estimated from the data. The stages of the analysis are listed in Table 1. First, the expected frequency of cysts (F_e) in each month is calculated, i.e., $F_e = \sum (F_o)/n$, where n is number of months. Second, the cumulative distributions of observed and expected data are calculated for each month. Third, D_{max} is defined as the highest value of the differences between the expected and observed data, this value being taken to a table of the Kolmogorov–Smirnov statistic K (Pollard, 1977) or obtained from statistical software; if the sample size (N) > 50, the critical value for the KS test can be calculated from the formula given in Table 1.

Table 1. Kolmogorov–Smirnov (KS) one-sample test: observed frequency (F_o) of soil samples (out of 30) containing cysts of the protozoa *Naegleria* each month for a year (Jan = January, Feb = February etc.)

Months											
Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
15	14	14	23	25	9	2	2	8	12	20	16

1. The expected frequency (F_e) in each month is $\sum (F_o)/n$ where n = number of months = 160/12 = 13.33.

2. Calculate the cumulative distribution of observed data for each category: 15/160, 29/160, 43/160, 160/160.

3. Calculate the cumulative distribution of expected data for each category: 13.33/160, 26.66/160, 39.99/160, 160/160.

4. D_{max} is the highest value of the difference between the two cumulative distributions. In this case D_{max} = 0.16 in May (Fig. 1).

5. D_{max} is taken to a table of the KS statistic (Pollard, 1977). D_{max} is greater than the tabulated value at P = 0.05 indicating significant monthly variation in the number of cysts. If N >50, as in the present example, the critical value for the KS test can be calculated from the formula $\{1/2n \ln(2/0.05)\}^{1/2}$.

Table 2. Kolmogorov–Smirnov (KS) two-sample test: are more bacteria isolated from kitchen sponges than cloths? (F_O = observed frequencies in each interval, *CFc* = cumulative frequencies of cloth data, *CDc* = cumulative distribution of cloth data, *CFs* = cumulative frequencies of sponge data, *CDs* = cumulative distribution of sponge data.)

	Cloth data			Sponge data			Difference
Variable	F_o	*CFc*	*CDc*	F_o	*CFs*	*CDs*	*CDc–CDs*
<1.9	0	0	0	0	0	0	0
-0.975	2	2	0.1	0	0	0	0.10
-0.7625	2	4	0.2	1	1	0.05	0.15
-0.55	1	5	0.25	2	3	0.15	0.10
-0.3375	3	8	0.4	0	3	0.15	0.25
-0.125	3	11	0.55	1	4	0.2	0.35
-0.0875	2	13	0.65	1	5	0.25	0.40
0.3	4	17	0.85	3	8	0.4	**0.45**
0.5125	1	18	0.90	4	12	0.6	0.3
0.725	0	18	0.90	3	15	0.75	0.15
0.9375	1	19	0.95	0	15	0.75	0.20
1.15	0	19	0.95	0	15	0.75	0.20
1.3625	0	19	0.95	2	17	0.85	0.10
1.575	0	19	0.95	1	18	0.95	0
1.7875	1	20	1.0	2	20	1.0	0

1. Calculate the cumulative distribution of cloth frequencies (*CDc*).

2. Calculate the cumulative distribution of sponge data (*CDs*).

3. Subtract the two distributions: *CDc* – *CDs*.

4. D_{max} is the highest value of the difference between *CDc* – *CDs* (Figure 2). In this case D_{max} = 0.45.

5. Calculate K = $D_{max} \sum (n_1 n_2/n_1 + n2)$ = 0.89, where n_1 and n_2 are the numbers of cloths and sponges respectively.

6. This value is taken to a table of the Kolmogorov–Smirnov statistic K for the two-sample test (Meddis, 1975) or is provided by statistical software.

Interpretation

The cumulative distributions for the observed and expected data are given in Figure 1. The greatest deviations between observed and expected frequencies were observed in the period April-July and maximum deviation in May (month 5). In May, D_{max} = 0.16 which, ignoring the sign, is greater than the critical value of the K statistic, calculated using the formula, at P = 0.05 indicating significant monthly variation in the number of cysts. In the first five months, the frequency of samples with cysts varied between 15 and 25, the frequency declining significantly in June, with lower frequencies continuing throughout July and August. In September however, the frequency of cysts increased to approach those observed at the beginning of the year. Hence, the data imply a seasonal effect on the rate of encystment of *Naegleria*. However, further research demonstrated that despite these variations, encysted individuals always comprised a constant proportion of the total number of *Naegleria* present. Hence, although there is likely to be a

Figure 1. *Kolmogorov–Smirnov (KS) one-sample test: cumulative distributions of the observed and expected data (** D_{max})*

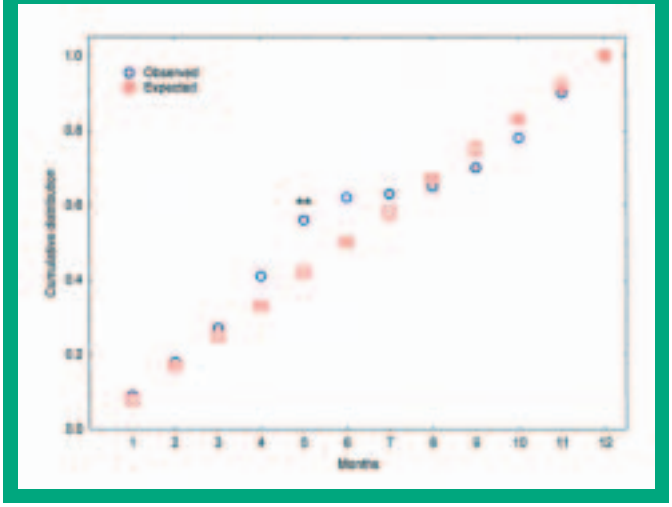
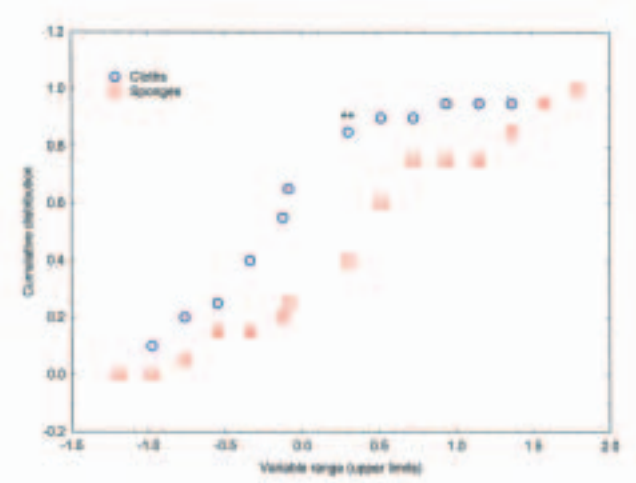


*Figure 2. Kolmogorov–Smirnov (KS) two-sample test: cumulative distributions of the cloth and sponge data (Obs = observed frequencies, CumF = cumulative frequencies, CumD = cumulative distribution (** D_{max}))*



seasonal effect on *Naegleria* numbers, encystment is not related to the onset of less favourable conditions.

The advantage of the KS test over the χ^2 test in this context is that the order of the observations is taken into account. In addition, unlike χ^2, KS can detect accumulations of small differences of the same sign. The disadvantage of KS is that it requires relatively large numbers of observations to properly reject the Ho. Hence, there is a greater probability of making a type II error, i.e., accepting the H_o when it is false, compared with the χ^2 test, especially if the data are samples from a discrete distribution or are from a grouped continuous distribution. In such circumstances, it is good practice to accept the H_o only when the test statistic is well below the critical value and to be suspicious of values only slightly smaller than the critical value.

Theory two-sample test

The two-sample test determines whether two samples of observations come from the same type of distribution, regardless of shape. The stages of the analysis are listed in Table 2. First, the variable under study is divided into appropriate interval categories. The number of categories selected is not critical, but it is important to have sufficient categories to represent the spread of the variable. In the present case, 15 intervals were chosen. Second, the cumulative distributions of the observed and expected data over these intervals are calculated, and the cumulative proportions of the observed and expected proportions subtracted for each interval. Third, D_{max} is the highest value of the difference between the two cumulative distributions, in this case $D_{max} = 0.45$, is substituted in the formula to give a value of K, which is taken to the statistical table (Pollard, 1977) or obtained from statistical software.

Interpretation

At $P = 0.05$, the value of K is greater than the tabulated value indicating greater numbers of bacteria isolated from sponges compared with dishcloths, thus confirming the previous analysis using the Mann–Whitney test (Hilton & Armstrong, 2006). Hence, there is evidence that the sponges harbour considerably more bacteria than cloths. The two-sample KS test is one of the most useful and general non-parametric methods available for comparing two samples.

Conclusion

The KS test is a non-parametric test which can be used in two distinct circumstances: first, as an alternative to χ^2 as a goodness-of-fit test to compare whether a given observed sample of frequencies conforms to a specific or predicted distribution. Unlike the χ^2 test however, it takes the order of the observations into account but is liable to a type II error and should be used with caution, especially if the sample size is small. Second, it can be used as a general non-parametric test to compare two samples of observations which come from any type of distribution.

references

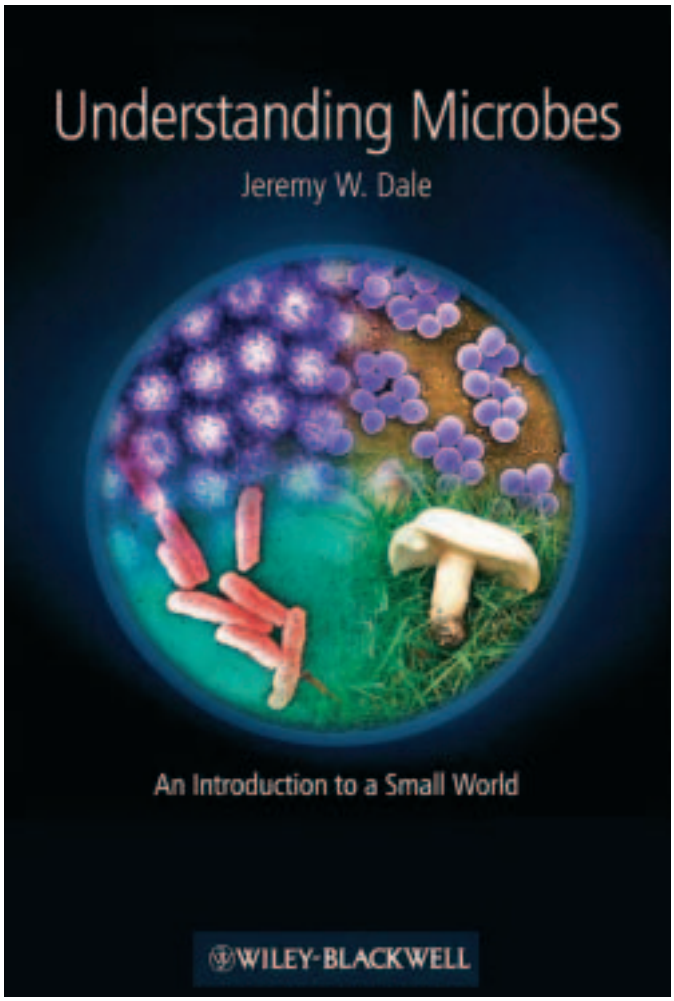
- Cutler, D. W., and Crump. L. M. (1935). Problems in Soil Microbiology. Longmans, Green and co., London.
- Hilton, A., and Armstrong R. A. (2005a). StatNote 1: Are the data normal? *Microbiologist*, **Vol. 6**, No.2, pp34–35.
- Hilton, A., and Armstrong, R. A. (2005). StatNote 3: Testing the difference between two groups. *Microbiologist*, **Vol.6**, No.4, pp30–32.
- Hilton, A., & Armstrong, R. A. (2006). StatNote 4: What if the data are not normal? *Microbiologist*, **Vol. 7**, No.1, pp34–37.
- Meddis, R. (1975). Statistical handbook for non-statisticians. McGraw Hill.
- Pollard, J. H. (1977). A Handbook of Numerical and Statistical Techniques. Cambridge University Press.

Anthony Hilton[1] and Richard Armstrong[2]
[1]Biology & Biomedical Sciences and [2]Vision Sciences, Aston University, Birmingham, UK

book review

Understanding microbes: an introduction to a small world

By Jeremy W. Dale
Publisher: Wiley-Blackwell (11 Jan 2013). £22.50, 230pp.
ISBN-10: 1119978793
Reviewed by Heather Moore



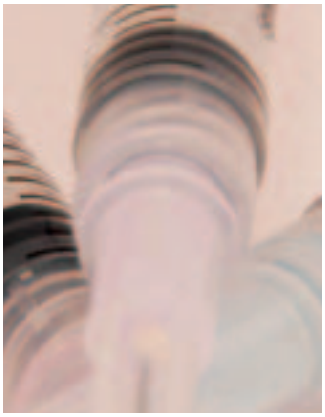
At £22.50 for 230 pages this book represents very good value for money; it is well presented, informative and easy to read. For someone new to the topic of microbiology this would be a great place to start as no great quantity of prior knowledge is required. This book would particularly complement A-level Biology through to level 2 university undergraduate, and promotes enthusiasm and application for the subject. The narrative offers a number of more general knowledge-style facts, which also help make the reader's experience a little more relaxed than perhaps they would have been if they had chosen to go straight to primary literature or refer to a textbook. The author has a very good ability to communicate the subject and the book is an excellent source for widening the knowledge of the non-scientist reader.

The content is well illustrated; the author has struck the important balance between offering illustrations at regular intervals to allow a good reading flow to be established but also adding content to the chapter to support the concepts being explained. Illustrations include a good blend of original diagrams as well as colour photographs to aid explanations.

This book begins with a broad introduction to microbes and their existence; it includes the basics such as the explanation of micrometres, exponential numbers and cell growth, and eases the reader into more detailed concepts later in the book. The book explains commonly advertised examples of microbiology such as probiotics, dental hygiene, lactose intolerance, disinfectants and biofuels but also covers topics such as food spoilage, sewage treatment, bioremediation, antibiotics, vaccines, food preservatives and flavourings.

Throughout the book, fundamental discoveries are referred to from the 17th century to the present day. The reader is led through a story of the microbes in our bodies, the atmosphere, on earth and in water, and gradually a comprehensive picture is built of the smaller world around us. The author covers bacteria, archaea, fungi, viruses, prions and protists in early chapters, and also covers the basics of micro- and molecular biology. Historical events make interesting reading, referencing pathogens and diseases past and present such as the plague, cholera, TB, influenza, HIV, CJD, cystic fibrosis and MRSA. Later chapters explore carbon and nitrogen cycling, evolution, cell division, quorum sensing and sporulation, as well as more comprehensive topics such as horizontal gene transfer, gene expression, gene cloning and sequencing

The book concludes with an interesting 'Controversies and Speculations' chapter which includes topics such as the origins of life, possible life elsewhere in the universe, superbugs and climate change. A handy reference section is also included at the end of the book including the further explanation of the building blocks and processes of life, as well as suggested further reading. This book is a good introductory prequel to another book by Jeremy Dale, co-authored by Simon Park, *Molecular Genetics of Bacteria*. (Wiley-Blackwell).



Spring Meeting 2013 report

The Stratford Q Hotel, Stratford-upon-Avon, UK, Tuesday 23 April 2013

STIs in the 21st Century

The Q Hotel at Stratford-upon-Avon was once again the venue for S*f*AM's Spring Meeting. This annual event is tailored to those working in medical microbiology and provides biomedical scientists with interesting talks which are highly relevant to their daily work.

Over 80 delegates came to listen to a varied programme on the theme of '***Sexually Transmitted Infections***' (STIs). During the registration period, there were nine trade stands to visit whilst enjoying the refreshments on offer.

Sally Cutler, a member of the S*f*AM Executive Committee, chaired the morning session. All three presentations were given by staff from Public Health England (PHE), formerly the Health Protection Agency (HPA).

The first speaker of the day was Gwenda Hughes, Head of the STI section, and focused on '***Epidemiology of STIs in the UK***'. After pointing out that the highest burden of disease is seen in young adults, men-who-have-sex-with-men (MSM) and certain black ethnic minority groups, she showed some data illustrating the factors influencing transmission. The association between socio-economic deprivation and high rates of disease was particularly striking and evident for all types of STIs.

Trends need to be interpreted in the light of service developments as well as epidemiological drivers. In addition to improvements in diagnostic tests, the provision of tests continues to evolve. Public health interventions need to be culturally appropriate and focus on maintaining and improving access to each new vulnerable group as it appears.

The title of Cathy Ison's talk, '***Gonorrhoea — may be untreatable by 2015!***' attracted significant media interest. Put simply, each time a new drug is used to treat gonorrhoea, *Neisseria gonorrhoeae* develops resistance to it and we now have the situation of no further new drugs being available.

This has prompted a proactive approach whereby recommendations for therapy have been altered before the WHO threshold of 5% gonococcal resistance, to the currently recommended agent, has been reached in the general population. Other suggestions include the use of combination therapy and targeted use of previously used agents. Following publication of global and European action plans, the Gonoccocal Resistance to Antimicrobials Surveillance Programme (GRASP) action plan was issued in February 2012.

In conclusion, Cathy stressed the need to maintain expertise for the culture of *N. gonorrhoeae*, without which emerging mechanisms of resistance cannot be detected.

Sarah Woodall presented the final talk of the morning session entitled '***Changing trends in chlamydia infection***'. Following the phased implementation of the National Chlamydia Screening Programme between 2003 and 2008, there was a period when screening coverage targets were applied. These targets are no longer in place and the programme is well established.

The majority of diagnoses are now made in venues other than genitourinary medicine (GUM) clinics. As a consequence of the resultant widespread testing of lower risk groups, a different distribution of positive/negative results is seen. Another trend has been the move away from enzyme immunoassays to the now universally used nucleic acid amplification tests (NAATs). Although the rates of chlamydia diagnoses have been relatively stable over the last four years, trends continue to be monitored by mathematical modelling, surveys such as the National Survey of Sexual Attitudes and Lifestyles (Natsal) and seroepidemiology studies using stored serum samples.

Louise Hill-King

Following a lunch that had pleased and filled our stomachs to the brim, and a further opportunity to peruse the trade show, an afternoon session that maintained our level of interest was very much needed. Fortunately, this session did not fail to live up to that expectation. The session began with a talk by John White, Guy's and St Thomas' NHS Foundation Trust, describing an STI that is often overlooked, *Trichomonas vaginalis*. Dr White described how there have been no recent developments in diagnostics, but with growing links with prostate cancer and PID, and with *T. vaginalis* being a HIV transmission co-factor, it must not be pushed aside. A light-hearted spin was put on this important issue, with Dr White joking about the popularity of his Sunday clinic after church. However, there was no distraction taken away from the fact there needs to more awareness of *T. vaginalis* as those affected are often older in age and consider themselves at lower sexual risk. Overall, it was an interesting talk which stimulated many discussions, especially regarding the change of the gold standard diagnostic test.

The second talk of the afternoon was presented by Heather Cubie, NHS Lothian and University of Edinburgh. Heather's talk shone a light on the success of the HPV vaccines. Although most people are aware of HPV being extremely common, when Heather presented the statistics of there being 150 different types of the virus, with over 30 types affecting genital areas alone, there were many shocked faces amongst the audience. With over 80% of sexually active adults unknowingly contracting HPV at one point in their lives, and cervical cancer currently the most common cancer in females under the age of 35, there was no need to validate the introduction of the HPV vaccines. The talk covered other cancers and diseases HPV causes including genital warts. Furthermore, Heather went on to discuss why there was a need to introduce new vaccines, as the current vaccines do not cover all HPV types. Heather highlighted the important issue of whether solely offering a vaccine to young women in the UK was fair, especially when genital warts account for a large proportion of STI diagnoses. Heather concluded her talk by explaining the true answer to her question *"HPV vaccines, are they doing the job*?" is that it will take us roughly 15 years to see how effective the vaccines truly are.

The day was brought to a close with a talk on bacterial vaginosis (BV). Philip Hay began by demonstrating the stigma surrounding BV, he asked the room "*if they or a friend had ever had the infection*?" In response, only two people shyly put their hands up. Philip went on to describe a case study in Ecuador where self-medicating has taken place, by covering condoms in gentamicin cream and taking oral metronidazole. This not only highlighted the growing problem with antibiotic resistance and the availability of antibiotics, but also showed the stress patients feel and the lengths they will go to in order to try to cure this recurrent infection. The talk concluded with the important question, do we classify BV as an STI?

The meeting was then drawn to a close and delegates had the opportunity to discuss the day and the variety of interesting talks.

Sabrina Roberts

Environmental Microbiology lecture 2013

Programming soil bacteria to do amazing things

On the 28 October 2013, the annual SfAM *Environmental Microbiology* Lecture will take place at the Institute of Civil Engineers, 1 Great George Street, London. Attendees will hear from Professor **Víctor de Lorenzo**, CNB-CSIC (Madrid, Spain) who will discuss the enzymatic activity of environmental microbes and how such properties can be harnessed and put to invaluable use. The vast majority of this treasure trove hasn't yet been exploited, and in order to do so, understanding of a vast number of fundamental biological processes is needed. Genetic engineering successes and failures will be presented to illustrate what needs to be done in order to merge genetic engineering with environmentally-friendly technologies.

Professor de Lorenzo is a Spanish chemist and microbiologist. He works as Professor of Research at the National Centre of Biotechnology in Madrid, where he has been employed since 1996 after running a large number of Molecular Microbiology and Environmental Biotechnology activities at the Pasteur Institut (Paris), the University of California (Berkeley), the University of Geneva and the Federal Center of Biotechnology (Braunschweig). His research exploits advanced molecular biology and genetic engineering of soil microorganisms (e.g., *Pseudomonas putida*) for the sake of biomonitoring, bioremediation, and wherever possible, valorization of chemical pollution in the environment.

Professor de Lorenzo is also active in promoting a European-wide debate with the various stakeholders interested in the beneficial application and dissemination of modern research in biology. **http://www.cnb.csic.es/~meml**.

All members will have received an invitation to the lecture with this issue of *Microbiologist* and for those who are unable to attend, the lecture will be available online soon after the event.

Institute of Civil Engineers, 1 Great George Street, London ■ 28 October 2013

Wednesday 15 January 2014

Winter Meeting

- **Food contamination: the food handler's role**
- **Biodefence**
- Including the Denver Russell Memorial Lecture

The Royal Society, London, UK

Programme*

*Please note that this is a provisional programme and likely to change. For the latest information please visit www.sfam.org.uk/en/events/index.cfm/Winter_meeting

10.00 – 10.30 **Tea, coffee and registration**

Chair: **To be confirmed**

10.30 – 11.15 **The Denver Russell Memorial Lecture**
To be confirmed

11.15 – 11.50 **Nasty germs: in the bed or reds under the bed?**
Tim Brooks, Public Health England, UK

11.50 – 12.25 **General introduction to food contamination**
Chris Griffith, retired

12.25 – 13.30 **Lunch**

Session A Food contamination: the food handler's role

Chair: **To be confirmed**

13.30 – 14.05 **The food manufacturer**
Peter McClure, Unilever, UK

14.05 – 14.40 **The caterer**
Tayo Irawo, independent consultant

14.40 – 15.00 **Tea and coffee**

15.00 – 15.35 **The retailer**
To be confirmed

15.35 – 16.10 **The consumer**
Ellen Evans, Cardiff Metropolitan University, UK

Session B Biodefence

Chair: **To be confirmed**

13.30 – 14.05 **Biodefence over the ages and predictions for the future**
Petra Oyston, DSTL, UK

14.05 – 14.40 **If the anthrax does not get you the worms will! All you need to know about *Bacillus anthracis* from nasty things in the mail to tea, sharks and green fluorescent nemotodes**
Les Baillie, University of Cardiff, UK

14.40 – 15.00 **Tea and coffee**

15.00 – 15.35 **Glanders and melioidosis — past lessons and future perspectives**
Andrew Simpson, DSTL, UK

15.35 – 16.10 **Synthetic biology and biosecurity**
Malcolm Dando, Bradford, UK

16.10 **Close**

To register online for this meeting please visit www.sfam.org.uk/en/events/index.cfm/Winter_meeting or contact Sally Hawkes ■ Email: sally@sfam.org.uk ■ Telephone +44 (0)1933 382191

membership options

■ **Full Ordinary Membership** gives access to our many grants and awards, online access to the *Journal of Applied Microbiology*, *Letters in Applied Microbiology*, *Environmental Microbiology*, *Environmental Microbiology Reports* and *Microbial Biotechnology*, copies of *Microbiologist*, preferential registration rates at Society meetings and access to the members' areas of the website.

■ **Full Student Membership** confers the same benefits as Full Membership at a specially reduced rate for full time students not in receipt of a taxable salary.

■ **Associate Membership** is only open to those with an interest in applied microbiology without it being a prime aspect of their job. For example, school teachers and those taking a career break; on maternity leave, or working temporarily in other areas. It does not provide access to any journals or Society grants and awards.

■ **Honorary Membership** of the Society is by election only and this honour is conferred on persons of distinction in the field of applied microbiology. Honorary Members have access to our online journals.

■ **Retired Membership** is available to Full Members once they have retired from their employment. Retired Members are entitled to all the benefits of Full Membership except grants and access to the Society's journals.

■ **eAffiliate Membership:** This category of membership is open to microbiologists residing in Band I developing countries and is free of charge. It is an online only membership and provides access to the eAffiliate bursary only.

■ **eStudent Membership:** This category of membership is open to undergraduate students only. It is an online only membership and is free of charge. This category of membership does not provide access to the Society's grants or journals.

■ **Corporate Membership** is open to all companies with an interest in microbiology. Corporate Members benefits include:

- Quarter page advertisement in each issue of *Microbiologist* (which can be upgraded to a larger size at discounted rates).
- The opportunity to publish press releases, company news, etc., in each issue of *Microbiologist*.
- FREE banner advert on the Society website with a direct link to your company site.
- Up to three members of company staff attending Society meetings at members' rate (this means a 50% discount on non member registration rate).

JOIN US!

You can apply for membership on, or offline. To apply offline, please contact the Membership & Finance Co-ordinator, Julie Wright on **+44 (0)1234 326846**, or email **julie@sfam.org.uk.**

benefits

The Society for Applied Microbiology is the voice of applied microbiology within the UK and was founded in 1931. Society members play a leading role in shaping the future of applied microbiology, and enjoy many benefits, including:

- The opportunity to apply for one of our many grants or funds.
- Eligibility to win any of our awards or nominate a candidate for the SfAM Communications Award.
- Access to our five peer–reviewed Journals: *Journal of Applied Microbiology*, *Letters in Applied Microbiology*, *Environmental Microbiology*, *Environmental Microbiology Reports* and *Microbial Biotechnology*.
- Free access to the entire collection of digitized back files for *JAM* and *LAM* dating back to 1938.
- A topical quarterly magazine, *Microbiologist*.
- Substantially reduced rates for attendance at SfAM meetings and conferences.
- Networking with worldwide professionals in over 80 countries.
- Access to private members' area of the SfAM website.
- Monthly email bulletins with the latest news from SfAM.
- Invitation to the annual *Environmental Microbiology* lecture.
- Fostering cross disciplinary research.
- A 25% discount on the extensive Wiley–Blackwell collection of titles.

Detailed information about all these benefits and more can be found on the Society website at: www.sfam.org.uk.

GRANTS & AWARDS: Many grants, awards and prizes are available to members including the W H Pierce Memorial Prize and prizes for student oral presentations and posters at the Summer Conference. In addition to these substantial awards, the Society has funds to assist members in their careers as microbiologists. These include the President's Fund, Conference Studentships, Sponsored Lecture Grants and the popular Students into Work Scheme.

Full details of all the Society's grants and awards can be found on the website together with application forms.

JOURNALS: The Society publishes two monthly journals: *Journal of Applied Microbiology* and *Letters in Applied Microbiology*. We also produce this quarterly colour magazine, *Microbiologist*, which contains features, topical news stories and full details of our meetings. The Society is also a partner with Wiley–Blackwell in the monthly journals: *Environmental Microbiology*, *Environmental Microbiology Reports* and *Microbial Biotechnology*.

All Full and Student Members receive free access to the online versions of the Society's journals, and can also submit papers to our journals via an online submission service.

MEETINGS: We hold three annual meetings; the Winter Meeting is a one-day meeting with parallel sessions on topical subjects. The Spring Meeting is a one–day meeting tailored for personnel in clinical microbiology. The Summer Conference is held every June/July and comprises a main symposium, a poster session, the AGM and a lively social programme. All members are invited to our prestigious annual lecture held to commemorate the success of our *Environmental Microbiology* journal. We also hold joint ventures with other organizations on topics of mutual interest.

WEBSITE: The website is the best source of detailed information on the Society and its many activities. It has fully interactive membership areas where you can find archive issues of *Microbiologist*, exclusive SfAM documentation and much more.

Membership changes

NEW MEMBERS

We would like to warmly welcome the following new members and hope that you will participate fully in the activities of the Society.

Bangladesh

K. Z. Mamun

Canada

L. Giroux

Greece

P. Roufiktos

Iraq

S. Suliaman

Ireland

K. Lacey; F. Lyons; M. P. Prunty

Italy

F. E. Moccia; E. Stefanelli

New Zealand

A. J. Cornelius

Nigeria

D. A. Adedapo; O. Adeleke; I. A. Adeleye; I. C. Akahara; A. Ayeni; V. N. Chignor; C. B. Chikere; O. M. David; C. B. Ekwuabu; C. Ezeama; J. S. Fatoba; U. O. George-Okafor; M. A. Habid; S. O. Oboirah; I. Odetoyinbo; J. Ogbonna; O. P. Ogunlowo; C. C. Okere; G. N. Okpala; J. O. Oluyege; A. Onanuga; A. Onilude; C. O. Onwosi; N. Sanni; O. O. Sonowo; F. Tahir; F. O. Tasie

Pakistan

U. Noor

Philippines

R. Soriano

Portugal

S.I. Chaves Ribeiro; M. Costa; C. Costa Silva; M. de Lurdes Enes Dapkevicius; M. F. Paixao Domingos Lopes

South Africa

M. M. Bello-Akinosho; L. Bothma; B. Kullin

Spain

L. Laforet

Thailand

E. Sangvichien

UAE

S. Basha

UK

E. Abeke; S. Anderson; J.-P. Anthony; D. Arulogun; K. Brunner; A. Clements; C. Collingwood; F. Coulter; S. P. Cummings; J. R. de Rezende; A. Djurhuus; F. Elgina; T. Fu; M. Glaire; K. Grant; C. Gwyther; L. Hays; Z. Iqbal; M. Kellermann-Thornton; V. Kelly; K. Kemmett; J. Kirby; P. Kroll; J. M. Kwiatkowska; Y. Lee; I. Lidbury; S. Lowe; J. S. Mandair; P. Mariathasan; D. McGee; A. Mohammad; N. Monaco; H. B. Morgan; E. Muhs; C. C. Munns; M. Myers; H. Najmuldeen; L. Nguyen My; M. Nnadi; O. Onamade; W. Palmer-Brown; A. S. Rahman; D. L. Rathbone; L. Rossoni; D. Russo; S. Samarasinghe; N. Savory; A. Schulze; A. Scott; L. Sheriffe; C. Spence; A. Suarez-Suarez; N. Wang; A. Wipat; A. Zaidi; M. Zhang

USA

K. Baker; H. Bloss; A. Chmura; C. Clemente dos Santos; S. Gibson; D. Harrow; G. Harvey; D. Macinga; L. Mehalik; A. Mickey; A. Morozov; F. A. Okafor; C. Rempe; R. J. Stangl; P. Truong; J. Ufnar; H. Woo

Losses

We were saddened to learn of the death of the following Members of the Society:

Judith M. Anderson, D. L. Georgala, Arun Ghosh and Alexandra Henein.

2013 SfAM AGM

The 82nd Annual General Meeting of the Society for Applied Microbiology was held on Wednesday 3 July at 17.30 pm at The Hilton Hotel, Cardiff.

Present:

38 Members attended the AGM. This included the President, Martin Adams (MA) and General Secretary, Mark Fielder (MF).
In attendance: Philip Wheat (PW), Nancy Mendoza (NM).

1. Apologies for absence

Janet Corry
Sue Passmore
Max Sussman

2. 81st Annual General Meeting

The minutes of the 81st Annual General Meeting held in Edinburgh in 2012 were published in the September 2012 issue of *Microbiologist*. They were approved and accepted by those present.

Proposed: Sam Law
Seconded: Arthur Gilmour

3. Matters arising from the previous minutes

*Sf*AM were requested to approach the topic of vaccination. MF reported that a couple of public engagement events on the issue had taken place. MF is also writing a document for the public on the importance of vaccines.

Basil Jarvis (BJ) raised a point that there were inaccuracies in the 2011 annual report regarding election of officers. It was noted that these had been corrected.

4. Report of the Trustees of the Society 2012

MA asked for the report of the Trustees and the statement of accounts to be officially received and approved. All present were in agreement.

Bernard Dixon (BD) asked a question about the General Secretary's report: he said there was a Regem event in Cardiff around 20 years ago. There was a press room and lots of interest from the public. Would the Executive Committee consider adding public sessions to the scientific meetings where appropriate? MA agreed to consider this.

5. Adoption of the annual report 2012

Copies of the Annual Report of the Society for 2012 had been distributed previously.
Proposed: BJ
Seconded: Arthur Gilmour
The annual report 2012 was duly adopted.

6. Election of new members

(including Honorary Members), deaths and resignations

A list of the names of applicants for membership and a list of deaths has appeared in the *Microbiologist* throughout the previous year. The Society also holds a summary list of new Members and resignations throughout the previous year for consultation if requested.

BJ enquired what the criteria were for election of Honorary Members? MA replied that all members were free to nominate candidates (two Member names were required for the nomination); these were then considered by the Executive Committee and if appropriate would be offered Honorary Membership status.

BJ commented that it may be useful if this process could be publicized. MA replied he would consider this action.

7. Nomination and election of the Hon General Secretary, Professor Mark Fielder

MA commented that MF's initial five year term of office comes to an end at the AGM. The constitution allowed for a yearly renewal of the position for a further five year term provided both MF and the Executive Committee agreed. MA proposed that MF serve a further year as Honorary General Secretary. This was unanimously accepted by the meeting.

Proposed: Christine Dodd
Seconded: Louise Fielding
Mark Fielder was duly elected.

8. Nomination and election of the Hon Vice President, Professor Christine Dodd

MA highlighted that Professor Christine Dodd was nominated as the next Vice President.

The meeting agreed unanimously with this decision.

Proposed: Sally Cutler
Seconded: Sam Law
Professor Christine Dodd was duly elected.

9. Nomination and election of new Committee Members

MA highlighted that there were four vacancies due to the retirement of Irene Grant, Katie Laird and Louise Fielding, and Christine Dodd's change of office.

There had been four nominations:

Professor Val Edwards-Jones
Proposed: Steve Davies
Seconded: Louise Fielding

Professor John Threlfall
Proposed: MA
Seconded: Andy Sails

Dr Brendan Gilmore
Proposed: Jean Yves Maillard
Seconded: Irene Grant

Dr Brian Jones
Proposed: Jean-Yves Maillard
Seconded: Nick Jakubovics

All four were unanimously elected.

10. Any other business

BJ commented that communication amongst Members at meetings is as important as with the public and media. We've had some very poor slides at the meeting this time. We used to issue instructions on how to produce slides for Society meetings, could we return to doing this?

BD agreed with BJ's comment but noted that the four student presenters gave accessible material and kept to time.

David Post: What is being done to encourage overseas members to apply for the various awards?

MA replied that there is no shortage of applicants in fact the numbers have significantly increased. President's Fund awards have gone to many overseas participants, as have studentships. MA did not perceive this as a problem.

Stuart Pettit highlighted that the dates for next year's meetings were not available from the Society's website. MA commented that this was an omission and would be rectified.

Ioannis Giavasis commented that the presentations at the Summer Conference had been of a high standard. He enquired whether there was any room in future programmes for more oral presentations? Could younger scientists have the chance to present orally? Perhaps linked to publication in the *Sf*AM journals?

MA replied that the presentations are made mostly by invited speakers whose work is relevant to the programme theme. The only other option would be parallel sessions but at present we wouldn't have a big enough audience to make that viable. We used to offer journal paper sessions but they were parallel sessions and poorly attended.

Stuart Pettit commented that various Members attend meetings and sit on committees relating to external affairs and policy. Are there reports and are they available to Members?

PW replied that reports are submitted and they are tabled at Committee meetings.

Stuart Pettit enquired if they could be made available on the Society's website?

MF replied there are confidentiality issues in some cases but it could be considered.

Don Whitley (DW): The *Science Showoff* evening last night and last year in Edinburgh was childish and vulgar. It could give new members of the Society the wrong idea about what we're all about.

MA replied that he did not attend last night but didn't object to the one in Edinburgh last year.

DW said that in his opinion some of the humour was pathetic.

MF commented that it is a very different format and it isn't for everyone. That's one of the reasons we don't have it as a core part of the meeting. It's not run by us, just with us. It has a different purpose, which is to get members of the public who avoid science to get involved (over 50% of the audience last night for instance were the general public).

MF went on to say that profanity does make some people laugh and if we managed to get just one person to take something positive away about science then that's a good thing. It's not for everyone but it does allow scientists to reach new audiences.

MA commented that if we continue with such events perhaps we could give it a 'health warning' in future.

BJ concluded by thanking the officers, Committee and staff for their efforts in running the Society. This was unanimously endorsed by those present.

MA concluded the meeting by announcing the next AGM will be in Brighton 2014 on the 2nd July.

The meeting concluded at 6.15 pm.

In the loop pecs

News from the SfAM Postgraduate and Early Career Scientist Committee

Preparing an oral presentation

Presenting your work is a fantastic opportunity; it is the most direct way of getting your research, interests and personality across to members of your field, or even potential employers. The majority of people find public speaking nerve-racking and daunting, and get nervous just thinking about it. If you are one of the lucky ones that doesn't have this problem, you may still find yourself not knowing how to structure your presentation.

The first thing to think about when preparing your presentation is deciding what outcomes you want to show. Try to define a clear purpose. In my experience the best presentations tell a story about the research findings, rather than just monotonously listing data. It is also important to try to identify the type of audience you will be talking to as this will determine the level of science in your work or even the type of material to share. An effective presentation only delivers as much information as the audience actually need — not everything the presenter knows about the subject. Decide what you want to say and collect the relevant information. Keep the number of slides to a minimum, ensure they are clear and concise, and avoid overcrowding them with lots of text. Be aware that nerves can impact your speaking style, therefore be prepared to speak clearly, slowly and take your time; don't forget to breathe!

The structure of a presentation can vary, but generally they start with an introduction to set the scene, and define the aims and hypothesis showing the relevance of your study to the scientific community. The methods section should explain how you set out to investigate the hypothesis. Try not to get lost in small details of specific experiments, instead give an overview of what you did. Follow this up with your results using graphs, diagrams or tables where appropriate, as these are often more effective than just using text. Presenter beware though, make sure your figures are clear and do not contain too much information; there is nothing more frustrating to the audience than a slide being put up which is unreadable, more often than not accompanied by the phrase "*you won't*

be able to see that so I will talk you through it". A further point to bear in mind is, if you are showing results on large graphs or tables, be sure to highlight the significant information, otherwise they could appear daunting to the audience. Throughout the results section explain what each experiment or figure means, what is the overall finding? As well as helping to keep the audience's attention they must be able to fully understand you. It may be worth including a discussion section, if time allows, this section can help you contextualise your findings within the wider scientific field. Finally, you should conclude by summarizing what has been said throughout the presentation, this section can be used to discuss future or ongoing work. It is vitally important that you use this section to highlight a clear take-home message for your audience.

At the end of a presentation there is usually allocated time for questions. Prepare for this in advance by thinking through your talk, what questions would you ask if you were in the audience? If you're not sure, present to a friend, colleague or supervisor and see what questions they ask (but try to make sure that they have a similar level of knowledge as your prospective spectators). Above all, be confident! If someone asks you a question you don't know the answer to, take your time, think and relax, you're not superhuman so admit their point is interesting, that you don't know but you would be grateful for a discussion about it after the presentation. This will give you a chance to meet fellow researchers and possible future collaborators; they may even help you get some insight into your research. Remember, practice really does improve performance so make sure you rehearse beforehand. Where possible, present at student conferences, like the PECS Autumn Meeting. This type of meeting provides an opportunity to present to your peers in a slightly more relaxed and friendly environment. Finally, keep in mind that you are the expert, no one in the audience will know your research better than you. Giving an oral presentation really does get easier every time so, the more you do it the better it will get!

Ditte Hobbs

Glenn Gibson dos and don'ts for presentations

DO

- ✓ Know your audience and tailor the presentation to them (are they experts, well informed, schoolchildren, lay persons?).
- ✓ Keep text use low — maximize diagrams and good graphics.
- ✓ Practice — don't turn down any opportunity to present. You will learn by mistakes and audiences are usually generous with advice.
- ✓ Try to avoid notes; you look more confident without them.
- ✓ Use clear, familiar fonts and a good, consistent size (e.g., Arial 32).
- ✓ Keep the pointer still, it will expose nerves if it shakes – and do not circle it around particular parts of the slide, just point straight to them and keep it steady.
- ✓ Try to vary your tone for emphasis. Do not drone on and on monotonously.
- ✓ Ensure you are familiar with the facilities (computer, podium, screen, stage, pointer, slide changer, microphones) before your session starts.
- ✓ Introduce yourself to the chairperson.
- ✓ Thank your audience for their attention and whoever invited you.

DON'T

- ✗ Rush and garble on because you are nervous. Speak clearly and concisely.
- ✗ Be rude to questioners — avoid a conflict. You can do that afterwards.
- ✗ Get drunk before you start. You can do that afterwards as well. Alcohol and public presentations do not mix!
- ✗ Stand somewhere where all the audience cannot see you.
- ✗ Talk to the screen instead of the audience (do not turn your back on them).
- ✗ Read your slides out; instead use them as cues/cribs.
- ✗ Focus on one person or one spot in the audience, instead scan the room.
- ✗ Give a whole dissertation/thesis in one presentation.
- ✗ Overrun on time (it is discourteous to the chair, organizers and other speakers).
- ✗ Be too arrogant, although do appear to be fully confident and in control (even if you are not).

careers

A career in the three sectors — public, private and not-for-profit

Philip Wheat describes his varied career journey

Sheffield Teaching Hospital

It is only when you start looking at the road which your career has taken that you realize that along the journey certain crossroads or forks in the road occurred, which proved pivotal to the eventual outcome of the career.

The first crossroads, which was critical, was how I arrived in a career where the common theme was to become microbiology. It was over 40 years ago when I successfully applied for a Junior B Medical Laboratory Technician position in the United Sheffield Hospital Group (which eventually became Sheffield Teaching Hospitals). I was offered a position on the basis of obtaining at least two A levels in science subjects. I had visited the pathology laboratories for several afternoons over a 3-month period. This allowed me to form an opinion that my first choice would be to work in a microbiology laboratory. If this was not possible, I had decided that working in a haematology laboratory was my second choice. It was not until the morning of my first day when I reported to start work that I found out I had fortunately been allocated a position in a microbiology laboratory. However, it was arbitrary how this choice was made and I could quite easily have been writing this article about a career in haematology!

For the next 23 years I worked in a number of diagnostic laboratories learning the science and skills of medical microbiology. During the early years I was fortunate to be able to continue my education on a part-time basis whilst working in the laboratories. I obtained a Higher National Certificate in Biological Sciences with Medical Microbiology as my specialist subject. I then obtained the specialist fellowship qualification of the Institute of Medical Laboratory Technicians, which later became the Institute of Biomedical Science (IBMS). Once I had obtained these further academic qualifications and gained experience of working at the bench, I started to undertake supervisory roles within the laboratory. In addition, I became involved in many extra-curricular activities. These included organizing, teaching and examining for IBMS accredited courses. I also organized and presented at numerous scientific conferences. In the late 1980s I became subject tutor for Medical Microbiology for the Master of Science course organized by Sheffield Hallam University.

During the late 1970s and 1980s I developed an in-depth interest in antimicrobial agents. This was an ideal time to be involved in this area because it was during this period that many new agents were developed and launched. My interest in this field resulted in having over 40 peer-reviewed scientific papers published. During this time I obtained a Master in Medical Sciences (MMedSci) degree (by thesis) from the University of Sheffield.

I now come to the second crossroads in my career. After I was awarded my MMedSci, I considered undertaking further studies to obtain a PhD. However, at the same time I was approached to act as interim laboratory manager. I decided to accept this role and after a period of four months and an extensive interview process I was made Laboratory Manager at the Royal Hallamshire Hospital, Sheffield in November 1990. I do still wonder where my career would have gone had I been successful in obtaining a PhD!

As laboratory manager I was in charge of over 40 staff and a large budget. This was in the early days of laboratory accreditation by Clinical Pathology Accreditation (CPA) and internal "market" forces in laboratory medicine. I was laboratory manager for

The Blore Tower, Bedford. The Society's offices from September 1997 until 2006

just under five years. During the latter part of this period I was approached by the Mast Group, based on Merseyside, to become their scientific director. This I think of as the third major crossroads of my career.

Although like any management position the laboratory manager role was challenging, I had reached a stage in both my personal and professional life where I needed additional challenges. I decided to accept the role of Scientific Director at the Mast Group and took up the position in 1995.

The Mast Group is a family-owned private company which primarily manufactures and sells products into microbiology laboratories worldwide. As scientific director I was responsible for both quality control and research development laboratories. In addition, I was in overall charge of the ISO 9001 quality system employed by the company, as well as all aspects of health and safety. During this period I was able to complete a Master of Business Administration (MBA) degree at Sheffield Business School, which I had started whilst working in the Royal Hallamshire Hospital. Studying for the MBA and working full-time in a pressurized environment was challenging, but ultimately very rewarding. I gained significantly (though not financially) by developing a far better understanding of overall management processes. As a result of the MBA I was better able to conceptualize situations in my everyday management dealings. Some of the modules I studied also gave me far greater understanding of key areas of my day-to-day role: quality management systems, finance, marketing, strategy and operations management to name a few. Another advantage of the MBA was that it allowed me to study with other students from a variety of differing industries (public, private and not-for-profit); this networking was invaluable. The MBA also included a significant number of small group workshops where scenario planning was undertaken in situations where you had no previous experience. The experiences gained in these situations have proven invaluable in my career.

Once I obtained the MBA, I reached the fourth major crossroads in my career. During 1998 the owners of Mast Group decided they would reorganize the structure of the company. As part of this reorganization I was offered the role of Managing Director of Mast Laboratories. This included everything I had previously been engaged with as scientific director but in addition, I would be in charge of the whole of the manufacturing operations. This was a significant increase in my responsibilities. I accepted the offer and threw myself into this very challenging role. I found the skills I had gained from both my previous management experience and the MBA studies invaluable. I was able to implement many aspects of operations and change management I had studied. It also meant I was able to apply in practice the expertise and tools I had gained by in-depth study of quality management during the dissertation part of my MBA.

This role in particular very much brought home the major difference between working in the public sector and private industry. Generally speaking at a very basic level, working for the Government or public sector your salary is paid every month irrespective of how you or your place of work performs. In the private sector this is very different. If the company does not produce the quality goods that customers want or there is a problem such that goods cannot be manufactured, at some stage there will not be enough money to pay the monthly salaries!

I faced many major changes during my time as Managing Director of Mast Laboratories. Two in particular had implications right across the rest of the group. Firstly, I was responsible for the successful introduction and implementation of an integrated information operational technology system. One of the features of this change was the introduction of materials resources planning and lean manufacturing for the manufacturing processes. The second big project was the successful introduction of the CE mark across the entire product range. This CE mark is a quality symbol to allow the product to be purchased anywhere in the European Union area (and indeed beyond). Without this, a product cannot be sold. This undertaking was a daunting task with over 1,000 products involved. Each one required a product technical dossier containing a variety of detailed information. All products had to be labelled accordingly and contain pack inserts on how to use the product; all of this had to be in at least six different languages. This proved quite challenging when some of the products were only one inch tall!

During this period I was finding that my time was increasingly being taken up with directing manufacturing or general management issues and I was not able to spend enough time on the microbiology aspects of my role. During late 2004, I became aware that the Society for Applied Microbiology (S*f*AM) was seeking their first Chief Executive Officer (CEO). When I examined the role it appeared to involve a mix of general management, but crucially for me it would also involve more contact with the science of microbiology. I decided to apply and as they say, the rest is history! This I see as the fifth crossroads in my career. I started with S*f*AM in 2005.

S*f*AM, although a registered charity and hence not-for-profit, is very similar to a small medium enterprise (SME) company. The turnover of the Society is approximately £1 million and we employ five staff. As CEO, I am in day-to-day charge of the operations of the Society including financial control. In addition, I advise the Trustees on many differing aspects of strategy. Once again, the role

of CEO is totally different to what I have encountered previously. This is mainly down to the fact that I answer to the Trustees (and in particular the President) of the Society. These are all volunteers and I do not see them on a daily basis.

Although the Society was founded in 1931 it had only once previously employed a full-time Executive Secretary. If the Society was going to survive and develop further, the Trustees decided that a full-time CEO was needed. One of the first tasks they wanted me to undertake was to overhaul the governing constitutional documents. They also wanted the Society to become a company (whilst retaining charitable status) limited by guarantee. This, ultimately, was a way of protecting both the existing and future Trustees from any liability, should the Society suffer financial difficulties.

Both obtaining company status and registering again with the Charity Commission involved a lot of detailed work liaising with a variety of professional advisors and Trustees. My second major task as the new CEO was to assess suitability (or otherwise) of the premises we occupied and, if appropriate, recommend and organize the move into more suitable facilities. When I first started in the role the offices were in the Blore Tower in the centre of Bedford. Whilst the site did have some attractions it suffered badly from being on three floors and having poor access. After much work we moved into our current offices towards the end of 2006.

During the last eight years I have changed the operations of the Society significantly. More staff have been employed and we now have an office structure which is fit for purpose and resilient. This has resulted in a significant increase in the activities of the Society. We now have a record number of Members and a greater number of grant applications and awards. Over time, the Trustees and I are looking to further develop the services provided to both the Members and the public at large.

Crucially for me, the major benefit of my current role is that it has enabled me to keep up to date with advances in microbiology. My background was limited to medical microbiology and the CEO's role has enabled me to significantly broaden my knowledge by

The Society's present offices in Bedford Heights, Bedford

meeting S*f*AM Members and non-members who work in other fascinating, diverse areas of microbiology, such as the food and environmental sectors. In addition, I have benefited enormously from networking with colleagues in other Life Science Learned Societies. S*f*AM is increasingly being actively involved with the Society of Biology which, as well as individual Members, also has nearly 100 Member Organizations which represent the whole plethora of Life Science Societies.

It is only when you look back on your career and in particular when you are asked to write this type of article that you realize perhaps the significance of the choices you have made along the way. My career has been far from a straight road; as I have highlighted, there have been crossroads or forks in the road and many more minor deviations.

My one piece of advice to anybody reading this article, at the beginning of their career, is to take opportunities when they are presented; you never know where they may lead. My initial starting point of getting technical training in microbiology has led to many other areas which were not at all apparent at the time I started. It is possible to apply the microbiology knowledge and develop further skills. This is particularly relevant to the highly competitive world we live in today. One way you can develop your skills is seek out extra-curricular activities. For instance, being a Member of S*f*AM and getting involved is a very good starting point.

I have been very fortunate in my career in that I have genuinely enjoyed my time working. Some of this is down to being involved in one way or another with the fascinating science which is microbiology.

You may be left asking, where to next? Is there a sixth major crossroads where I may have to make a choice? You never know what is around the corner; watch this space!

Philip Wheat FIMBS, MMedSci, MBA
Chief Executive Officer
Society for Applied Microbiology

Students into Work Grant report

am I eligible — can I apply?

Yes — if you are FULL Member who can offer an undergraduate microbiology student the chance to obtain work experience. If you would like to read about the experiences of students who have benefited from this grant, you can do so below.

For further information visit: **http://www.sfam.org.uk/en/grants--awards/students-into-work-grant.cfm**

The discovery of antibiotics from Actinomycetes

I first became interested in the discovery of antibiotics from Actinomycetes after completing a module in microbial biodiversity in my second year of an Applied Biology Degree at Northumbria University. Since the discovery of penicillin, bioactive compounds from novel microorganisms have led to the development of the majority of antimicrobial agents, by far the order of *Actinomycetales* and in particularly the genus *Streptomyces* being the richest source to date.

During my third year, I was given the opportunity to undergo a final year project entitled Bioprospecting for Novel Bioactive compounds from Actinomycetes. This project aimed to selectively isolate novel rarer species of Actinomycetes of the *Micromonospora* genus and to test these for their antimicrobial properties using multiple different growth media to encourage secondary metabolite production. To discover novel antibiotics from natural sources, either new material is required to be studied or new methods are to be employed to study existing material, it was for that reason that rare Actinomycetes were studied as it was thought novel species would more likely produce novel compounds. This project was successful with over 2,000 Actinomycetes being isolated on selective media from European soil. Representative isolates were subsequently assessed for their antimicrobial activity against pathogenic/non-pathogenic, Gram-positive and Gram-negative bacteria.

Following this I was delighted to be offered a chance to continue with this work, made possible by a SfAM Students into Work Grant. As a new approach we have revisited Actinomycetes previously tested, including those that were previously found to have no activity, and assessed the antimicrobial production using a novel induction method.

Antibiotic production is closely related to stress responses in bacteria, and therefore when the bacterium is not stressed they will not produce an energy expensive compound such as an

Figure 1. *Production of a potentially novel antibiotic in a combined culture of Micromonospora. HPLC profiles of the secondary metabolites produced by the novel Micromonospora with or without inducer bacterium. The boxed area indicates the novel peak upon induction and initial fractionation profiles. Elution was performed with a linear gradient*

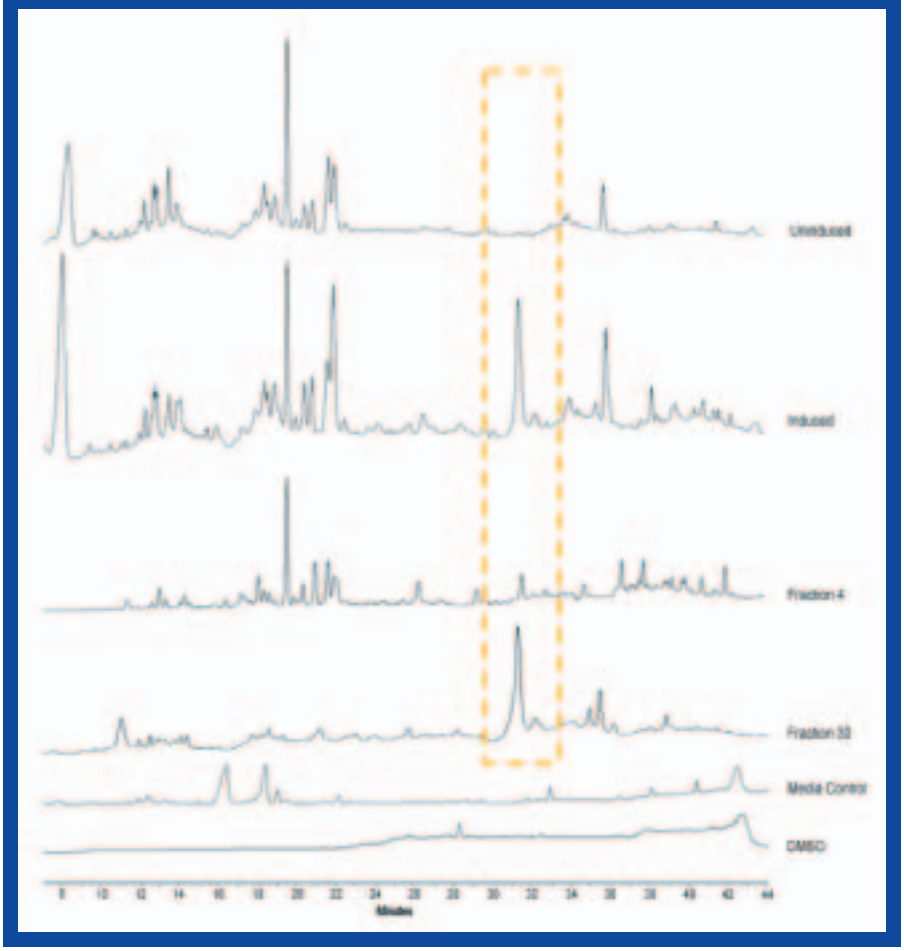


Table 1. Microtitre antimicrobial testing results of solvent extracts from induced and uninduced novel *Micromonospora* and *Kribbella* strains

	Micromonospora Crude extracts		*Kribbella* Crude extracts		*Micromonospora* Fractions	
	Uninduced	Induced	Uninduced	Induced	Fraction 4	Fraction 30
R. rhodochrous	-	+	-	+	-	+
T. paurometabola	-	+	-	-	-	+
G. bronchialis	+	+	-	-	+	-
N. asteroides	+	+	-	-	+	+
M. smegmatis	-	+	+	+	+	-
E. coli	-	-	-	-	-	-
S. aureus	-	-	-	-	-	-
Y. enterocolitica	-	-	-	-	-	-
E. faecalis	-	-	-	-	-	-
S. marcescens	-	-	-	-	-	-
B. subtilis	+	+	-	-	-	-
B. cereus	-	-	-	-	-	-
S. cerevisiae	-	-	+	-	-	-
M. luteus	-	-	-	-	-	-
S. pyogenes	-	-	+	+	-	-

- = No inhibition observed
+ = Inhibition of growth

antibiotic. Therefore, we have employed a co-culturing method to initiate this stress response. The co-culturing of bacteria will represent the natural environment upon which these novel bacteria would normally produce the observed antibacterials as a competitive mechanism.

Secondary metabolite production and extraction were performed by culturing two 1 litre broth cultures for each strain for one week at 28°C. Cultures were then induced with five mycolate-containing bacteria after one week and then further incubated for a week to allow secondary metabolite production. Solvent extractions were performed using acetone, DCM and methanol to recover possible active compounds, and dried down. Microtitre antimicrobial testing of these crude solvent extracts were performed on 15 bacteria including the five inducer bacteria using standard protocols, and recorded in Table 1.

Two bacterial strains were chosen for phylogenetic analysis on the merit of the initial antimicrobial assays performed. Strain UNN01288 originating from Derwent river bank sediment and UNN00553 isolated from Thornton Woods soil were assessed by 16S rDNA sequences analysis. They showed a high similarity to members of the genus *Micromonospora* and *Kribbella*, respectively. Maximum likelihood, neighbour joining and maximum parsimony phylogentic analysis using 1,000 bootstrap values clearly indicated the position of the two isolates within a coherent cluster of the genus *Micromonospora* and *Kribbella*.

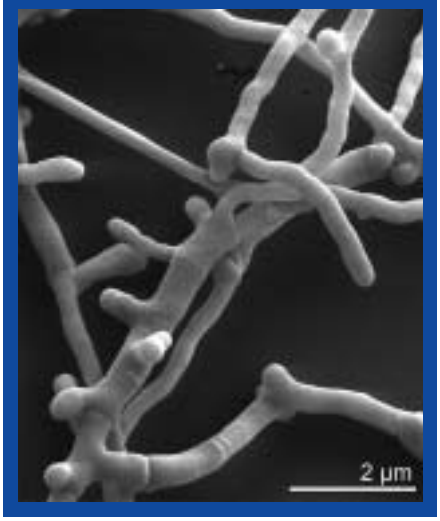
Active compound extracts of the induced novel *Micromonospora* isolate were then fractionated to further purify the sample, a silica gel column and a stepwise solvent gradient were used and the resulting fractions retested for antimicrobial activity (Table 1). 10 mg/ml of the active fractions were resuspended in DMSO and analysed by HPLC (C18 4.6mm x 250mm) at 25ºC and a flow rate of 0.5 ml/min. The solvent composed of acetonitrile/water with a stepped gradient from 0–100% acetonitrile. The elution profile was monitored at $ABS_{254\ nm}$.

Testing of the crude acetone extracts against the 15 clinically relevant bacteria showed increased antimicrobial activity upon induction with competitive mycolate-containing bacteria, as previously seen by Onaka *et al.* (2010) against *Streptomyces* strains. The induced *Micromonospora* culture extracts were found to have activity against the inducer bacteria *Roddococcus rhodochrous*, *Tsukamurella paurometabola* and *Mycobacterium smegmatis* not seen with the uninduced cultures, with similar results observed with the *Kribbella* extracts. Interestingly, the induced extract no longer inhibited *Saccharomyces cerevisiae* but gained activity against *R. rhodochrous*. HPLC separation profiles of the *Micromonospora* extracts observed a new peak present in the induced extract compared with the control for the *Micromonospora* extract.

Further testing of the fractioned induced *Micromonospora* extract showed fractions 4 and 30 to have activity; this differential activity shows the new peak observed was separated in fraction 30 which contains the active component against the *Rhodococcus*, *Tsukamurella* and *Nocardia* species tested.

This work highlights the need for more extensive protocols for the induction of secondary metabolites in bacterial cultures. Many species may have the capability to produce antibiotics, but have not previously been stressed correctly to induce their production, leading to the presumption that many bacteria have been overlooked as useful sources of natural products. With the isolation of novel strains becoming increasingly more difficult, new techniques should be employed to counteract the threat of antibiotic resistance.

Figure 2. *Kribbella sp.*



References

■ Onaka, H., Mori, Y., Igarashi, Y., and Furumai, T. (2010). Mycolic acid-containing bacteria induce natural-product biosynthesis in *Streptomyces* species. *Appl. Environ. Microbio.*, | **77**(2), pp400–406.

Kathryn Turnball
Northumbria University

President's Fund report

am I eligible — can I apply?

It is not only our Student Members who require our help. Senior microbiologists often find difficulty in funding attendance at meetings. If you are in this position you are eligible for this fund.

For further information visit: **http://www.sfam.org.uk/en/grants--awards/presidents-fund.cfm**

Rapid detection of *E. coli* O157

***Escherichia coli* was for many years** considered to be a non-pathogenic inhabitant of human and animal intestinal tracts, and was only recognized as a cause of gastroenteritis in the late 1940s. Pathogenic strains of *E. coli* have since emerged as a major cause of documented outbreaks and sporadic cases of diarrhoea worldwide, and are reported by the Centers for Disease Control and Prevention (CDC) to be one of the three most common foodborne infections.

Strains of *E. coli* inducing mild to serious gastrointestinal diseases in humans have been classified into six major categories; enterohaemorrhagic (EHEC), enterotoxigenic (ETEC), enteroinvasive (EIEC), enteroaggregative (EAEC), enteropathogenic (EPEC) and diffusely adherent (DAEC) *E. coli.* However, enterohaemorrhagic *E. coli* are the most significant group of diarrhoeagenic *E. coli*, based on frequency and severity of illness. *E. coli* O157:H7 is the serotype accounting for the greatest proportion of EHEC disease cases, and is responsible for greater than 73,000 cases of illness and 61 deaths each year in the USA, in comparison to the 37,000 cases and 30 deaths each year attributed to non-O157 EHEC serotypes (CDC, 2008).

Whilst undercooked minced beef (Figure 1) has been the food most often associated with *E. coli* O157, outbreaks have also been linked to other food vehicles such as apple cider, mayonnaise, cantaloupe, lettuce, hard salami, raw milk, goat cheese, and alfalfa and radish sprouts. Fruit and vegetables implicated in outbreaks have in most cases been contaminated with cattle or other ruminant manure during harvesting and processing (Figure 2).

Conventional methods for the detection of *E. coli* O157 commonly use enrichment, followed by isolation on Sorbitol MacConkey Agar with cefixime and potassium tellurite (CT-SMAC). Most *E. coli* O157 strains do not ferment sorbitol and colonies are colourless on CT-SMAC, distinguishing them from sorbitol-fermenting non-O157 *E. coli* strains. However, traditional isolation methods are time-consuming and competing flora may obscure O157 colonies, thereby giving rise to false negative results. Selective capture with *E. coli* O157 specific magnetic beads (immunomagnetic separation, IMS) significantly reduces background flora, and has been incorporated in isolation methods for improved recovery rates and the reduction of false-negatives on selective agars (LeJeune *et al.*, 2006). Isolation rates may be further improved by the use of chromogenic agars such as ½ CT-CHROM Agar that can detect sorbitol-fermenting *E. coli* O157 strains.

Since *E. coli* O157 may be present in food and environmental samples in small numbers, and the infectious dose is low

Figure 1. *Minced beef associated with E. coli O157*

(<50 cells), sensitive and rapid detection methods are required to ensure a safe supply of foods. In recent years, a number of companies have developed methods for detection that are specific, faster and more sensitive than traditional culture methods. Enzyme-linked immunosorbent fluorescent assays (VIDAS-UP), immunoconcentration (VIDAS-ICE) and real-time PCR (GeneDisc, LightCycler) are examples of rapid methods that are commercially available for the detection of *E. coli* O157.

VIDAS-ICE is a fully automated method for the selective concentration of *E. coli* O157 from enrichment broth, and consists of two components; a solid phase receptacle whose interior is coated with anti-*E. coli* O157 antibodies, and a reagent strip which contains all the wash and release solutions. The enrichment broth is dispensed into a reagent strip and the sample cycled in and out of the solid phase receptacle in the VIDAS Immunoassay Analyser in a 40 minute procedure.

The immunoconcentrated samples are then streaked on to selective agar plates before inspection for typical colourless colonies on CT-SMAC agar and pink colonies on ½ CT-CHROM agar, after an 18–24 hour incubation period at 37°C.

VIDAS-UP, unlike the VIDAS-ICE system, does not require plating on selective agar for the screening of *E. coli* O157, and is based on an enzyme-linked fluorescent assay. The interior of the solid phase receptacle is coated with recombinant phage tail fibre protein for the capture of *E. coli* O157, and an automated reading of the fluorescence is given at the end of the 50 minute assay. In the GeneDisc protocol, a DNA sample is transferred to each reservoir before RT-PCR analysis in the GeneDisc Cycler for the presence of *eae* (attachment and effacement), enterohaemolysin (*ehx*), Shiga toxin 1 (*Stx1*), Shiga toxin 2 (*Stx2*) and O157 genes in a 55 minute assay. The LightCycler RT-PCR protocol may also be used for the detection of the O157 gene in a 60 minute assay.

In this study, *E. coli* O157 detection limits in artificially contaminated beef and cattle faeces samples were determined for IMS, VIDAS-UP, VIDAS-ICE, GeneDisc and LightCycler systems. Immunomagnetic separation and the GeneDisc were the most sensitive methods, and could detect an initial 1 CFU in 25g beef samples after a 6h enrichment in modified tryptone soya broth with novobiocin (mTSB+n) or buffered peptone water (BPW). The VIDAS-UP method could detect an initial 10 CFU, while VIDAS-ICE and the LightCycler methods could only detect an initial 100 CFU. Higher detection rates were achieved with 18h enrichments, where an initial 1 CFU in a 25g sample could be detected with all five methods. For cattle faeces, IMS could detect an initial 1 CFU after a 6h incubation in mTSB+n, while the VIDAS-UP and VIDAS-ICE, GeneDisc and LightCycler methods could detect an initial 1 CFU in 18h mTB+n enrichments.

Both VIDAS-UP *E. coli* O157 and the Gene Disc O157 correctly identified 17 non-sorbitol-fermenting and 22 sorbitol-fermenting *E. coli* O157 strains, and also correctly identified nine non-*E. coli* strains. VIDAS-UP and the GeneDisc O157 are therefore highly specific for *E. coli* O157 and can be used as rapid and reliable screening tests for the presence of *E. coli* O157.

I would like to thank the Society for Applied Microbiology for awarding me a grant from the President's Fund towards the presentation of this work at the 16th IUFoST Congress, 2012.

***Figure 2**. Fruit and vegetables implicated in outbreaks of food poisoning through contamination with E. coli O157*

References

- Centers for Disease Control. (2008). *Escherichia coli*. http://www.cdc.gov/ecoli.
- LeJeune, J. T., Hancock, D. D., and Besser. T. E. (2006). Sensitivity of *Escherichia coli* O157 detection in bovine faeces assessed by broth enrichment followed by Immunomagnetic Separation and Direct Plating methodologies. *Journal of Clinical Microbiology*, **Vol. 44**(3), pp872–875.

Hilda Nyati
National University of Science and Technology, Bulawayo, Zimbabwe.

corporate news

The latest news, views and microbiological developments from our Corporate Members

Buffered Peptone Water (ISO), the first in a new 'just add water' media line

Lab M's new µPREP™ Buffered Peptone Water ISO (BPW) is the first product in a brand new line of bagged, sterile dehydrated microbiological culture media that are made ready to use simply by adding water.

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Simply attach a standard laboratory deionised or reverse osmosis water supply, via the Lab M filter accessory, to the bag. The medium reconstitutes rapidly, requires no additional sterilisation and is ready to dispense and use in minutes.

All Lab M media are manufactured in powdered form, ensuring rapid cold dissolution and avoiding any of the reconstitution issues that can arise with granulated media, making them ideally suited for use in the µPREP™ format. Robust double-skinned bag construction and a dual port system ensure that leakage is not an issue, and the µPREP™ system has performed well both in-house and in rigorous field trials.

For anyone with bulk media needs, µPREP™ BPW (ISO) takes up minimal storage space, offers quick, convenient reconstitution with no need to autoclave and preparation does not require skilled personnel. To find out how µPREP™ BPW (ISO) and this expanding product range can help streamline your laboratory's workflow please contact us.

further information

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Redesigned Petri dish racks and tags

At Don Whitley Scientific, we recently redesigned our 10-plate Petri dish racks. These racks are ideal for use in Whitley Workstations for stacking, sorting and storing your Petri dishes. The new stainless steel model is more robust and sturdy; and it's fully autoclaveable.

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The set of Petri Dish Rack Coloured Tags includes 20 of each of seven different colours: yellow, blue, red, green, white, orange and grey tags. A colour for every day of the week!

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Pseudomonas aeruginosa added to Microbiologics EZ-CFU quantitative QC microorganism product line for growth promotion testing

Microbiologics has added *Pseudomonas aeruginosa* ATCC® 9027™* to their popular EZ-CFU™ product line. EZ-CFU™ is designed for performing Growth Promotion Tests of culture media as described in the United States Pharmacopeia (USP), European Pharmacopoeia (Ph. Eur.) and Japanese Pharmacopoeia (JP). *Pseudomonas aeruginosa* ATCC® 9027™* is listed as one of the compendial challenge microorganisms for the Growth Promotion Test.

Chief Operating Officer of Microbiologics, Donna Scholer, comments, "We are very excited to have this *Pseudomonas* strain available in our EZ-CFU™ product line because it has been a popular customer request." Scholer continues, "EZ-CFU™ is one of four distinct product lines Microbiologics manufactures for Growth Promotion Testing. With each product offering unique features and benefits, we are able to meet each customer's individual needs in terms of test volume, preparation time, and ease-of-use."

The purpose of the Growth Promotion Test is to determine the suitability of culture media that is used in pharmaceutical tests. The test is performed by inoculating the media with a small number of microorganisms (less than 100 CFU) to ensure the nutritive properties of the media are adequate to support even a small number of microorganisms. The EZ-CFU™ product line from Microbiologics is designed to deliver 10-100 CFU per 0.1 ml of hydrated suspension.

further information

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Identifying the reservoirs for hospital and healthcare acquired infections

Studies continue to show that Medical Wire's **Polywipes™** sponge swabs can be an effective tool in the quest to identify reservoirs of infection within the near patient clinical environment. Organisms identified and tackled include *Clostridium difficile*, MRSA and *Acinetobacter*.

Polywipes™ are sterile premoistened blue cellulose sponge swabs, with a size 10cm x 5cm. The sponge material has been specially selected and prepared to ensure it is completely non-inhibitory to bacteria and other microorganisms. The sponge is premoistened in a neutralising or phosphate buffer, and individually sealed in an easy to open peel pouch.

Samples are collected from instruments, tables, curtains, under beds, and window ledges. Badges and lanyards worn by personnel should also be regularly sampled. Normally the sponge is then immersed in a nutrient broth and agitated to release the collected organisms. These are then plated and counted. However a new study to be presented later this year has shown that it is even possible to accurately identify sources of *C. difficile* simply by pressing the sponge momentarily onto a suitable anaerobic agar medium, followed by incubation.

further information

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Liquid Amies Transport Kits now available from TSC

Probact Liquid Amies Transport Kits are now available for the collection and transport of bacterial samples for use in high volume automated laboratories.

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information

Are you a Corporate Member of the Society? If so, this section of *Microbiologist* is for you. Here you can publish short press releases, acquisition notices, news of new staff appointments, technical developments and much more.

Each Corporate Member of the society may publish ***up to*** 200 words on a topic related to their field of activity in each issue of *Microbiologist*. For further information please contact Nancy Mendoza by email at: **nancy@sfam.org.uk**

Both Corporate Members and Ordinary Members of the Society will find a wealth of useful information and resources in this section.

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New accessions to the National Collection of Industrial, Food and Marine Bacteria (NCIMB)

Recent additions to the National Collection of Industrial, Food and Marine Bacteria include five species of lactic acid bacteria:

- *Lactobacillus songhuajiangensis*, isolated from sourdough, Heilongjiang Province, China.
- *Lactobacillus nenjiangensis*, isolated from Chinese pickle, Heilongjiang Province, China.
- *Lactobacillus rennini*, isolated from rennin.
- *Lactococcus fujiensis*, isolated from Chinese cabbages from a vegetable factory in Japan.
- *Lactococcus lactis* subsp. *tructae* isolated from the intestinal mucus of trout.

At NCIMB we are always keen to highlight the positive contribution that bacteria make to our lives and lactic acid bacteria are a great example of this. They have been used for centuries in food production and also play a key role in the production of animal feed. The benefits of their action include preservation — and of course taste!

Recently lactic acid bacteria have been the subject of much commercial and research interest with respect to their role as probiotics, and the possible health benefits of foods that use them for their production. This interest is not only reflected by these new accessions but also in some of the strains we are seeing deposited in our secure storage service as well as demand from clients to confirm the presence or absence of key strains in food products.

further Information

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society for applied sfam microbiology

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The SfAM Activated Sludge Meeting

Control of waterborne disease: a century of the activated sludge sewage treatment process

the Lancashire County Cricket Club, Manchester, UK

The meeting will take place at the Lancashire County Cricket Club, Manchester, UK, on 1 and 2 April 2014. Registration is from 13:00 on Tuesday 1 April and the meeting will finish at 17:00 on Wednesday 2 April 2014.

conference themes

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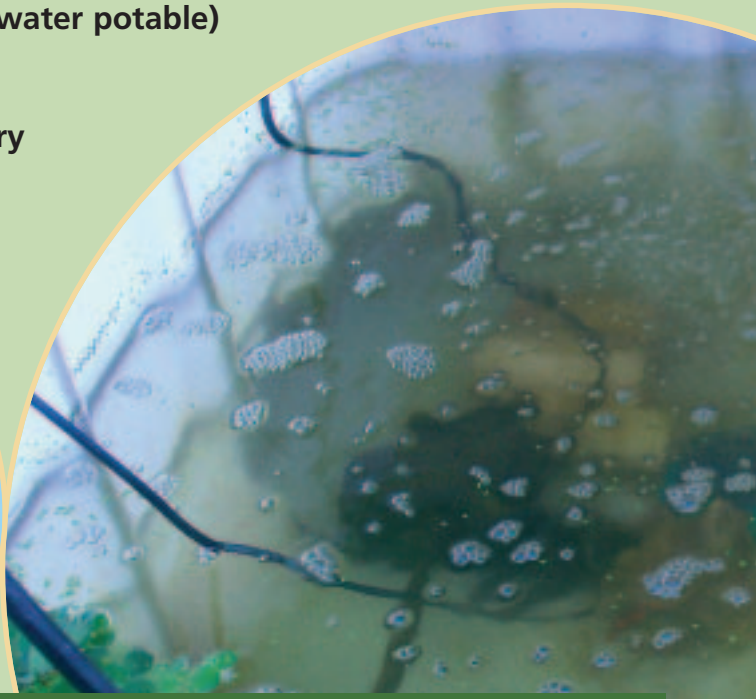
- Nitrification
- Phosphate recovery
- Gene transfer



For further information about this meeting and a provisional programme please visit www.sfam.org.uk/en/events/meetings-diary.cfm/activatedsludge or contact Sally Hawkes ■ Email: sally@sfam.org.uk ■ Telephone +44 (0)1933 382191

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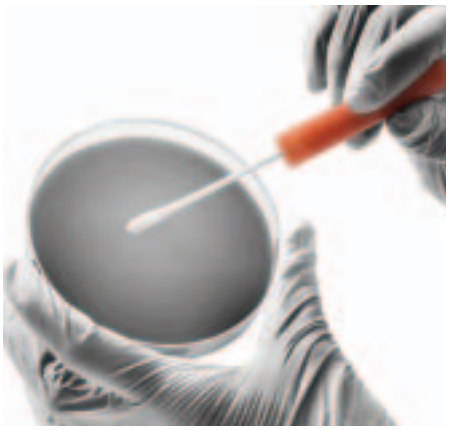

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