Microbiologist

The magazine of the Society for Applied Microbiology ■ September 2010 ■ Vol 11 No 3 ISSN 1479-2699

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Microbiologist is published quarterly by the Society for Applied Microbiology. ISSN 1479-2699. Registered in the UK as a charity and Company limited by guarantee. Registered in England and Wales: 6462427. Registered Charity: 1123044

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Cover: 'Risk' ©Joe Slonik/Pollard Creativity

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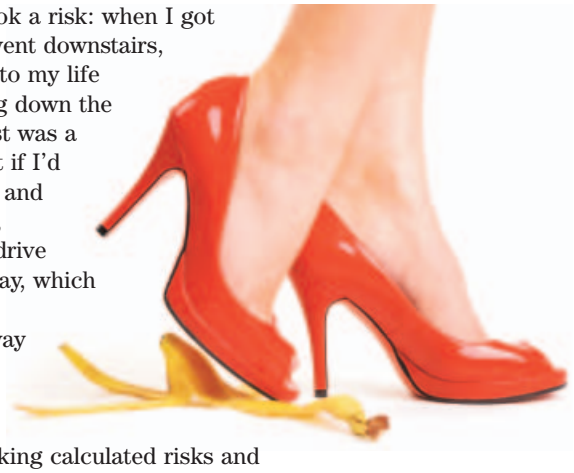
editorial

Lucy Harper talks about risk and risk communication



This morning I took a risk: when I got out of bed and went downstairs, there was a risk to my life from potentially falling down the stairs. Eating breakfast was a potential hazard (what if I'd choked on a sultana?) and as for getting to work, well, that's a 45 mile drive mostly on the motorway, which equates to an extra 0.2micromorts each way (one micromort is a one-in-a-million chance of dying).

We live our lives taking calculated risks and yet risk can be tricky to communicate. Take the comments made by Professor David Nutt who I'm sure you're all aware compared the risks involved in taking the drug Ecstasy with those of riding a horse. Whether or not you agree with his comments, mathematically, this is true. But there are many unscientific factors involved in making decisions based on risk analyses. The sociopolitical issues involved in riding a horse are very different from those involved in taking an illegal drug. As David Speigelhalter, Winton Professor of the Public Understanding of Risk at Cambridge University has said: "*It would be nice if statisticians could just do the sums and tell people what is safer than what. But comparing risks involves people's emotions as well as arithmetic.*"

In this issue of *Microbiologist*, we cover risk from a number of different perspectives. Scientists are often, and should be, expected to communicate risk to each other and to the general public: doing it badly can result in real and sometimes dangerous consequences, such as the MMR Andrew Wakefield debacle.

In our "Ask the expert" column we ask Fiona Fox, Director of the Science Media Centre (SMC) how scientists can help journalists to communicate risk effectively. There's also a link to a useful resource from the SMC: "*Communicating risk in a soundbite*" which you'll find really useful if you're communicating not only risk, but other scientific concepts through the news media (see page 32).

With the summer holidays nearly over, many of you will have visited petting farms and zoos with your family. News of the *E. coli* O157 outbreak associated with the petting farm at Godstone Park illustrates the need for sufficient hygiene measures at farms and zoos. On page 22 we learn more about this important pathogen and the recommendations for such places to reduce the risk of similar outbreaks.

Microbial risk assessment (MRA) is used to aid scientists and those in the food production industry in the understanding of microbial hazards in food safety. The magnitude of risk at various identified stages in food production, influence the regulatory measures placed at each stage. So understanding microbial risk from spoilage or contamination at each stage in the food production process is paramount. An interesting method of MRA, with particular reference to *Salmonella*, is described on page 26.

Finally, on page 30 we explore the links between the Hazard Analysis Critical Control Point (HACCP) process of risk management in food production and infection control in a healthcare setting and ask: should we use a risk-based approach to public health?

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: **lucy@sfam.org.uk**

Lucy Harper

Microbiologist is published quarterly by the Society for Applied Microbiology, a registered charity. ISSN 1479-2699

Copy Dates:

Vol 11 No.4 Dec 2010
Friday 24 Sept 2010

Vol 12 No.1 March 2011
Friday 17 Dec 2010

Vol 12 No. 2 June 2011
Friday 25 March 2011

Vol 12 No.3 Sept 2011
Friday 24 June 2011

Subscriptions: A subscription to *Microbiologist* is included in the annual *Sf*AM membership fee. For further information about the many benefits of membership please see page 6.

Advertising: Information about advertising in *Microbiologist* and how to submit advertisements can be found on the Society website.

Website: our website **(www.sfam.org.uk)** is a timely source of up-to-date information on all Society matters and maintains a comprehensive archive of articles and reports on a variety of microbiological topics.

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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 PDF downloadable 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 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 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.

■ **Retirement 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.

■ **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.** Alternatively, write to her at:

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microbreak

The competition for this issue of *Microbiologist* is based on the "microblogging" website Twitter. For those who don't know about Twitter, you can read about it in a previous issue of *Microbiologist* (September 2009, Vol. 10, No. 3, p14) but in a nutshell, it's essentially a way to find out about organizations and people you are interested in, in bite-sized chunks, 140 written characters at a time (including punctuation).

You can also write messages yourself, but they can only be 140 characters long — about the size of an average text message. These written messages are known as 'Tweets' and we are looking for the most interesting, inspiring and attention-grabbing microbiology-related tweet. To give you an example of a tweet, here's one S*f*AM tweeted from our Summer Conference in Brighton: *"A seriously horrific wound virtually completely healed in 2 months by treatment with phages #sfamsc10."*

So get tweeting and send your entries by email to the Editor by **15 October 2010**. But remember, any entries longer than 140 characters will be disqualified.

S*f*AM **Photo Competition**

Have you taken an outstanding photograph of your beloved bugs? Do you know someone who has and you'd like to see their work in print? Perhaps you've taken a photograph while attending a S*f*AM conference which you think is worthy of reproduction?

Due to popular demand, S*f*AM are running the photography competition again this year. We are looking for twelve eye-catching images to use for our 2011 calendar which we will be giving to all our members as a Christmas gift.

To enter this competition, please send your photographs to the Editor in the form of JPEG files which must be a minimum size of 7 x 7cm at 300dpi (800 x 800 pixels). Alternatively, you can send the original photographs in hard copy to the Society Office and we will return them to you once they have been scanned.

Photographs will appear in one of two categories:

1. Scientific — e.g., a colourful image using bacteria
2. Non-scientific but with a S*f*AM theme e.g., taken at a S*f*AM event

The closing date for entries for this competition is Friday 1 October 2010

president's column

Geoff Hanlon reviews the achievements and scientific successes of Med-Vet-Net

Most of you will be aware that in September 2004 the EU-funded Med-Vet-Net project was officially launched. The purpose of Med-Vet-Net was to develop a network of excellence at the European level, integrating medical, veterinary and food sciences with the overall aim of enhancing research into the prevention and control of zoonoses including foodborne diseases. The project was funded for five years at a cost of 14.4 million Euros by the European Union 6th Framework Programme, within the "Quality and Safety of Food" Priority Area and came to an end on 31 October 2009. My reason for waiting until now to write about the programme is simply that the final winding up of such large scale projects (particularly EU-funded projects) takes an extraordinarily long time and the final report has only just been published at the time of writing. The final financial settlements may not be completed before December this year.

Med-Vet-Net involved 15 independent public health and veterinary institutes in 10 European countries. Within the UK, the partner institutes included the Health Protection Agency, the Veterinary Laboratories Agency and of course the Society for Applied Microbiology.

There is no doubt that the programme has been an outstanding success and has raised awareness of zoonotic diseases amongst the general public and particularly, policy makers. At the same time it has enhanced the knowledge base and skills levels of researchers into zoonotic diseases within Europe. The programme was organized into three overarching Workpackages and 25 scientific Workpackages. The overarching Workpackages were as follows:

Workpackage 1 was the administrative arm of the network based at the French Food Safety Agency (AFFSA) and was responsible for providing financial and management reports to the European Commission and partner institutes.

Workpackage 2 incorporated the main scientific aspects of the programme and organized the research activities into four specific themes, namely, Epidemiology; Host-Microbe Interactions; Detection and Control; and Risk Research.

Workpackage 3 provided the knowledge hub of the programme and was responsible for spreading the information gained within the network both internally as well as externally to the general public, stakeholders outside the partnership and to the international scientific community.

The Society for Applied Microbiology was responsible for Workpackage 3 and you will all have seen reports from Teresa Belcher (Med-Vet-Net's Communications Director) in *Microbiologist* each quarter keeping us up to date on both the scientific achievements of the Workpackages and also progress in communicating the outcomes of the network. Initially, Teresa was employed by S*f*AM working from the offices in Bedford, but as the project developed it became clear that she and her team were not able to bid for further EU funding with the arrangements as they were. Consequently, an independent company (Science Communications Ltd.) was formed to organize Workpackage 3 on behalf of S*f*AM who still retained financial and managerial responsibility. This arrangement has been highly successful and Teresa and her colleagues are to be congratulated on their achievements.

The scientific successes of Med-Vet-Net have been substantial, of which the following are just a few examples taken from the final report:

New methods for the diagnosis, enumeration and typing of bacteria, viruses and parasites were developed and ratified. Over 168 papers have been published or are in press. Eight authoritative reports were delivered and are available to the public on the Med-Vet-Net website. Four guidelines or recommendations and three critical reviews of typing methods have been published. A strategic document outlining methods for calculating costs of zoonotic disease in the EU has been adopted and disseminated to the public. Seventeen standardized or harmonized procedures relating to laboratory based and epidemiological procedures have been developed. Twenty three databases, strain collections and DNA repositories have been established and are either already available to the scientific community or will be in the near future.

It was entirely appropriate that S*f*AM as the "*Voice of Applied Microbiology*" should be

associated with a project such as Med-Vet-Net and we are indebted to Professor Peter Silley who, when President of S*f*AM, was instrumental in bringing the project to fruition. Profound thanks are also due to Phil Wheat (CEO, S*f*AM) who while not involved in the initial planning of the project has had to negotiate his way on behalf of the Society through the administrative and financial quagmire that accompanies a major EU-funded programme.

Although the Med-Vet-Net project has formally ended, the future of the network is assured because on 6 October 2009 the newly formed Med-Vet-Net Association was officially launched. This is a self-funded Association, which currently comprises all of the Network's scientific partners. Dr Valérie Baduel of AFSSA is the elected president with Dr Roberto La Ragione of the VLA as Vice-President. The Project Management team is made up of Project Manager and Association Secretary, Professor John Threlfall of the Health Protection Agency, and Treasurer Arnaud Callegari, from AFSSA.

I would like to take this opportunity to thank all those who have been involved in this project and on your behalf wish the newly formed Med-Vet-Net Association every success for the future.

Professor Geoff Hanlon
President of the Society

ceo's column

Philip Wheat reports on the latest developments within the Society

I am writing this column in early June, several weeks away from the Summer Conference and I'm pleased to report that we have had to declare this year's conference at full capacity. I do apologise to members who have tried to book a place and were turned away. As well as the large number of registered delegates, we have also been overwhelmed by the number of abstracts we have received. In addition, it is also pleasing to report that the number of student members applying for a studentship is the highest I have known since my association with the Society. All these aspects bode well for a vibrant meeting both scientifically and socially and for those who didn't book a place in time, a full report of the meeting will appear in the next issue of *Microbiologist*.

In light of the demand for places at this year's meeting I strongly recommend you book your place early for next year's event as I am sure it once again will prove to be just as popular. Full details of next year's Summer Conference (Clontarf Castle, Dublin, 4-7 July, 2011) where the theme of the meeting will be Food Microbiology, will be found on our website. In addition, the full programme and delegate booking form will appear in *Microbiologist*.

Further to the President's column in the last issue of *Microbiologist* I can confirm we have launched a new category of membership — e-affiliate. This category of membership is only available to individuals in certain developing countries. The countries which are included can be found on our website (http://www.sfam.org.uk/sfamnewsarticle.php?150&1). E-affiliate membership is free of charge and is not available to existing members of the Society. All communications with e-affiliate members will operate online and the e-affiliate member must have an individual email address. E-affiliate membership is also only applicable to individuals training/working in the area of applied microbiology. Once the membership is accepted the individual will continue their membership by annual renewal. E-affiliate members will enjoy the following benefits of membership:

- A link to the electronic version of *Microbiologist*
- Receipt of the monthly Society news email bulletin
- After a period of 12 months membership a number of annual bursaries will be available to e-affiliate members to enable them to attend a Society conference at no cost. However, it should be noted that e-affiliate members are not eligible for any other award or grant which is currently offered to other grades of membership
- Ability to network with other members
- Access to the Members' area of the website

I can already report that we have had a very good response to this new grade of membership and we now have new members in many new countries (Ethiopia, Nepal, Sudan, Cameroon, Kenya, United Republic of Tanzania to name a few). If you are reading this and you think you are from a country where e-affiliate membership is applicable and you wish to apply, please email membership@sfam.org.uk for further information.

Philip Wheat
Chief Executive Officer

membership matters

SfAM Communication Award Winner

SfAM would like to congratulate the winner of the SfAM Communications Award, who this year was Professor John Oxford of Queen Mary, University of London and Scientific Director of Retroscreen Virology.

Professor Oxford has many years' experience working with influenza. He has written over 250 scientific publications, a textbook entitled "*Human Virology*" and has been instrumental in making the recent swine flu pandemic understood by non-scientists. Importantly, he has an historical perspective on the disease and put the swine flu pandemic into context with reference to avian influenza and the 1918 Spanish flu pandemic.

Professor Oxford is a regular contributor to TV news and features programmes including the BBC 10 o'clock news, Newsnight, Today, BBC News 24, and Richard and Judy. During these appearances, Professor Oxford has eloquently explained the risk posed by pandemic flu and stated the microbiological facts clearly and concisely in an effort to inform and educate the general public.

He has written or contributed to numerous newspaper articles and has appeared in a number of documentaries including the BBC Horizon episode "*Pandemic*". Professor Oxford has previously given a Dennis Rosen Memorial Trust lecture. The Dennis Rosen Memorial Trust is a charitable foundation established to encourage dialogue between artists and scientists and his involvement adds to his repertoire of public engagement activities, of which there are far too many to mention.

When asked about his achievement, Professor Oxford said: "*I am honoured by the award and especially pleased that it has come from the Society. On a different level, I have received the 'Shakers and Movers' citation from Time Out! But this evening at Brighton is on a much more scientific level and gives me great pleasure. Compared to any country I know, the UK, with its heart of science and the NHS, is the place to confront great microbiology attacks of Mother Nature*".

Professor Oxford accepted his award from Dr Lucy Harper (see photograph above) and provided delegates with an excellent after dinner speech at the Summer Conference dinner at The Grand Hotel, Brighton on Wednesday 7 July 2010.

A SfAM member recently became a finalist in the nationwide Wellcome Trust funded project: "*I'm a Scientist, Get me out of Here*!" This project is a brilliant way for scientists to engage with schools without ever leaving the lab! It runs for two weeks at a time and during that time, scientists are asked questions online from school pupils. Microbiologist Dr Michael Loughlin of Nottingham Trent University was asked questions like:

- Which is better; pizza or pie?
- What is the most dangerous bacteria?
- What is the biological basis of consciousness?

He was in the "Clean zone" — one of the busiest zones — alongside scientists from a variety of institutions and disciplines. This zone was based on a debate kit provided for schools which was all about the issues raised by antimicrobial cleaners.

After the first week of answering questions, students vote for their favourite scientist in a group and the one with the least votes is "evicted". Dr Loughlin made it to the finals and was the fourth of five scientists to be voted off. SfAM would like to congratulate Dr Loughlin for getting so far in what was clearly a challenging project.

The event will be running again next year, in March and June. So if any of our members are interested in taking part (and flying the flag for applied microbiology) you can find out more and sign up at http://imascientist.org.uk/for-scientists.

2010 SfAM AGM

The 79th Annual General Meeting of the Society for Applied Microbiology was held on Wednesday 7 July at 4.30 pm at the Grand Hotel, Brighton

Present:

Oyawoye Olubukola, Mark Reed, Janet Corry, Alison Kelly, Christine Dodd, Tim Aldsworth, Stuart Petitt, R.W.A.Park, Paul A. Gibbs, Basil Jarvis, Katie Laird, Vasilis Valdramidis, Alan Howgrave-Graham, Louise Hill-King, Nina Holling, Alexandra Henein, Brian Jones, Catherine Ramsay, Auwalu Uba, John Rigarlsford, Jays, Jacek Bardowsw, Andrew Sails, Martin Adams, Joanna Verran, Louise Fielding, Mark Fielder, Geoff Hanlon (Chair).

1. Apologies for absence

Apologies were received from Margaret Patterson, Arthur Gilmour, Jean-Yves Maillard and Irene Grant.

2. 78th Annual General Meeting

The minutes of the 78th Annual General Meeting held in Manchester in 2009 were published in the December 2009 issue of *Microbiologist*. They were approved and accepted by those present.

3. Matters arising

There were no matters arising.

4. Report of the Trustees of the Society 2009

Copies of the report of the Society for 2009 were distributed previously. R.W.A. Park raised a question regarding the office accommodation remaining satisfactory as described in the report of the Honorary General Secretary. He enquired as to the whereabouts of a collection of books donated to the Society for its 50th anniversary. Geoff Hanlon assured him this collection remains intact at the office premises. This report was accepted.

5. Adoption of the annual report 2008

Geoff Hanlon asked for the report of the Trustees to be officially adopted by those present. All present were in agreement.

6. Result of ballot and election of new committee members

Mark Fielder reported that this year there are four committee vacancies. Louise Fielding, Andrew Fox and Andrew McBain are retiring by rotation and were thanked for their contributions and hard work during their term of office.
Mark Fielder then stated that five nominations had been made to the committee and a subsequent ballot had resulted in three new members of committee:
Louise Fielding (voted back onto Main Committee) — nominated by Christine Dodd and seconded by Steve Davies; Katie Laird — nominated by Mark Fielder and seconded by Susannah Walsh; and Irene Grant — nominated by Margaret Patterson and seconded by Arthur Gilmour
The early retirement of Leon Gorris has left a one year post available which has created an incidental vacancy for one year. This will be offered to Clare Taylor — nominated by James Linton and seconded by Sophie Foley, who will then be able to seek re-election next year for a full three year term.

7. Election of Vice President

Geoff Hanlon put forward Martin Adams as new Vice President of SfAM. There were no objections and a unanimous agreement by a show of hands.

8. Election of new members

(including honorary members), deaths and resignations.
A list of names of applicants for membership and a list of deaths has appeared in *Microbiologist* throughout the previous year. The Society holds a summary of the resignations of members throughout the previous year for consultation if requested.

9. Any other business

Basil Jarvis asked if the Society is actively progressing the Society archive. Geoff Hanlon explained that experts have been consulted and found the current archive to be safe. The Society has invested in equipment which has the purpose of digitizing the archive and this work is ongoing.

Environmental Microbiology Lecture 2010

The 2010 *Environmental Microbiology* lecture will be presented by **Professor Willy Verstraete** of Ghent University, Belgium. The title of his presentation will be "***Microbial resource management***". Professor Verstraete is the head of the Laboratory of Microbial Ecology and Technology (LabMet) at Ghent University
The lecture will take place on the 11 October 2010 at the Royal Society of Medicine, London and all members of the Society should have received an invitation in the June issue of *Microbiologist*. Further details about Professor Verstraete can be found at: **http://www.labmet.ugent.be/en/?staff:head**

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.

Argentina

F. Sineriz

Belgium

E. Piednoir

Botswana

V. Khumalo

Brazil

S. Braga-Cruz

Cameroon

P. C. Chi; D. Oumar

Canada

P. Hanifi-Moghaddam

Egypt

A. Ahmed

Ethiopia

S. Gabre

France

C. Cisse; F. Loisy-Hamon

Hungary

C. Nemeth

India

S. Shrivastava

Ireland

N. Hanley; R. Khaksar; M. Mohd Ashaari; L. O'Sullivan; R. Ryan; A. Scanlon

Italy

S. Cahill; S. Delodovici

Kenya

L. W. Karanja; E. M. Njeru; M. O. Oyaro

Mexico

S. Trejo-Estrada

Nepal

J. P. Mathuria; P. Rai

New Zealand

D. Lindsay

Nigeria

S. S. Baba; E.I. Chukwura; F. Doherty; U. Ekwenye; J. Isibor; U. C. Kanife; C. Nnamchi; I-O. A. Oguntoye; A. O. Olaitan; M. Opara; T. Popoola; A. Sanyaolu; Y. M. Somorin

Portugal

S. Monteiro; R. Santos

Romania

A. A. Farkas

Saudi Arabia

A. Alsayeqh

Sudan

A. Elshayeb

UAE

S. Arunachalam; A. M. Kader Maideen

UK

A. K. Adoor; H. Al Zwainy; A. Alazemi; H. Allison; O. Amund; W. Armour; M. Bamaga; A. Bennett; N. Bentley; M-C. Catenazzi; L. Cavill; K. Church; A. Donnelly; N. Doyle; N. Draz; M. Enright; K. Evans; A. Fairclough; M. Febrer; A. Guria; N. Habil; C. Hawkins; C. Hunt; E. Johnson; M. Klyszewska; S. Maddocks; M. McConville; L. McIntyre; D. Merrifield; S. Messenger; H. Moeiniyan Bagheri; M. Montis; A. Nobbs; P-C. Obinna-Echem; J. O'keeffe; S. Patell; M. Patterson; B. Ramalingam; N. Rhouma; L. Roberts; D. Rooks; A. Russi; M. Sanderson; T. Sannasiddappa; M. Smallman; S. Smeaton; M. Stokes; B. Swift; M. Tangney; R. Villa; D. Webber; V. Wong; Y. Xu; J. Zhang

USA

B. Bratina; Y. Chambers; T. Chu; S. Cicchetti; J. Denson; J. Kist; J. Lavender; H. Markewich; H. Miller; C. Sanchez; D. Sauerzopf; L. Schneper; K. Subramanian; V. Timofeev; X. Wang; A. Wenzel; B. Wiggins

Vietnam

M. L. Duong

Zambia

L. Mwale

Zimbabwe

M. A. Osman

Corporate

Bruker UK Ltd
Leatherhead Food Research, UK.

Public Engagement and Innovative Project Grant report

The S*f*AM Public Engagement and Innovative Project grant can be used to develop an innovative piece of work associated with applied microbiology which has public engagement as its main focus. Here, **Professor Jo Verran** explains how she used this grant to raise awareness of malaria for World Malaria Day

World Malaria Day took place this year on 25 April and is used to raise awareness of the global significance of malaria and many charities and fund-raising agencies are active in taking part. Comic Relief and Sports Relief have brought malaria to the forefront of their activities in recent years and this has almost certainly introduced the impact of the disease to many of the UK population for the first time.

Several successful public engagement activities focusing on microbiology have been held recently in Manchester, hosted by Manchester Metropolitan University (MMU). These have usually been in conjunction with meetings of the Bad Bugs Bookclub which was launched at the 2009 S*f*AM Summer Conference. Here, a group of scientists and non-scientists get together to read popular novels in which infectious disease forms part of the plot (www.sci-eng.mmu.ac.uk/intheloop). We talk about the book, its characters, whether or not we enjoyed the read — and then we discuss how accurately the principles of microbiology have been conveyed and whether the information could be used to enhance understanding of the subject, through guided discussion topics and additional reading.

So World Malaria Day 2010 provided the perfect opportunity for a Bad Bugs Bookclub Public Engagement event. Together with the Single Cell Collective, and the Manchester Beacon for Public Engagement, we put together an application entitled 'What Malaria means to Manchester', for S*f*AM funding. The event would combine microbiology and music in a family-orientated afternoon event, which was eventually called 'Malaria Migrations'.

In preparation, the musicians and microbiologists got together a few weeks before the event for a conversation about malaria. The musicians used the discussion as a brief and inspiration to help them research and develop their performances, asking

searching questions about the natural history, epidemiology, treatment and symptoms of the disease, and its relationship with climate and poverty.

The event itself attracted an audience of around 100, dropping into the Nexus café bar in Manchester's Northern Quarter throughout the afternoon. The combination of science and music was compelling. We started with an overview of malaria, and an explanation of our aims. The Powerpoint presentation was projected throughout the afternoon, and information therein was used alongside education leaflets to provide the answers to a quiz. Displays of undergraduate student artwork, developed as an assignment combining interests in microbiology and art (*Microbiologist* March 2007, Vol.8 No.1 pp36), included clothing, jewellery, embroidery and graphic art flanked by enormous (2 x 1m) digital images of blood smears. These digitized images are being used in a MMU research project, developing training to improve diagnosis of malaria in Africa. Laura Tatum, PhD student, was on hand with a microscope to demonstrate the work.

The science displays and activities provided an ongoing backdrop to the performances provide by Single Cell. For me, highlights included songs about the impact of malaria on nineteenth century colonists, and the death of Byron from malaria. Poetry describing the symptoms of the disease as experienced by the poet narrator really brought the disease to the city. Drum rhythms accompanied graphic visuals describing the impact of high temperature on infected individuals. Gentle and moving world music provided by Tanante brought the event to a close.

The Bookclub meeting which followed, focused on the Calcutta Chromosome by Amitav Ghosh. The novel provides an interesting description of the initial association of malaria with the mosquito, but embeds the historical in a more mystical — and confusing — context described over several different periods of time. We struggled a bit with it to be honest!

Overall, the experience of planning for the day and working with Single Cell was really great fun. I felt that the event itself exceeded all expectations in terms of public engagement, raising awareness about malaria, and providing a really successful collaboration between two subjects that one might previously have thought to be poles apart. Many thanks to S*f*AM for bravely going with such a different idea, and enabling it to happen!

Jo Verran
School of Biology, Chemistry and Health Science, Manchester Metropolitan University

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journal**Watch**

News about the Society's journals

Journal of Applied Microbiology

The following articles published in 2010 were the most downloaded articles from Journal of Applied Microbiology between April - June 2010:

DNA extraction from bovine faeces: current status and future trends. D. Rapp, **Vol. 108**, No. 5

The feasibility of developing a risk assessment for the impact of climate change on the emergence of Crimean-Congo haemorrhagic fever in livestock in Europe: a Review. P. Gale, A. Estrada-Peña, M. Martinez, R.G. Ulrich, A. Wilson, G. Capelli, P. Phipps, A. de la Torre, M.J. Muñoz, M. Dottori, V. Mioulet and A.R. Fooks, **Vol. 108**, No. 6

Antimicrobial activity of honey from the stingless bee *Trigona carbonaria* determined by agar diffusion, agar dilution, broth microdilution and time-kill methodology. K.L. Boorn, Y.-Y. Khor, E. Sweetman, F. Tan, T.A. Heard and K.A. Hammer, **Vol. 108**, No. 5

Antimicrobial and antistaphylococcal biofilm activity from the sea urchin *Paracentrotus lividus*. D. Schillaci, V. Arizza, N. Parrinello, V. Di Stefano, S. Fanara, V. Muccilli, V. Cunsolo, J.J.A. Haagensen and S. Molin, **Vol. 108**, No. 1

Advances in enteropathogen control in poultry production. J.M. Cox and A. Pavic, **Vol. 108**, No. 3

Letters in Applied Microbiology

The following articles published in 2010 were the most downloaded articles from Letters in Applied Microbiology between April - June 2010:

Preservation of probiotic strains isolated from kefir by spray drying. M.A. Golowczyc, J. Silva, A.G. Abraham, G.L. De Antoni and P. Teixeira, **Vol. 50**, No. 1

The *in vitro* antibiofilm activity of selected culinary herbs and medicinal plants against *Listeria monocytogenes*. M. Sandasi, C.M. Leonard and A.M. Viljoen, **Vol. 50**, No. 1

Antimicrobial and antioxidant activities of Mexican oregano essential oils (*Lippia graveolens* H. B. K.) with different composition when microencapsulated in β-cyclodextrin. A. Arana-Sánchez, M. Estarrón-Espinosa, E.N. Obledo-Vázquez, E. Padilla-Camberos, R. Silva-Vázquez and E. Lugo-Cervantes, **Vol. 50**, No. 6

Inhibition of *Orientia tsutsugamushi* infection by a truncated recombinant 56-kDa outer membrane protein. S. Park, K.J. Hwang, H. Chu, S.H. Park, S.K. Shim, Y.S. Choi, J.S. Kim and M.Y. Park, **Vol. 50**, No. 5

Screening and characterization of butanol-tolerant micro-organisms. J. Li, J.B. Zhao, M. Zhao, Y.L. Yang, W.H. Jiang and S. Yang, **Vol. 50**, No.4

Environmental Microbiology

The following articles published in 2010 were the most downloaded articles from Environmental Microbiology between April - June 2010:

The structure of bacterial communities in the western Arctic Ocean as revealed by pyrosequencing of 16S rRNA genes. D.L. Kirchman, M.T. Cottrell and C. Lovejoy, **Vol. 12**, No. 5

Wrinkles in the rare biosphere: pyrosequencing errors can lead to artificial inflation of diversity estimates. V. Kunin, A. Engelbrektson, H. Ochman and P. Hugenholtz, **Vol. 12**, No. 1

Population ecology of nitrifying *Archaea* and Bacteria in the Southern California Bight. J.M. Beman, R. Sachdeva and J.A. Fuhrman, **Vol. 12**, No. 5

Early adaptive developments of P*seudomonas aeruginosa* after the transition from life in the environment to persistent colonization in the airways of human cystic fibrosis hosts. M.H. Rau, S.K. Hansen, H.K. Johansen, L.E. Thomsen, C.T. Workman, K.F. Nielsen, L. Jelsbak, N. Høiby, L. Yang and S. Molin, **Vol. 12**, No. 6

Escherichia coli toxin/antitoxin pair MqsR/MqsA regulate toxin CspD. Y. Kim, X. Wang, X-S. Zhang, S. Grigoriu, R. Page, W. Peti and T.K. Wood, **Vol. 12,** No. 5

Environmental Microbiology Reports

The following articles published in 2010 were the most downloaded articles from Environmental Microbiology Reports between April - June 2010:

Environmental occurrence and clinical impact of *Vibrio vulnificus* and *Vibrio parahaemolyticus*: a European perspective. C. Baker-Austin, L. Stockley, R. Rangdale and J. Martinez-Urtaza, **Vol. 2**, No. 1

Environmental reservoirs of *Vibrio cholerae* and their role in cholera. L. Vezzulli, C. Pruzzo, A. Huq and R.R. Colwell, **Vol. 2**, No. 1

Pyrosequencing reveals a contrasted bacterial diversity between oak rhizosphere and surrounding soil. S. Uroz, M. Buée, C. Murat, P. Frey-Klett and F. Martin, **Vol. 2**, No. 2

Detection of toxigenic *Vibrio cholerae* O1 in freshwater lakes of the former Soviet Republic of Georgia. C.J. Grim, E. Jaiani, C.A. Whitehouse, N. Janelidze, T. Kokashvili, M. Tediashvili, R.R. Colwell and A. Huq, **Vol. 2**, No. 1

Biosurfactants in plant–*Pseudomonas* interactions and their importance to biocontrol. J. D'aes, K. De Maeyer, E. Pauwelyn and M. Höfte, **Vol. 2**, No. 3

Lucy Collister
Wiley-Blackwell

bio **focus**

Mark Downs talks the role of the Society of Biology in education

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- advancing education and professional development
- supporting our members
- engaging and encouraging public interest in the life sciences

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Everybody is an education expert — at least that's what many people think: after all we are all 'customers' of education systems and processes at some point in our lives. The reality, however, is that education policy and practice is enormously diverse and equally complex, ranging from engaging young primary school children through to vocational and academic qualifications. There are a multitude of acronyms and a confusing array of institutions involved.

The Society of Biology is an active participant in education issues. As well as influencing policy, we also have a key role in helping with interpretation of the jargon that so often surrounds education debates. With that in mind the Society will be holding a seminar this autumn to help any of our members, who are not experts, get under the skin of education policy and how exams are set and assessed, perhaps helping to answer the hotly debated issue as to whether exams really are getting easier.

It is a good time to create momentum around education. Michael Gove, our Minister for Education has already indicated a likely shift to more 'traditional' A Levels, with the abolition of AS exams along the way. The exam regulator Office of Qualifications and Examinations Regulation (OFQUAL) has rejected the examining boards' proposals for new specifications for the GCSE examinations and the Qualifications & Curriculum Development Authority (QCDA) is to be abolished. These are significant changes that need to be monitored and influenced.

During the course of this year, the Society has been working with our Member Organisations to create a strong voice for biology, working both independently and with the other sciences, especially through SCORE (Science Community Representing Education). There has been real progress with the proposed new specifications for biology progressing much further than some of the other disciplines. In the past, some have positioned biology as the easy option but the evidence shows exactly the opposite. According to a range of independent measures, biology scores as one of the hardest A levels. In terms of relative grading, it is two grades 'harder' than some other disciplines. But we need to be careful to ensure biology stays relevant and focused on skills, not just knowledge. Practical training has always been under threat. It is more complicated in biology than many of the other sciences and certainly at University level, becomes extremely expensive. As the new coalition Government starts to review spending cuts across the public sector, the Society will be campaigning hard to ensure biology doesn't lose out. It would be all too easy for Government and the University sector to move away from hands on practical skills in the laboratory and in the field in favour of the cheaper option of demonstrations or videos. For that reason, practical skills will continue to be a focus of our work at all levels. The Practical Biology website has proved increasingly valuable to biology teachers and we now need to ensure it grows and becomes sustainable.

As well as influencing formal education policy, all learned societies must help show that the sciences are exciting as well as contributing significantly to our society and the economy. How often have we heard that it was an inspirational teacher that attracted someone into the study of biology? In a world of limited resources, we must make sure that teachers continue to be strongly supported with continual professional development available and resources easily accessible to help them make the current curriculum as engaging as possible, providing opportunities for study outside of core material to enrich learning. The Society of Biology will be pushing this independently, and through SCORE, and working closely with other institutions such as the National Science Learning Centre to ensure material is as widely available as possible.

Having succeeded in engaging students in studying biology, there is a further challenge of ensuring they maintain their association with the subject. To do that we need interesting and relevant careers material to help make choices. With this in mind, the Society is pulling together new resources for careers but will aim not to reinvent the wheel. Our Member Organisations have a wealth of material which needs to be drawn together and made available to all biologists, not just those in particular disciplines. Microbiology is an especially rich source of material for careers and practical demonstrations and we are keen to work with *Sf*AM in realizing ambitions which are to all our benefit.

Dr Mark Downs, Ph.D, FSB
Chief Executive, Society of Biology

mediawatch

microbiology and the media

If you have any views on science in the media which you think should feature in this column, please send them to the Editor at: **lucy@sfam.org.uk**

Standing up for Science

I was delighted to be given the opportunity to attend the 'Standing up for Science' media workshop held at The Linnean Society, London. The workshop was organized by *Sense about Science*; an independent charitable trust which aims to promote an evidence based approach to scientific issues that affect the public, by equipping people with the tools to understand how science works and how to make sense of scientific claims. In partnership with collaborating societies, the trust set up the *Voice of Young Science* (VoYS) programme which helps research scientists in the early stages of their career to get actively involved in public debates about science through a series of activities, workshops and publications.

The day began with registration and the opportunity for participants to introduce themselves and chat informally before heading down to the rather grand lecture room for the first session. This session was entitled 'Science and the Media', and was a discussion on the changing role of science and scientists in the public domain. There were three panellists; Dr Alan Dangour, Senior Lecturer at the London School of Hygiene and Tropical Medicine; Dr Mireille Toledano, Senior Lecturer in Epidemiology, Imperial College, London and Dr Robin Lovell-Badge, Head of Division of Stem Cell Biology and Developmental Genetics, Medical Research Council, who shared both their good and bad experiences with the media. From

their presentations and an interactive question and answer session afterwards, I learnt that an important element of dealing successfully with the media planning and preparation. Prepare in advance both what you are going to say and what you are not going to say. The speakers advised us to create a key statement that summarizes the message and repeat this statement as often as necessary. The panellists stressed the importance of making good use of training opportunities, especially in interview technique, before engaging with the media.

Prior to breaking up for lunch, the participants were split into four smaller groups and were asked to discuss our perceptions, both good and bad, of the representation of science by the media. Points raised were discussed during the second session of the workshop which was entitled 'What journalists are looking for?' Here a panel of journalists provided an insight into the daily activities of their jobs. They discussed their approach to stories and how they balance the need for news and entertainment with reporting science. David Rose, Health Correspondent at *The Times*, explained that time and space constraints associated with print media could lead to misinterpretation but journalists really want to get their facts right as it is their duty to be balanced and responsible.

Alok Jha of *The Guardian*, responded to delegates views on whether sensationalism was necessary in reporting scientific stories. He argued that using attention-grabbing language was an essential part of writing for the general public as opposed to the scientific community.

Jason Palmer, BBC Online, provided a different perspective to the debate, as online publishing is quite different from print with no restrictions on article length. He advised us as young scientists to be honest and clear when working with journalists. This was an interesting session as it was clear that journalists are passionate about reporting facts to the public and need help from scientists to do so.

Prior to the third session, we returned to our groups to discuss issues preventing early career research scientists from engaging with the media. The following factors were discussed by almost all groups: a lack of confidence and training opportunities, limited understanding of how the media works and time constraints. This discussion provided an excellent introduction to the final session of the day 'Standing up for science — the nuts and bolts'. We were shown the important role that we, as early career scientists could play in encouraging good science and evidence in the public domain, even though we are not yet leaders in our field. The panellists for this session were Lucy Goodchild, Press Officer at Imperial College, London; Julia Wilson and Alice Tuff, both from *Sense About Science*. We learnt the importance of our local press offices as an intermediary between the scientist and the media and how press officers help to promote our research to the public. We were also given practical advice on how to interact with journalists. We were encouraged to actively participate in standing up for science through the various activities of the VoYS network and we were provided with examples of projects undertaken by VoYS.

Through this workshop, I have learnt that as a scientist, as well as communicating research findings within the scientific community, I have a responsibility to promote science to the wider public in a balanced and responsible manner and it is important to know how to engage with the media to do this effectively. This is truly standing up for science. Involvement in group discussions has also improved my confidence. As a result, I have joined the VoYS network and hope to be actively involved in one of their on-going projects. I am very grateful to S*f*AM for this valuable opportunity and encourage student members to take advantage of such opportunities in the future. In conclusion, I would like to rephrase Edmund Burke's famous quote "*All that is necessary for the triumph of evil is for good men to do nothing*" to "*All that is necessary for the triumph of bad science is for good scientists to say or do nothing*" and would urge all young scientists to join the VoYS network and actively challenge misinformation about science.

Amara Anyogu
PECS Secretary

S*f*AM policy on the media

We will:

- always do our best to provide facts, information and explanation.
- if speculation is required, explain the rationale behind that speculation.
- desist from hyping a story—whether it is the journalist or the scientist doing the hyping.

SfAM events in 2011 — save the dates!

12 January 2011

Winter Meeting

- **Probiotics**
- **Anaerobic microbiology**

■ Including the Denver Russell Memorial Lecture

The Royal Society, London, UK

13 April 2011

Spring Meeting

Latest developments in respiratory infections

5th broadening microbiology horizons in biomedical science meeting

■ Including the Procter and Gamble Applied Healthcare Microbiology Award Lecture

The Stratford Q Hotel, Stratford upon Avon, UK

4 - 7 July 2011

Summer Conference

Food microbiology

■ Including the Lewis B Perry Memorial Lecture, followed by drinks, buffet and tour of the Guinness Storehouse

■ Conference dinner with Irish entertainment and tutored whisky tasting session at the Jameson Distillery

Clontarf Castle, Dublin, Ireland

For further information on these events please visit sfam.org.uk or contact Sally Cryer
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12 January 2011

Winter Meeting

- **Probiotics**
- **Anaerobic microbiology**

■ Including the Denver Russell Memorial Lecture

The Royal Society, London, UK

CPD ACCREDITATION APPLIED FOR

Programme

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

Chair: **Geoff Hanlon**

10.30 - 11.15 **The Denver Russell Memorial Lecture — *Propionibacterium acnes*: emerging pathogen?**
Peter Lambert, Aston University

11.15 - 11.50 **The gut flora and probiotics.**
George MacFarlane, University of Dundee

11.50 - 12.25 **An overview of the past 40 years in anaerobic microbiology**
Mike Wren, University College London Hospital

12.25 – 13.30 **Lunch**

Session A Probiotics

Chair **Martin Adams**

13.30 - 14.05 **Probiotics and the elderly.**
Ian Rowlands, University of Reading

14.05 - 14.40 **Probiotics. prebiotics and neonates**
Christine Edwards, University of Glasgow

14.40 - 15.00 **Tea and coffee**

15.00 - 15.35 **Veterinary use of probiotics.**
Roberto La Ragione, Veterinary Laboratories Agency

15.35 - 16.10 **Safety of probiotics.**
Dr Kevin Whelan, King's College London

Session B Anaerobic microbiology

Chair **Mark Fielder**

13.30 - 14.05 **State of the art regarding *clostridia***
Ian Poxton, University of Edinburgh

14.05 - 14.40 **The exploitation of beneficial anaerobic microorganisms**
Nigel Minton, University of Nottingham

14.40 - 15.00 **Tea and coffee**

15.00 - 15.35 **Anaerobes in complex polymicrobial diseases**
M. J. Woodward, Veterinary Laboratories Agency

15.35 - 16.10 **An overview of identification of anaerobes, including latest developments**
Val Hall, Anaerobe Reference Laboratory, National Public Health Service, Cardiff

16.10 - 16.45 **Oral anaerobes**
Peter Mullany, Eastman Dental Institute

16.45 **Close**

The programme for this meeting was correct at the time of going to press

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SfAM WINTER MEETING WEDNESDAY 12 JANUARY 2011

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Escherichia coli O157: a wolf in petting farm clothing?

Open farms and petting zoos present children with sometimes unique access to both farm and wild animals. The experience provides opportunity to touch or feed animals not normally encountered in the domestic setting. Importantly, petting farms and zoos provide both entertainment and educational opportunities for children of all ages. However, in a small number of circumstances, contact with such animal hosts may give rise to zoonotic infections, including *Salmonella*, *Campylobacter*, *Cryptosporidium*, and *Escherichia coli* (*E. coli*), particularly *E. coli* O157.

In the Netherlands it is estimated that there are approximately 450 petting zoos which are visited annually by 15-20 million people (Heuvelink *et al.*, 2007). In the United Kingdom it is reported that there are between 5 and 10 million visitors to open farms each year (Walker, 2010). Petting farms typically have significant numbers of visitors between the months of May and September, coinciding with school holidays and vacation breaks. As a consequence, there is the potential for transmission of zoonotic organisms to many farm visitors in the absence of appropriate interventions and controls. However, overall the risk of infection is still perceived as proportionately low in context of the incidence of infection.

Ordinarily, infection with *E. coli* O157 is most commonly associated with the consumption of contaminated foods such as meat, unpasteurized milk or cheeses. The consumption of faecally contaminated fresh produce, such as lettuce, has also been implicated in several outbreaks. Transmission can also take place via person-to-person contact through the faecal-oral route; this infective route is reported most commonly in child daycare centres. Recreational activities such as swimming in infected water bodies such as rivers or streams have also been reported as a transmission route. *E. coli* O157 can also be transmitted via contact with infected animals and such an infection route is most often associated with country fairs, petting zoos and petting/open farms (Rangel *et al.*, 2005). Quite simply, people touching animals or contaminated surfaces associated with animals may contaminate their hands with *E. coli* O157 (Duffy, 2003) and infection may result from hand-to-mouth contact.

In the last 10 years, several European countries and America have reported *E. coli* O157 outbreaks associated with petting farms and zoos, farmyard camps and country fairs. In the United States animal contact outbreaks were first reported in 1996, with most outbreaks subsequently associated with direct contact with cattle. The prevalence of *E. coli* O157 in farmed livestock has been reported by several groups but by contrast we still know relatively little about the prevalence in the diversity of species found on petting farms. Cattle are ordinarily perceived as the main reservoir of the organism, with *E. coli* O157 found in approximately 40% of herds in England and Wales (Paiba *et al.*, 2003). The presence of *E. coli* O157 has also been reported in other animals including pigs, sheep, horses, alpacas, llamas, deer and rabbits (reviewed by Pritchard *et al.*, 2009). Several surveys would indicate that the prevalence of *E. coli* O157 in various species found on petting farms is actually quite high with some farms having between 50% and 70% positive samples (Heuvelink *et al.*, 2007, Pritchard *et al.*, 2009). Currently less is known about the colonization and persistence of *E. coli* O157 in small ruminants such as sheep compared with our current knowledge of the associations of this organism with cattle (La Ragione *et al.*, 2009).

One of the major issues in the control of *E. coli* O157 in animal species is that the organism survives in the gastrointestinal tract and does not cause

illness, especially in cattle. As a consequence, the disease is not evident and may not initially be considered during disease investigations. Evidence from several countries has shown that a small percentage of both farmed and wild animal species, will shed the organism. Additionally, intermittent shedding of *E. coli* O157 is recognized in livestock, and is often associated with weaning and age of the animal (Nielson *et al.*, 2002). It is now recognized that increased frequency of shedding of the organism occurs in the summer and autumn months with decreasing frequency during colder seasons (Dunn *et al.*, 2004, Money *et al.*, 2010). It can be speculated that a percentage of animals on open farms may also shed *E. coli* O157 during these seasonal periods thereby potentially exposing large numbers of visitors to these attractions during the summer months.

Outbreaks attributed to petting farms and similar contact routes have been most commonly reported from the UK, US, and Netherlands. Quite often the numbers of infected individuals has been quite low. Outbreak data provided by the Health Protection Agency reports 195 outbreaks of *E. coli* O157 in England and Wales between 1992 and 2008 with approximately 1000 confirmed cases reported. It is estimated that between 5% and 10% of cases resulted from zoonotic transmission but it was not possible to estimate how many resulted specifically from exposure at open farms. However, larger outbreaks resulting from direct contact with animals on petting farms have also been reported in the US (Lejeune & Davis, 2004). The latest reported occurrence of *Escherichia coli* O157 on various petting farms in England in 2009 is considered the largest outbreak of Verocytogenic *E coli* O157 (VTEC O157) resulting from contact with animals in the UK, with 93 visitors affected (Griffin Investigation, 2010). Following this *E. coli* O157 outbreak associated with petting farms in England, the debate continues regarding whether the access of potentially vulnerable groups such as young children (0 to 5 years) to such animals is considered safe and appropriate.

Escherichia coli O157 is reported to have a low infectious dose with as little as between 10 and 100 organisms giving potential rise to infection. One particular modelling study assessed the theoretical loading effects of *E. coli* O157 shed by sheep onto a field preceding a scout camp where several people became infected with *E. coli* O157. The modelling outcome agreed with previously reported estimates for the ingestion of a low infective dose (4-24 organisms, Strachan *et al.*, 2001). The isolation rate of *E. coli* O157 from faecal samples is also perceived as low in numbers. Consequently, the presence of only low numbers of *E. coli* O157 present does not potentially hinder the infection potential for visitors exposed at these attractions.

Escherichia coli O157 was first isolated in 1982 in the US (Riley *et al.*, 1983) from patients presenting with haemolytic ureamic syndrome (HUS) and bloody diarrhoea. The pathogenicity factor for *E. coli* O157 was first reported in 1983; with *E. coli* O157 isolates found to produce a toxin. Further work has demonstrated that *E. coli* O157 produces several virulence factors including two major verotoxins vt1 and vt2. Ordinarily, infection with *E. coli* O157 may be self-limiting resulting in mild diarrhoea but a small proportion of the population may go on to develop haemorrhagic colitis or HUS, which is often associated with acute renal failure and neurological sequelae. Importantly, the high risk groups for infection with this particular organism are infants, young children and the elderly. Within these high risk groups infection with *E. coli* O157 may be fatal.

Infection with *E. coli* O157 is typically considered to be foodborne and

as a consequence transmission via direct contact with contaminated faeces has been perhaps underestimated. Studies on both experimentally infected and naturally colonized cows have shown that the highest numbers of *E. coli* O157 were isolated from the bovine faeces. By contrast, examination of the lumen contents of the bovine gastrointestinal tract failed to recover or recovered significantly lower levels (Naylor *et al.*, 2003).

Contact with animal hides, faeces and saliva, faecally contaminated farm structures, contaminated bedding and soil are implicated increasingly as critical vehicles in the spread of infection. The organism has been shown to survive for a long time in faeces and in the environment (Varma *et al.*, 2003, Williams *et al.*, 2005) and may continue to produce vt1 and vt2 toxins during this period (Wang *et al.*, 1996). The message that emerges from review of circumstances surrounding outbreaks on petting farms is the need to adhere to good hygiene principles, both personal and from the farm management perspective. Some studies have shown that handwashing with soap and water decreases the risk for *E. coli* O157 infection. The preventative effect of hand-washing after direct contact with animals and before consumption of food has been noted during the course of several outbreak investigations involving petting farms (Steinmuller *et al.*, 2006).

A three year study of hygiene and open farms in the Netherlands (Heuvelink *et al.*, 2007) has shown that whilst the hygiene of approximately 300 establishments (petting farms, care farms and farmyard campsites) was generally good, it was concluded that there was a requirement for improving knowledge of the general public about hygiene and handwashing along with providing better handwashing and footwear cleaning amenities. The study also collected data about the levels of detection of *E. coli* O157 in fresh faeces collected from the farms during the study period; these visits occurred between June and November. Approximately 70% of the petting farms were positive for *E. coli* O157, with the highest number of isolations recorded in sheep and cattle.

In the UK the official advice provided by the Health Protection Agency (HPA, UK), advocates that the general public visit petting farms and similar

attractions. Where there is the potential for contact with animals there is a need to adhere to good handwashing principles. The HPA website states that: "*It is very important for parents and children to make full use of the washing facilities that are provided at open farms. They should wash their hands thoroughly after contact with the animals, before eating and before putting fingers near their mouths*." Advice available to the public in the UK on avoiding infection during farm visits (HPA website, 2010) cites specific additional action points to minimize zoonotic disease transmission. Managing the degree of contact is considered paramount and children are dissuaded from kissing animals or allowing animals to lick their faces. Eating and drinking when touching animals is not recommended and the public are advised to eat and drink only in designated picnic or café areas. Generally, there are a low number of handwashing facilities available to the large volumes of visitors at country fairs, petting farms and farm zoos. Consequently, the general public are less likely to wash their hands after touching the animal exhibits. Several outbreak investigations have estimated the occurrence of handwashing in such circumstances to range from 45% to 55% (Friedman *et al.*, 1998, Crump *et al.*, 2002).

In response to the 2009 outbreak of *E. coli* O157 on a farm in Surrey, an official investigation was undertaken to address the circumstances that led to the incident. The Griffin Committee enquiry considering the circumstances and management of the outbreak have recently published their recommendations (Griffin Investigation Committee, 2010). The report has concluded that the outbreak was not exceptional but had affected a large number of individuals, with an estimated child infection rate of 1%. The enquiry considered that even if the control of the outbreak had occurred earlier in the outbreak timeline, approximately half of the reported disease cases would still

have occurred. Additionally, this particular outbreak demonstrated that reliance on handwashing alone, as an intervention step, was not sufficient to prevent zoonotic transmission.

The report places emphasis on several key aspects, primarily changes to the identification and management of future outbreaks, the education of the public regarding risk of zoonotic infection before and during visits to open farms, education of the management staff and animal handlers on farms and the development of appropriate regulatory approaches for ensuring good consistent standards are developed and maintained on open farms.

Specifically, the public require a greater understanding of the necessity for good handwashing procedures to be undertaken if children are allowed to have direct contact with animals. Farm staff are required to ensure that handwashing practices are actively encouraged, to ensure that animal contact areas are supervised and that public contact areas are appropriately designed and remain clear of animal faeces or faecally contaminated material. The regulators have been tasked with developing an appropriate code of practice and assisting the industry in the development of a suitable accreditation scheme. The Griffin Committee note that the prospect of another farm outbreak would have serious impact on the future of the open farm industry and for the credibility of the regulatory bodies providing support and control to this industry. As a consequence of the Surrey outbreak, diseases associated with *E. coli* O157 infection have become statutorily notifiable.

Further knowledge will contribute to the control of this organism and with the Griffin Committee recommendations in mind it is clear that research into the pathophysiology and epidemiology of this important pathogen is significant and of ongoing importance. There is a necessity for this type of research to be undertaken in tandem with research into the development of suitable vaccine candidates for use in both a medical and veterinary context.

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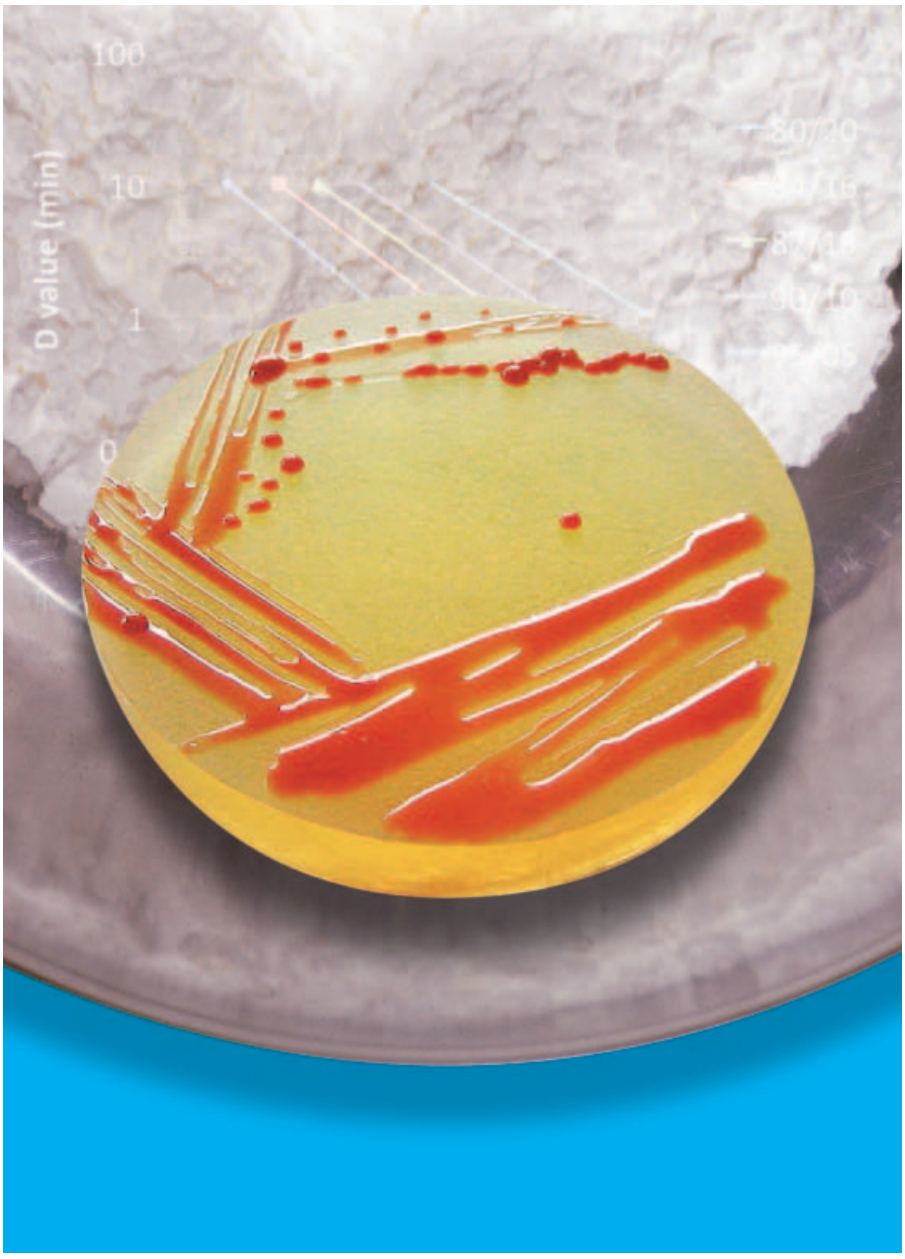
references

- Crump, J.A., Sulka, A.C., Langer, A.J., Schaben, C., Crielly, A.S., Gage, R., Baysinger, M., Moll, M., Withers, G., Toney, D.M., Hunter, S.B., Hoekstra, R.M., Wong, S.K., Griffin, P.M. and Van Gilder, T.J (2002). An outbreak of *Escherichia coli* O157 infections among visitors to a dairy farm. *N Engl J Med.* Aug 22; **Vol. 347** No. 8: pp555-60.
- Duffy, G. (2003). Verocytoxigenic *Escherichia coli* in animal faeces, manures and slurries. *J Appl Microbiol.*; **Vol. 94** Suppl:94S-103S.
- Dunn JR, Keen JE, Thompson R.A. (2004). Prevalence of Shiga-toxigenic *Escherichia coli* O157:H7 in adult dairy cattle. *J Am Vet Med Assoc.* 4 Apr 1;**Vol. 224**, No.7: pp1151-8.
- Friedman, C.R., Torigian, C., Shillam, P.J., Hoffman, R.E., Heltzel, D., Beebe J.L., Malcolm, G., DeWitt, W.E., Hutwagner, L. and Griffin, P.M. (1998). An outbreak of salmonellosis among children attending a reptile exhibit at a zoo. *J Pediatr.* May; **Vol. 132**, No.5 pp802-7.
- Griffin Investigation Committee (2010). Final Report — Review of the major outbreak of *E. coli* O157 in Surrey, 2009 [WWW document]. http://www.griffininvestigation.org.uk/report/executive_summary/default.htm (accessed 15 June 2010).
- Heuvelink, A.E., Valkenburgh, S.M.,Tilburg, J.J.H.C., Van Heerwaarden, C., Zwartkruis-Nahuis, J.T.M. and De Boer, E. (2007). Public farms: hygiene and zoonotic agents. *Epidemiol Infect.* October; **Vol. 135**, No.7: pp1174–1183.
- HPA (2010). 10th June 2010 — last review. Advice for parents and children planning farm visits. [WWW document]. www.hpa.org.uk/ProductsServices/LocalServices/NorthWest/NorthWestPressReleases/nwest100610Adviceforfarmvisits/ (accessed 16 June 2010)
- La Ragione, R.M., Best, A., Woodward, M.J. and Wales, A.D. (2009). *Escherichia coli* O157 colonization in small domestic ruminants. *FEMS Microbiol Rev.* Mar; **Vol. 33**, No.2: pp394-410. Epub 2008 Dec 12.
- LeJeune, J.T and Davis, M.A (2004). Outbreaks of zoonotic enteric disease associated with animal exhibits. *J Am Vet Med Assoc.* May 1;**Vol. 224**, No.9: pp1440-5.
- Money, P., Kelly, A. F., Gould, S. W. J., Denholm-Price, J., Threlfall, E. J., and Fielder, M.D. (2010) Cattle, weather and water: mapping *Escherichia coli* O157:H7 infections in humans in England and Scotland. *Environ. Micro.* doi:10.1111/j.1462-2920.2010.02293.x
- Naylor, S.W., Low, J.C., Besser, T.E., Mahajan, A., Gunn, G.J., Pearce, M.C., McKendrick, I.J., Smith, D,G.E. and Gally D.L. (2003). Lymphoid Follicle-Dense Mucosa at the Terminal Rectum Is the Principal Site of Colonization of Enterohemorrhagic *Escherichia coli* O157 in the Bovine Host. *Infect Immun.* March; **Vol. 71**, No.3: pp1505–1512.
- Nielsen, E.M., Tegtmeier, C., Andersen, H.J., Grønbaek, C. and Andersen, J.S (2002).Influence of age, sex and herd characteristics on the occurrence of Verocytotoxin-producing *Escherichia coli* O157 in Danish dairy farms. *Vet Microbiol.*Sep 2;**Vol. 88**, No.3: pp245-57.
- Paiba, G.A., Wilesmith, J.W., Evans, S.J., Pascoe, S.J., Smith, R.P., Kidd, S.A., Ryan, J.B., McLaren, I.M., Chappell, S.A., Willshaw, G.A., Cheasty, T., French, N.P., Jones, T.W., Buchanan, H.F., Challoner, D.J., Colloff, A.D., Cranwell, M.P., Daniel, R.G., Davies, I.H., Duff, J.P., Hogg, R.A., Kirby, F.D., Millar, M.F., Monies, R.J., Nicholls, M.J. and Payne, J.H. (2003). Prevalence of faecal excretion of verocytotoxigenic *Escherichia coli* O157 in cattle in England and Wales. *Vet Rec.* Sep 20;**Vol. 153**, No. 12: pp347-53.
- Pritchard, G.C., Smith, R., Ellis-Iversen, J., Cheasty, T. and Willshaw G.A. (2009). Verocytotoxigenic *Escherichia coli* O157 in animals on public amenity premises in England and Wales, 1997 to 2007. *Vet Rec.* May 2;**Vol.164**, No.18: pp545-9.
- Rangel, J.M., Sparling, P.H., Crowe, C., Griffin, P.M. and Swerdlow, D.L. (2005). Epidemiology of *Escherichia coli* O157:H7 outbreaks, United States, 1982-2002. *Emerg Infect Dis.* Apr; **Vol. 11**, No, 4: pp603-9.
- Riley, L.W., Remis, R.S., Helgerson, S.D., McGee, H.B., Wells, J.G., Davis, B.R., Hebert, R.J., Olcott, E.S., Johnson, L.M., Hargrett, N.T., Blake, P.A. and Cohen, M.L. (1983). Hemorrhagic colitis associated with a rare *Escherichia coli* serotype. *N Engl J Med.* Mar 24;**Vol. 308**, No.12: pp681-5.
- Strachan, N.J., Fenlon, D.R. and Ogden, I.D. (2001). Modelling the vector pathway and infection of humans in an environmental outbreak of *Escherichia coli* O157. *FEMS Microbiol Lett.* Sep 11;**Vol. 203**, No.1: pp69-73.
- Steinmuller, N. Demma, L., Bender, J.B., Eidson, M. and Angulo, F.J (2006). Outbreaks of enteric disease associated with animal contact: not just a foodborne problem anymore. *Clinical Infectious Dis*, **Vol. 43**: pp1596–1602.
- Varma, J.K., Greene, K.D., Reller, M.E., DeLong, S.M., Trottier, J., Nowicki, S.F., DiOrio, M., Koch, E.M., Bannerman, T.L., York, S.T., Lambert-Fair, M.A., Wells, J.G. and Mead PS. (2003) An outbreak of *Escherichia coli* O157 infection following exposure to a contaminated building. *JAMA*; **Vol. 290**: pp2709–12.
- Walker, G. (2010). E.*coli* O157 – developments arising from the Griffin Committee Enquiry http://www.hse.gov.uk/aboutus/meetings/committees/hela/150410/h9-04.pdf (accessed 16 May 2010)
- Wang, G., Zhao. T. and Doyle, M.P. (1996). Fate of Enterohemorrhagic *Escherichia coli* O157 in Bovine Feces. *App. Environ Micro.* **Vol. 62**, No. 7,July 1996, pp2567–2570
- Williams, A.P., Avery, L.M., Killham, K. and Jones, D.L. (2005). Persistence of *Escherichia coli* O157 on farm surfaces under different environmental conditions. *J Appl Microbiol.* **Vol.8**, No.5: pp1075-83.

The application of microbial risk assessment principles to understanding and managing microbial hazards in foods: a case study with *Salmonella* in dry foods



The food industry faces ongoing challenges due to the microbial contamination of food. National and international regulations increasingly use a "risk-based" approach to food safety (where the regulatory focus is driven by the magnitude of the risk). So risk assessment is becoming a valuable tool to systematically organize and evaluate the potential public health risk posed by food processing operations. This article demonstrates a case study approach, using the example of *Salmonella* in dry foods, to demonstrate the value of quantitative microbiological risk assessments (QMRA) in managing risk.

Quantitative microbial risk assessment

QMRA is a methodology used to organize and analyze relevant data in order to estimate the public health consequences associated with microbiological risk. Historically it's been used to assess the risk posed by contaminated food and water, although here we will specifically focus on only food, particularly the risk posed by dried foods contaminated by — but not supporting the growth of — *Salmonella*. QMRA considers some or all of the various stages in the food production process and the main outcome is traditionally defined as the estimated probability of illness from the consumption of the food product under study. However, this methodology has also been successfully applied to provide valuable information on the microbial consequences of specific processing steps in the food production chain, as well as during handling by the

Table 1. Results of surface sampling for *Salmonella* and Enterobacteriaceae

	Enterobacteriaceae				
Salmonella	**Absent**	**<100**	**>=100**	**TNTC**	**Total**
Absent	4400	1000	40	200	5640
Present	10	15	2	25	52
Total	4410	1015	42	225	5692

TNTC: too numerous to count

Table 2. Calculations of the probability of *Salmonella* and Enterobacteriaceae (EB) occurring

Odds of *Salmonella* occurring	52/5692 = 0.914%
Odds of EB occurring at TNTC*	225/5692 = 3.953%
Calculated odds together	0.914%*3.953% = 0.036%
Actual odds together	24/5692 = 0.439%

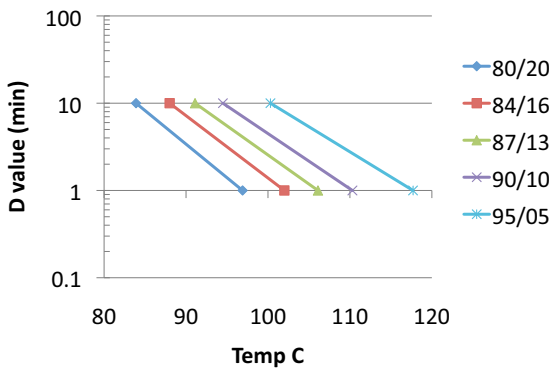
TNTC: too numerous to count

consumer, in particular, those that contribute to an increased risk of foodborne illness (Cassin *et al.*, 1998). Once the risk model is developed, different scenarios can be analyzed by varying the inputs of particular modules. Individual process steps, as well as risk mitigation strategies, can be evaluated under this scheme to determine their impact on the overall risk (Vanderlinde, 1998); the results of these risk assessment simulations may provide scientific basis for the evaluation of risk management alternatives.

Monte Carlo simulation is currently the most widely used technique for conducting microbial risk assessments. This methodology uses a stochastic approach, where key factors in the model are represented by distributions and a set of output values in the form of a distribution is generated as a result of multiple iterations. Thus, input data in the form of distributions of probability (as opposed to discrete values) — for example for the prevalence and levels of pathogen in a carcass or for thermal inactivation during a cooking step — are combined to generate an estimated probability of illness which is also represented as a distribution. Because high-risk scenarios often arise from outlying data points rather than average results (Whiting 1997), Monte Carlo simulation has the potential to provide a more realistic estimation of risk compared to a strictly deterministic approach. In addition, taking into account the variability described by a frequency distribution produces a more realistic assessment of risk than one based on a sole discrete value, such as the mean or worst case, at each step modelled (Brown *et al.*, 1998).

Risk assessment in general and QMRA in particular is often described as consisting of four stages (Jaykus *et al.*, 2006): (1) hazard identification, in which the pathogenic microorganisms potentially present in the food product are identified; (2) hazard characterization, which describes the adverse health effects associated with the microorganism if consumed; (3) exposure assessment, which provides an estimated frequency of consumption of the food in study, and the probable number of microorganisms per serving; and (4) risk characterization, where hazard characterization and exposure assessment are integrated to provide an estimated risk of infection associated with the consumption of the food product.

Figure 1. *Relationship between decimal reduction time (D-value) and solid/moisture ratio for Salmonella and temperature as extrapolated from literature data*



Risk from *Salmonella* in dry foods

Recent U.S. *Salmonella* outbreaks and recalls, including the Peanut Butter Corporation of America outbreak, the Plainview non-fat dry milk recall, and the Basic Food Flavors hydrolyzed vegetable protein recall have highlighted the importance of controlling *Salmonella* in Formulated Dry Foods. The analysis that follows was inspired by a series of risk assessments undertaken to assist food companies in managing the risks associated with formulated dry food products that do not support the growth of *Salmonella*.

Use of microbial indicators in dry food environments

One of the most important issues facing dry food manufacturers who wish to control *Salmonella* is the development and implementation of an environmental monitoring program that will identify and control *Salmonella* in the processing plant environment. A good source of detailed information needed to set up such a program can be found in the "Control of *Salmonella* in Low-Moisture Foods" document recently published by the Grocery Manufacturers Association (GMA, 2009). This document advocates a zone-based control system where different areas of the plant are designated as part of different hygiene zones. Zone 1 might (for example) contain product contact surfaces that represent the highest risk, should *Salmonella* be present. Zone 2 might represent non-product contact surfaces adjacent to Zone 1, while Zone 3 might represent non-product contact surfaces further from Zone 1. Finally, Zone 4 would represent areas far outside the process area (locker rooms, warehouses, loading docks, etc.) The GMA (2009) document furthermore recommends microbial sampling for

both indicator organisms (typically Enterobacteriaceae) as well as *Salmonella* in Zones 2-4, but only for Enterobacteriaceae in Zone 1. This is in keeping with general food industry policy to avoid sampling for pathogens on food contact surfaces because they occur infrequently and their detection places the company in an untenable position.

This type of sampling strategy (looking for indicators as well as pathogens) raises an often-debated issue regarding the use of microbial indicators: do indicators work and what exactly do they indicate? To illustrate the potential value of indicator organisms in such an environment, the data in Table 1 were created. These data represent one year of sampling results from a fictitious food processing plant that analyzes a variety of food contact and non-contact surfaces and show the degree of correlation between Enterobacteriaceae counts and *Salmonella* prevalence. So, for example, both *Salmonella* and Enterobacteriaceae were absent from the sampled surface 4400 times out of the total number of samples (5692) taken. Likewise, *Salmonella* were present in 52 samples out of 5692, and *Salmonella* were absent but Enterobacteriaceae were present at a level of greater than 100 cells in 40 out of 5692 samples taken.

Table 2 uses a concept from statistics called the Joint Probability, to compare the theoretical odds of *Salmonella* and "too numerous to count" (TNTC) levels of Enterobacteriaceae occurring simultaneously. For example, the odds of *Salmonella* occurring on a surface are 52/5692 or 0.914%. The odds of TNTC levels of Enterobacteriaceae occurring on a surface are 225/5692 or 3.953%. Statistics tells us that the theoretical odds of these two events occurring together are 0.914% * 3.953% = 0.036%, but we also know the actual odds as well from Table 1: 25/5692 = 0.439% or a value more than 10 times higher than would be expected by change alone! Repeating these calculations for other combinations shown in Table 1 reveal that surfaces having more than 100 Enterobacteriaceae have a four times greater risk of containing *Salmonella*, while surfaces with any levels of Enterobacteriaceae are at twice the risk of containing *Salmonella*.

Table 3. Example results from risk assessment showing calculations

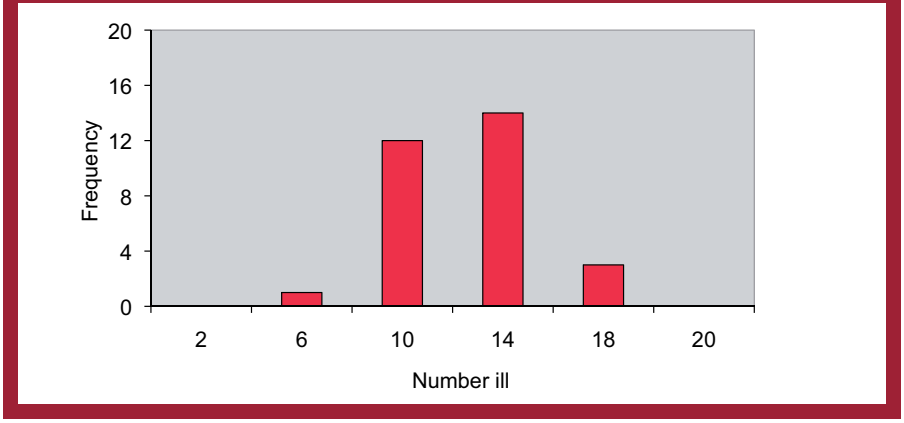
Description	Value	Cell	Formula
Cells per gram	1	B 2	user input
Positive tests	0	B 3	user input
Negative tests	21	B 4	user input
Probability of positive	0.04347	B 5	=RiskBeta (1+B3, 1+B4)
Grams per serving	25	B 6	user input
Cells per serving (pre)	1.09	B 7	=B6*B2*B5
Log cells per serving (pre)	0.03621	B 8	=LOG (B7)
Log reduction by process 1	0.63	B 9	=RiskTriang (C9, D9, E9)
Log reduction by process 2	0.34	B 10	=RiskTriang (C10, D10, E10)
Log cells per serving (post)	-0.93	B 11	=B8-B9-B10
Cells per serving (post)	0.1165	B 12	=10^B11
Risk per serving	0.0003	B 13	=1- (1+B12/51)^-0.13

Expanding the focus to a full QMRA

While the above exercise points out the value of a risk-based, statistically grounded approach to managing risk, this can be expanded to encompass more aspects of processing and storage. The data on Enterobacteriaceae on Zone 1 surfaces (where *Salmonella* tests are not typically performed) can be used in conjunction with the other risk calculations that follow, but only when two additional critical pieces of information are known: the concentration of *Salmonella* when they are present and the cross-contamination rate from surface to food. No information in the published literature for either of these two important data gaps were located, however, levels are likely to be low when *Salmonella* are present (based on anecdotal information), and cross-contamination rates very low (based on typical cross-contamination rates of 1% when surfaces are wet, Chen *et al.*, 2001) since moisture is known to facilitate transfer.

Dry foods often have a processing step where heat is applied, although it is well know than *Salmonella* are much more resistant to heat when in a dry state (Mattick *et al.*, 2001). Although studies in the literature often use water activity as the key variable, food processors, especially those using extrusion technology, will have measured percent moisture or the solid to moisture ratio rather than water activity. This means there is a need to determine the relationship between heat applied and moisture on thermal inactivation. The effect of thermal inactivation is often measured as D-value — or the time producing a 1-log reduction in the microbial concentration. D-values for *Salmonella* were based on data provided in the Annex to Control of *Salmonella* in Low-Moisture Foods, published by GMA

Figure 2. *Predicted number of illnesses arising from 30 simulations of 1.5 million iterations each, for food products contaminated with low levels of Salmonella*



(2009), specifically the data from Dega *et al.*, (1972) and McDonough & Hargrove (1968). These data were used to create a mathematical model to interpolate between the highest moisture in the Dega report (49% moisture) and the moisture in the McDonough and Hargrove report (4%). This model is shown in Figure 1, where each coloured line corresponds to a different solids/moisture ratio.

While a detailed exposition of a full QMRA is beyond what is possible in the limited format of this article, Table 3 shows an excerpt from a QMRA for *Salmonella* in dry foods. Many risk assessments are developed using the Microsoft Excel™ add-in, @Risk (Palisade Corporation, Ithaca, NY), and the table summarizes information contained in an @Risk-based spreadsheet. The first column is a description of the information found in each row. The next column shows an example of the value that might be found at any point in time in the simulation. The next column contains a cell number, which corresponds to the cell in the spreadsheet where the value can be found. This is important to understand how the formula, found in the next column works to perform the calculations. The formula column either contains the formula that shows how the contents of different cells are combined, or indicates that the contents of the cell has come from user input. Formulae can either be strictly mathematical (i.e. B7: =B6*B2*B5) or they can contain @Risk functions. The two @Risk functions currently implemented in the spreadsheet are the RiskBeta function, used to calculate the probability that a pathogen is present, or the RiskTriang function, used to calculate the expected log reduction due to the application of heat.

The QMRA model in Table 3 can be used with a variety of assumptions to create predictions regarding microbial risk. For example, if we assume that: an ingredient is contaminated at a level of 1.5 cells/g; one serving contains 3.6 grams of this ingredient; one hundred and fifty tests of the ingredient were performed but no pathogens were found; 1.5 million servings of the product are currently in the marketplace; a process has been applied where the log reduction varies uniformly from 0.86 to 1.49 Log CFU and the probability of human illness from *Salmonella* is as indicated by the dose response model published by WHO/FAO (2002), then Figure 2 shows the expected number of illnesses from these 1.5 million serving to be at least 6, at most 18 and most likely around 14.

In addition to the analysis shown here, another factor which serves to mitigate *Salmonella* risk in dried products is the fact that *Salmonella* is known to die off slowly in such foods. One of the most comprehensive datasets on this topic can be found in Tamminga, *et al.*, (1976) where the survival of *Salmonella* in chocolate was studied. These data show that *Salmonella* dies at a rate of about 0.25 log CFU per month. While this may seem very low, considering many dried ingredients may be held for a year or more before use, the net effect on risk may be significant.

Summary

Several important points bear repeating. Indicator organisms can be useful in assessing risk, although significant data gaps are still needed to make a direct connection to risk. When low water-activity foods are processed, *Salmonella* may survive unless high temperatures and long times are used. Negative test results can be used in risk assessment to demonstrate lower risk. When foods are contaminated with very low levels of *Salmonella* illnesses may still result, especially when millions of servings are considered. Products manufactured with older ingredients represent a measurably lower risk. All of the above factors can be integrated into a comprehensive risk assessment to aid food processors in managing *Salmonella* risk in dried foods.

references

- Brown, M.H., Davies, K.W., Billon, C.M.P., Adair, C., and McClure, P.J. (1998) Quantitative microbiological risk assessment: principles applied to determining the comparative risk of salmonellosis from chicken products. *J. Food Protect.* **Vol. 61**, pp1446-1453.
- Cassin, M.H., Lammerding, A.M., Todd, E.C.D., Ross, W., and McColl, R.S. (1998) Quantitative risk assessment for *Escherichia coli* O157:H7 in ground beef hamburgers. *Int. J. Food Micro*. **Vol. 41**, pp21-44.
- Chen, Y., Jackson, K.M. Chea, F.P. and Schaffner, D.W. (2001) Quantification and variability analysis of bacterial cross-contamination rates in the kitchen. *J. Food Protection.* **Vol. 64**, pp72-80.
- Dega, C. A., J. M. Goepfert, and Amundson, C. H. (1972) Heat resistance of salmonellae in concentrated milk. *Appl. Microbiol.* **Vol. 23**, 415-420.
- Grocery Manufacturers Association. (2009) Control of *Salmonella* in Low-Moisture Food. Washington, DC.
- Grocery Manufacturers Association. (2009) Annex to Control of *Salmonella* in Low-Moisture Food. Washington, DC.
- Jaykus, L, S. Dennis, D. Bernard, H.G. Claycamp, D. Gallagher, A.J. Miller, M. Potter, M. Powell, D. Schaffner, M.A. Smith, T. Ten Eyck. (2006) Using Risk Analysis to Inform Microbial Food Safety Decisions. Issue Paper 31. CAST, Ames, Iowa.
- Mattick, K. L., Jorgensen, F., Wang, P., Pound, J., Vandeven, M. H., Ward, L. R., Legan, J. D., Lappin-Scott, H. M., and Humphrey, T. J. (2001) Effect of Challenge Temperature and Solute Type on Heat Tolerance of *Salmonella* Serovars at Low Water Activity. *Appl. Environ. Microbiol.* **Vol. 67**, pp4128-4136
- McDonough, F. E., and Hargrove, R. E. (1968) Heat resistance of *Salmonella* in dried milk. *J. Dairy Sci.* **Vol. 51**, pp587-1591.
- Tamminga, S. K., R. R. Beumer, E. H. Kampelmacher, and van Leusden, F. M. (1976). Survival of *Salmonella* eastbourne and *Salmonella* typhimurium in chocolate. *J. Hygiene.* **Vol. 76**, pp41-47.
- Vanderlinde, P. (1998) Quantitative microbial risk assessment - An Australian perspective. *Food Aust.* **Vol. 50**, pp626-628.
- Whiting, R.C. (1997) Microbial database building: What have we learned? *Food Technol.* **Vol. 51**, pp82-86.
- WHO/FAO (2002) Risk assessments of *Salmonella* in eggs and broiler chickens. Microbiological Risk Assessment Series 2. ISBN 92-5-104873-8.

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> It's time to close the book on infectious diseases, declare the war against pestilence won, and shift national resources to such chronic problems as cancer and heart disease
>
> **William Stewart**
> Surgeon General of the USA, late 1960s

HACCP in Clinical Practice

While few would argue that resources should be targeted at such chronic conditions, can we be confident that the war on infectious diseases has been won? With the annual number of cases of Healthcare Associated Infection (HCAI) estimated at three hundred thousand (HCAI Research Network 2010), can clinicians and biomedical scientists learn patient safety management from professionals in other industries?

What is HACCP?

In the food manufacturing industry, a risk based, preventative approach to food safety has been in operation for the last 40 years. The Codex Alimentarius Hazard Analysis Critical Control Point system (HACCP) was developed in the 1960s by the Pillsbury Corporation, the US Natick Laboratory and NASA, as a tool to ensure safe food for the space programme. A food safety management system based on Codex Principles has been a legal requirement for all food business operators (FBOs - including manufacturers, caterers, retailers and hospital caterers) in the EU since 2006. HACCP requires identification of the potential hazards at each stage of the food process flow, assessment of the risk posed by the hazard (likelihood and severity) and a decision tree process to determine which of the identified hazards of significant concern must be controlled to ensure food safety. In this way, a small number of Critical Control Points (CCPs) are identified that can then be monitored and the process verified. This is designed to answer the question: "*are we doing what the HACCP plan says we should do to produce safe food*?" Corrective actions must be validated in case of a CCP which is found to be outside the limits of control. The whole HACCP plan must be documented, to prove due diligence and audited to answer the question, "*are we doing what we say we do and is it effective*?" (Codex Alimentarius, 2008).

It could be argued that by concentrating efforts on a small number of points that are critical to process safety, other important but non-critical parts of the process may be overlooked. It is important to remember that HACCP does not replace good hygiene or good clinical practices which are the bedrock upon which HACCP stands. Such

activities which are associated with the healthcare environment or activities associated with the treatment or diagnostic process and are considered as minor risks are termed Pre-Requisite Programmes (PRPs). They include cleaning, personal hygiene, training, maintenance of equipment and facilities and pest control (Griffith 2006).

Can HACCP be applied in a clinical setting?

Could this approach be used to control outbreaks of infectious disease, reduce HCAIs in general clinical practice or ensure accuracy and timeliness of the results from the hospital biomedical laboratories? Risk-based approaches to patient care are not new. The standard precautions needed to reduce the risk associated with the spread of pathogenic microorganisms from a variety of bodily sources are upgraded to transmission-based precautions where the presence of specific pathogens linked with HCAIs is confirmed (Kilpatrick *et al.*, 2008). HACCP is a well characterized tool that can and has been applied to clinical practice. Following the SARS outbreak in Canada, the UK Health Protection Agency (HPA) began to develop HACCP principles and critical control points were identified for application at each stage of such an outbreak. The view was that HACCP had the potential within an outbreak situation to provide a checklist for action for healthcare managers and workers on the front line (Regan, 2003). This was the first published application of HACCP to outbreak scenarios but a number of years before, HACCP had been proposed for use in the handling of breast milk in a neonatal unit (Hunter, 1991). The use of HACCP in clinical areas is not, therefore, novel but its uptake has been very limited, with few publications dealing with clinical applications.

In the surgical arena, HACCP-based safety management can be used to help prevent problems occurring as a result of poor practice or contaminated medical devices. There have been media reports of patients suffering or dying as a result of problems during surgery, such as swabs being left inside a patient, despite current systems that are in place to prevent such errors. In 2001, a man in the USA died after receiving infected tissue during knee surgery. The company supplying the tissue were unable to guarantee that it was free of microbial contaminants (Williams, 2003). Kilpatrick *et al.*, (2008) proposed a patient journey tool, based upon HACCP principles, to determine which patients require isolation as a result of their infectious condition. It is designed to be a practical tool that utilizes a decision process to determine the actions required for patient and staff safety.

In the biomedical laboratory, HACCP could be viewed as irrelevant as there are no patients, but in this case the definition of a hazard must be carefully considered. A hazard could be viewed as incorrect — resulting in the wrong diagnosis for the patient, or a delay in obtaining a correct, but critical result. So, application of a risk based approach, following HACCP principles, is as applicable in the laboratory as on the ward, in the operating theatre or in the food factory. Monitoring of the hazards that give greatest cause for concern will ensure that the laboratory processes are under control. HACCP can identify essential control points by evaluating the severity of the outcome for the patient against the probability of occurrence. Although the process proposed by Powers (2005) does not include the traditional Codex CCP Decision Tree, it does introduce to the process the issue of detectability of the hazard prior to it causing harm to an individual. Resources can then be targeted at those points in clinical laboratory practice that are identified as most likely to cause harm to patients (Powers, 2005).

A risk-based approach to public health?

Targeted public health messages have taken a risk-based approach for a number of years but the success of these is variable. Folic acid uptake among pregnant women remains low, healthy eating messages have failed to halt the rise in obesity and we are now in the throes of a binge-drinking epidemic. The factor that many of these campaigns fail to recognize is that changing people's knowledge is not enough to change their behaviour — we must also change their attitude. Kilpatrick *et al.*, (2008) highlighted that, although procedures are in place for infection prevention, compliance rates may be low. The same problem occurs in the food industry where factors such as failure to prioritize risks associated with the hazards, failure to recognize the risks of pathogens on certain foods, lack of focus and expertise or insufficient education reduce legal compliance (Taylor, 2001; Yapp & Fairman, 2006).

In order to achieve optimal public health management, all who are involved in the diagnosis, treatment and care of patients must embrace and comply with the documented patient safety management systems, whether HACCP-based or otherwise.

references

- Codex Alimentarius (2008) *Guidelines for the Validation of Food Safety Control Measures.* CAC/GL 69. www.codexalimentarius.net (accessed 12 July 2010)
- Griffith C. (2006) HACCP and the management of healthcare associated infections. Are there lessons to be learnt from other industries? *International Journal of Healthcare* **Vol. 19** No. 4: pp351-367
- HCAI Research Network (2010) http://www.hcainetwork.org/about%20hcai.htm
- Hunter P. (1991) Application of HACCP to the handling of expressed breast milk in a neonatal unit. *Journal of Hospital Infection* **Vol. 17**: pp139-146
- Kilpatrick C., Prieto J. and Wigglesworth N. (2008) Single room isolation to prevent the transmission of infection; development of a patient journey tool to support safe practice. *British Journal of Infection Control* **Vol. 9**: pp19-25
- Powers D.M. (2005) Laboratory quality control requirements should be based on risk management principles. *Lab Medicine* **Vol. 36**, No.10: pp633-638
- Regan M. (2003) Severe acute respiratory syndrome and Toronto. *J. Epidemiol Community Health* 2003; **Vol. 57**: pp642-643
- Taylor, E. and K. Kane. (2005). Reducing the burden of HACCP on SMEs. *Food Control* **Vol. 16**: pp833-839
- Williams L.L. (2003) HACCP; Resolving product safety and liability nightmares. Medical Device Link. www.devicelink.com
- Yapp, C. and Fairman, R. (2006). Factors affecting food safety compliance within small and medium-sized enterprises: implications for regulatory and enforcement strategies. *Food Control* **Vol. 17**: pp42-51

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Ask the expert — communicating risk

In 2002 the Science Media Centre (SMC) met with top scientists and journalists to discuss ways in which the reporting of risk via the broadcast media could be improved. Lucy Harper interviewed one of the people behind the resultant advice, Director of the Science Media Centre (SMC), **Fiona Fox** (pictured left)

Q Can you explain in a little more detail how the advice provided by the SMC came about?

A Yes, the leaflet has an interesting background. Before the SMC was set up we had a four month consultation where we went out and met hundreds of scientists, science press officers and journalists and asked them what we could do to improve science reporting in the UK news media. The communication of risk by scientists and journalists was raised as an issue time and time again. To be honest, it was very, very difficult to know the best way to go about this. I came across a lot of people who had spent thousands of pounds on workshops for journalists where no journalists had turned up, so we decided not to go down the road of running events because it just didn't seem effective. We knew that whatever we did would need to align with our philosophy: "*the media will do science better if scientists do the media better*".

The process in creating the advice leaflet was nice. We've done three or four advice leaflets and for each of them we've brought a group of experts into this room [the briefing room at the SMC — for those of you who don't know, the SMC is located in an office tucked away along the side of the imposing frontage of the Royal Institution]. For this leaflet they comprised one third risk experts and one third of the group were journalists, who agreed to keep the contents of the meeting off the record. The remainder of the group comprised press officers and science communicators (see Table 1). What was great was that no-one was allowed to criticize anyone else. It wasn't a debate, it was an opportunity for people to say "*this is the best way to do it*". We put all the ideas and suggestions up on a board, stopping anyone from saying "*I hate that*" and then afterwards we picked those we felt were the best.

Our feeling was that scientists should use the opportunities provided by science in the headlines, all those amazing front page opportunities on MMR [the measles, mumps and rubella combined vaccine which was incorrectly linked with autism by Dr Andrew Wakefield in a *Lancet* paper] or GM [genetic modification in food production] or nanotechnology. I think it's critical that scientists use those opportunities, to ensure that key messages about scientific understanding and risk are communicated. Then, in five or ten years when the public have heard thousands of scientists being interviewed on many topics, we hope they will have a better understanding of risk. So we really put the responsibility on the shoulders of scientists rather than on the media.

Q Do you think the communication of risk in the news media has improved since the publication of this leaflet?

A I really believe it has. As I say, there are two sides to this story: I think scientists are getting better at communicating risk and certainly the science correspondents are much more careful. For example, when they can, they will insist to their Editors that they use numbers as well as percentages. But what's great is that when we started, the misconception was that scientists should start speaking in the same way as everyone else in order to communicate more effectively to the public. There was a general feeling that if John Humphries said: "*Professor Blogs, all my listeners want to know is: is MMR safe*?", the scientist should say: "*yes it's safe*" in order to convince the public that MMR is safe. But we did not take that view. Every scientist we spoke to said that no self-respecting scientist would ever say that anything was 100% safe. We don't believe that science should lose all its

Table 1. Participants who contributed to the leaflet "Communicating risk in a soundbite"

Name	Position	Organization
Dr. David Adam	Journalist	Nature
Prof. John Adams	Professor of Geography	University College, London
Prof. Peter Atkins		
Mr. Robert Beasley	Head of Press	Department of Health
Dr. Helen Bedford	Senior Research Fellow	Institute of Child Health
Prof. Sir Colin Berry	Professor of Morbid Anatomy	The Royal London Hospital
Mr. Jon Burch	Executive Secretary	Royal Academy of Engineers
Mr. Pallab Ghosh	Science Correspondent	BBC
Mr. Mike Granatt	Head of Government Information and Communication	Cabinet Office
Mr. Simon Gregor	Head of Press and Media Activities	Public Health Laboratory Services
Dr. Evan Harris	MP for Oxford West and Abingdon	House of Commons
Dr. Jeremy Hodge	Managing of Fire and Risk Sciences	Building Research Establishment Ltd
Dr. Susan Jebb	Nutrition Scientist	MRC Human Nutrition Research
Dr. Paul Martin	Science Writer and Fellow of Wolfson College	Cambridge University
Ms. Marjorie Monickendam		Public Health Laboratory Services
Dr Chloe Sellwood	Scientific Development Division	Public Health Laboratory Services
Dr. Robert Mitchell	Environmental Surveillance Unit	Public Health Laboratory Services
Ms. Vivienne Parry	Freelance Science Journalist	
Mr. Alasdair Philips	Director	Powerwatch
Dr. Simon Singh	Science Writer	
Mr. Harry Swan	Risk Management Consultant	Regester Larkin
Karen Talbot	Head of Press	Food Standards Agency
Dr. Pat Troop	Deputy Chief Medical Officer	Department of Health

specific language, its caution, I think that's wrong. What scientists need to do is communicate the scientific process effectively. So what you'll see in the leaflet is advice including that if John Humphries asks that question, what scientists need to do is say: "*John, no self-respecting scientist will ever say that MMR is safe, as far as we know it's the safest vaccine that we have used and all the evidence says it is a safe vaccine. Will there ever be any side effects? Of course. Will there be problems in the future? The jury's still out and we have to keep monitoring the situation*". Scientists shouldn't be doing what politicians do, which is getting rid of all the nuances.

Q Talking about the language scientists use, can you give us some examples of the common mistakes made by scientists when communicating risk?

A Well, obviously talking in very technical language that the public can't understand, or making the mistake that in order to get a public health message across, they should hide the level of risk. One of the things scientists have to do is talk about the weight of evidence. This has become a big issue with swine flu [influenza A H1N1] where Liam Donaldson, the Chief Medical Officer (CMO), was told by the modellers at Imperial College London and elsewhere that the number of deaths in the UK caused by swine flu could be between 1000 and 65,000. To date there have been 474* deaths in the UK. He gave the upper figure of 65,000 to journalists and now there's a row about whether they were oversold because "*the CMO said there would be 65,000 deaths*". In fact, the models were very, very clear that the results were clustered round the lower end of this range.

It's similar with climate change: the rise in global temperature could be two degrees, or eleven degrees, and the eleven degrees shouldn't be hidden for fear the media will put it in the headlines. What climate change scientists should be saying is what the models or the weight of evidence shows. They shouldn't be leaving that to chance. If they say between two and eleven degrees, every self-respecting journalist will use eleven degrees, that's going to happen, so the messages need to include the weighting information.

Q Can you provide some examples of situations where the good and/or bad communication of risk has resulted in real consequences for members of the public?

A On the whole, the introduction of the HPV (human papilloma virus) vaccine, was handled very well by the media. As you know, it's only been introduced a couple of years, but about six months ago a teenager died shortly after receiving the HPV vaccine. There was no evidence that there was a connection, but of course the media went for it. These risk stories are often the ones with which scientists are most cautious about engaging and often want to run the other way. A headline like "*HPV kills teenager*" is exactly the kind of headline that most scientists will not want to engage with — but the message from the SMC is: that's when it's critical to engage. When a risk is being sensationalized or hyped, that's when you need to engage, and I'm very pleased to say that's what happened. The scientists that we contacted put out accurate messages pointing out that there was absolutely no evidence at that stage that the death was related to the HPV vaccine and people should remain calm, and in the end that was the message that came across.

The other thing that's changed a lot since we opened is that we've seen a gradual increase in the status of the science and health reporters within their own newspapers and the influence they have over coverage. They are our

champions and I think the coverage of HPV was better than the coverage of, say, MMR (12 years ago) as I think people have learnt a lesson. We had Mary Hockaday, Head of the BBC newsroom, at our climate science event recently and she said: "*We have learnt the lessons of GM and MMR. We were attacked very publicly and we are more cautious and more careful about the way we present these things*".

A slightly different example involves Sir John Krebs, the former Chair of the Food Standards Agency (FSA), a very thoughtful and influential commentator at communicating risk. When he discovered that scientists felt there could be a risk of bovine spongiform encephalopathy (BSE) in sheep, he had quite heavy internal discussions with his scientists at the FSA and said they should proactively tell the media about this risk. I think some were opposed to it and warned him he could start off a huge scare. But he fought against this and pursued his own belief: the more openness and transparency the better. He did a series of television interviews on a Monday morning to say researchers had found a theoretical risk of BSE in lamb for the first time, and there was no scare. That was a really interesting experiment and something that he really believes in. In the report I did for government (Science in the media — securing the future. See 'Further reading' at the end of this article) I quote one of the participants who said: "*Journalists get terribly excited by a glimpse of the ankle but not at all excited by the full striptease*" and I think that's really true. If journalists find out about a risk story and there's any evidence that an institution, government-funded or otherwise, has been covering it up, it is more likely to be front page news.

We've run stories about risk — there was a big story about working in nuclear power plants being associated with an increase in the risk of heart disease and it was significant. But scientists couldn't find a causal link — it was an association and could have been linked to several other factors such as lifestyle and eating habits. A lot of the epidemiologists involved felt it was a lot more to do with the lifestyle of the subjects of the study. So researchers from Cumbria did a briefing here at the SMC and emphasized a million times: you can't say this, you can't say that,

you can say there is an association but not a cause, and by the end the journalists were muttering that there was no story — thinking that the SMC's job is to give them stories. But in fact the SMC's job is to help the scientists get their story into the media in an accurate and balanced way. So there was no-one happier than the scientists that day — especially because of their commitment to the workers who they didn't want to scare. I'm a big fan of more open and transparent communication of risk.

Q The leaflet that was produced by the SMC has some excellent advice. To ensure our scientists don't make any mistakes, can you summarize the advice provided by the leaflet for us please?

A One of the things I haven't mentioned is comparing risks with everyday events. That's absolutely critical I think. For the public to have a sense of how risky it is to, say, eat certain kinds of foods, they need to have something to relate to in terms they understand. Of course the other side is the fact that people are doing risky things every day. A lot of people feel strongly that some are saying: "*I don't want to take the risk of adopting GM crops*", or "*I'm against new technology like nanotechnology even though it can deliver huge benefits*" and yet they've never compared these risks to the risks they take in everyday life, like driving, cycling, or the 'madder' risks like extreme sports. But scientists do have to be careful to be evidence-based — going back to what I said earlier, we're not encouraging scientists to behave like campaigners.

Another piece of advice we give, is to think about the consequences of not taking the risk. That again goes back in particular to new technology (such as GM crops) and the whole discussion about risks of contamination of other plants and potential risks of harm from GM food. I think John Beddington has been very good as the Chief Scientific Adviser. More research has been done that shows no evidence of risks of harm from eating GM crops. Also, of course, America is a huge living experiment because they've been eating GM food for ten years and there's been no harmful effect so far. But also we have climate change, we have a hugely increasing world population and we

have drought and food shortages. Giles Oldroyd from the John Innes Centre said at a briefing here: "*Ten or fifteen years ago we had the luxury of turning down this new technology. Now we no longer have that luxury, we might have it in the UK but we don't have it in the developing world*". So we need a much more rigorous look at the down sides of not adopting a new technology.

Similarly, there was one major train crash which was caused by an engineering fault on the line, in which there were several deaths. The government's reaction was to close down the entire rail network, mainly because they wanted to be seen to be doing something. All the engineers were whispering in the ear of government: "*Do not do this. We do need to do this work, but we don't need to close down the entire rail network*". Why? Because more people die on the roads than they do on the rail network, so if you move people off trains and into cars, more people will die. That's the kind of grown-up debate we need to have. Volcanic ash has been really interesting, because again, if you close down the airspace people will take other modes of transport which might be riskier.

I was at a conference recently on swine flu and there were experts there who believed that one of the many factors which led governments to take the pretty extreme action in terms of preparation was the level of risk a public will accept. This is now being criticized for being too extreme. One of the reasons for this level of preparation was an assumption at a policy level, that publics worldwide would not accept a certain level of risk. What they mean by that is they could have come out and said swine flu is a major threat (by saying) "*We could do ten things to attempt to minimize deaths from swine flu. In fact we are only going to do five things but that will mean that worldwide, 200,000 people will die. We could do these ten things which will minimize the death rate, but will double the financial cost*".

The assumption is that governments always have to do the ten things because of the risk-averse attitude of our population. Now my reaction to that is we need to have more grown-up debates amongst the public because the cost of buying in vaccine, the cost of antiviral drugs for everyone, the cost of the reaction to swine flu was huge. Now, as we go into public spending cuts, that is money that's taken away from premature baby units and cancer units. I totally support what the government did on swine flu, but I think it could have taken different action if the British public were prepared to say there's no 'no risk' option and we will accept a certain level of risk. Similarly with volcanic ash, who is going to go on TV and say: "*we won't close down our air space, but just to let you know, a couple of flights will probably drop out the sky*". It might then be for the public to say: "*Yes we've discussed this, we're happy for a couple of flights to drop out the sky, with deaths of 300 versus the huge economic and social impact*", or more probably they'd say: "*Do you know what, the way you die in an air crash and the whole drama is too much so we will take this dramatic policy option because we're not prepared to take the risk*". What's wrong at the moment is we don't have that discussion, so policy makers are making decisions based on a public mood of risk-aversion and then getting criticized for it.

Q Finally, do you have any memorable quotes from people who've communicated risk well/badly?

A The one I love is from Professor Alan Boobis OBE, a top toxicologist from Imperial College London, a very good scientist. There was a big scare a few years ago linking an Indian dye which is added to food (Sudan 1) to cancer. We called Professor Boobis up about this and said the media are going mad; it's on the front page of everything and he said: "*Eating food containing Sudan 1 gives you about the same risk of developing cancer as if you smoked one cigarette in a lifetime*". Every newspaper picked it up and it was absolutely lovely because it was based on good science. This wasn't a journalist saying this, it wasn't an MP, it was based on his absolute assessment of the risk.

Another example was from an expert on making building blocks out of black ash. Greenpeace had done a big exposé and they had a piece on *Newsnight* about the use of black ash in building material and how some people were getting health effects from buildings made with this material. He took an hour off his holiday to do the half hour interview and was very upset because they only used one sentence. So he came in to the SMC and ranted and raved and said: "*I hate the media, the whole item was Greenpeace, the whole thing was a hatchet job*", and on his way out, I asked "*by the way, what was the one sentence*?" and he said "*Oh yes, it was you would have to eat 25 blocks of your own building in order to get any effect*". So I said "*That is brilliant. You're saying it was a terrible report, but I reckon a lot of people sitting at home watching Newsnight who see an expert who knows his stuff saying you'd have to eat it to get any effect, I think that's really good*".

Prior to the development of the SMC leaflet, Roger Harrabin and the Kings Fund put together a list of recommendations of double checks for journalists to ensure they make appropriate comparisons and put risk into context. Now, the SMC are recommending that where journalists don't do this, scientists should.

*at the time of going to press, since the beginning of the pandemic, there have been 474 deaths reported due to pandemic (H1N1) 2009 in the UK; 359 in England, 69 in Scotland, 28 in Wales and 18 in Northern Ireland according to an update from the HPA weekly epidemiological update, 10/06/2010. http://www.hpa.org.uk/web/HPAweb&Page&HPAwebAutoListName/Page/1243928258560

further reading

- "Communicating risk in a soundbite" — advice leaflet produced by the Science Media Centre: http://www.sciencemediacentre.org/uploadDir/admincommunicating_risk.pdf
- "Science and the media: securing the future" — report written for the Department for Business Innovation and Skills, Science and Society initiative. http://interactive.bis.gov.uk/scienceandsociety/site/media/2010/01/21/comment-on-the-final-report/

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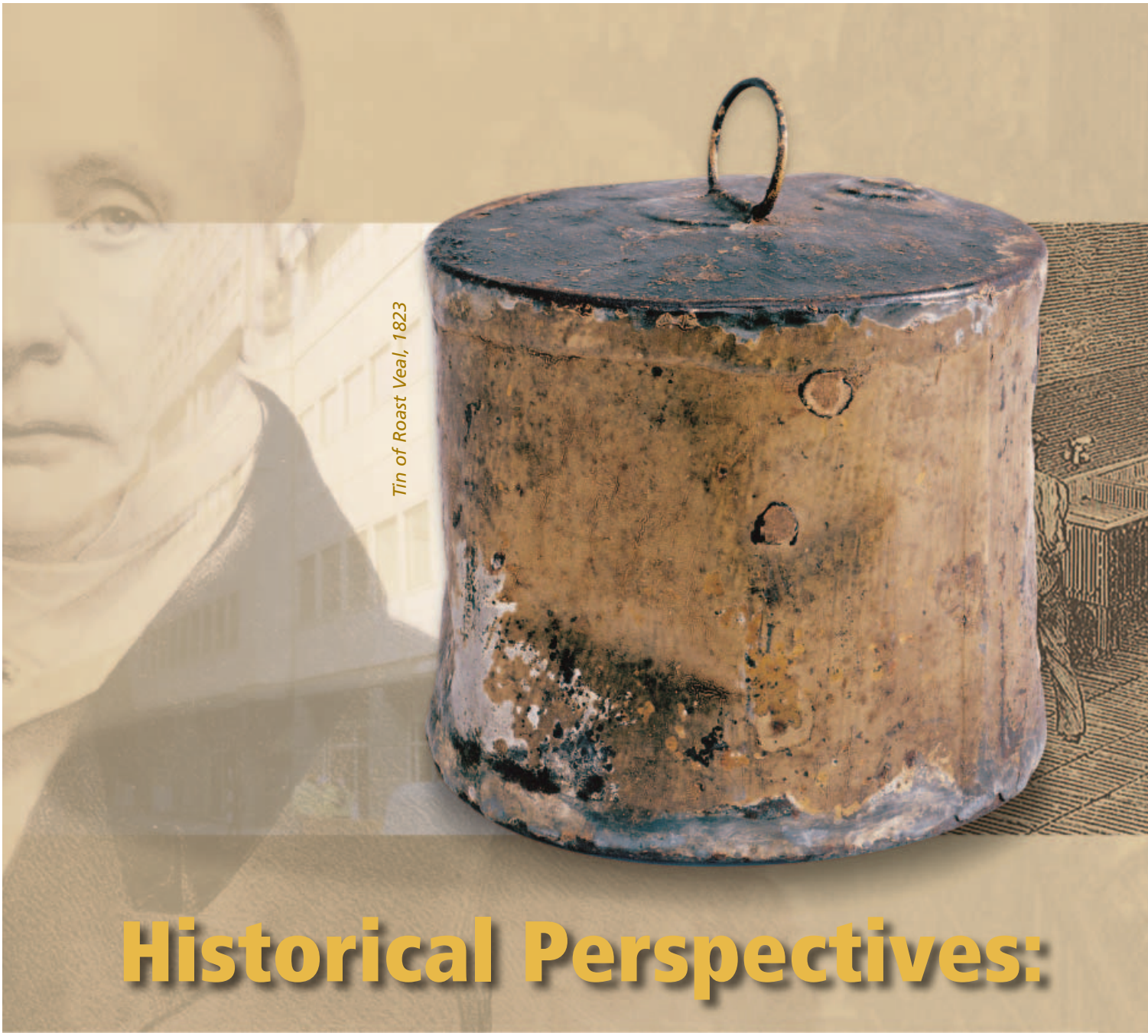


Tin of Roast Veal, 1823

Historical Perspectives:

It is perhaps a matter of irritation to some food microbiologists that the early development of most practically important food preservation techniques took place without their input. Although they may take some consolation from their subsequent role in helping to ensure that these foods are both reliably safe and durable. This certainly applies to food canning which was commercialized in the early years of the 19th century but was not put on a more scientific basis until the period 1895-1925.

Though a number of 18th century antecedents can be mentioned, such as the growth of home bottling of fruits in Europe and the Dutch Navy's use of cooked meat packed into tinned iron canisters which were then filled with hot fat and sealed, credit for the invention of canning goes quite justifiably to Nicolas Appert. Born at Chalons-sur-Marne in 1749, he received a thorough grounding in food-related occupations working as a chef and in brewing and distilling before finally setting up as a confectioner in Paris in about 1780. He sold his business and moved in 1795 but continued his experiments in food preservation which he had started some time earlier. By 1803 he was sufficiently confident in the results of his careful experimentation to submit some of his products for trials by the French Navy where there was an understandable demand for an alternative to the salt beef and hard biscuits currently used to feed the crew on long sea voyages. Appert's products passed with flying colours and even attracted plaudits from leading gourmands of the day. According to his own account, "*the Society for the Promotion*

Figure 1. *Bryan Donkin, English inventor, 1829*

photograph kind courtesy of the Phillimore Collection at the Science Museum

Nicolas Appert — the inventor of canning

preserved for posterity

of National Industry aimed to stimulate those whose talents were directed to discoveries of benefit to nation and humanity by the offer of flattering rewards". Animated by this, he submitted the results of his own work which were evaluated by a special committee, which included the chemist Gay-Lussac amongst its members.

Essentially his procedure consisted of packing the product into glass bottles, corking and heating in a water bath for an extended period, usually hours. He used glass because of its barrier properties to air and had the bottles purpose-made with a wider than usual neck and strong enough to withstand the manhandling and heat treatment they received. Similarly he used the finest quality corks as well as larger ones made by gluing together three or four separate pieces.

As a result of the favourable report from the Committee, the Ministry of the Interior awarded Appert 12,000 Francs (at that time about £500). This was not an unqualified gift since he was required to use some of it to publish, at his own expense, a report on his work and supply the Ministry with 200 copies. Still, it compares quite well with the award of only 5 guineas (£5.25) made in 1807 to Thomas Saddington of Upper Thames Street in London by the Society of Arts for his economical method of preserving fruit without sugar. This method also involved heating loosely-corked bottles of fruit to 70-80^{o}C for more than 30 minutes before topping up with boiling water and corking tightly. Saddington though never extended his techniques to less acidic products than fruit.

Appert had developed his process on the basis of trial and

Figure 2. *Tin of Roast Veal, 1823.*
This tin was manufactured by Donkin, Hall and Gamble in 1823, for the 1824-1825 expedition in search of the North West Passage, which was commanded by Rear-Admiral Sir William Edward Parry (1790-1855). The 7lb tin was opened in 1939 by its previous owners, The British Food Manufacturing Industries Research Association (BFMIRA), to investigate the state of preservation of the veal, and acquired by the Science Museum in 1965. In 1810 Nicholas Appert, a French chef, was the first person to perfect the technique of heating food to high temperatures to kill bacteria and then preserving it in glass jars sealed with cork. The following year, two Englishmen, Donkin and Hall, developed tin vacuum cans and set up the first food canning factory.

error and at his own admission by "*long perseverance and conviction*". He was not a scientist and had no knowledge of the existence of microorganisms but observed that, "*Fire has the peculiar property, not only of changing the combination of constituent parts of vegetable and animal productions, but also of retarding, for many years at least, if not destroying, the natural tendency of those same productions to decomposition.*" Although he does at one stage write tantalisingly that, "*May we not infer that the application of…heat…operates…so as to destroy the predominating agency of fermentation*?", it was his stated belief and that of informed scientific opinion that the preservative effect of the process was due to the expulsion and exclusion of air. Appert repeatedly refers to this in his book and Gay-Lussac himself carried out experiments on Appert's products and found they contained very little oxygen, apparently confirming the assumption.

Fortunately in this instance, it seems not to have mattered that the underlying principle was not understood since the processes applied were based on painstaking empirical work. Appert always stressed the need for cleanliness in his operations and it is also the case that microbiological spoilage in canned foods generally manifests itself quite quickly so that after a period of storage most failed units could be weeded out on the basis that they had exploded. Looking at some of Appert's recipes it is perhaps understandable why the products did prove stable. In many cases the food was cooked twice, before and after bottling. So the process resembled Tyndallization, the technique invented by the physicist John Tyndall in the 1870s, whereby heat resistant bacterial spores are eliminated by a sequence of boiling steps which eliminate vegetative organisms, interspersed with resting phases when surviving spores are allowed to germinate and grow into vegetative cells susceptible to boiling.

Essentially the same process as Appert's was described in an English patent, taken out in 1810 by Peter Durand of Hoxton Square. Although this was a year before the English translation of Appert's book, it does appear to have been based almost entirely on the original French version. Durand himself states that the invention was "*communicated to him by a certain foreigner residing abroad*". A significant difference however was Durand's mention of enclosing the food in "*bottles or other vessels of glass, pottery, tin or other metals or fit material…*" At this stage Appert had only used glass vessels and it is unlikely that Durand had tried all these alternatives; more probably he was trying to cover himself against someone circumventing his patent by using a different sort of container.

Durand does not seem to have exploited the technique commercially and very soon sold the rights to Bryan Donkin, John Hall and John Gamble for £1,000. John Hall was the owner of the, then well known, Dartford Iron Works, Bryan Donkin had been an apprentice to Hall but became an eminent engineer in his own right and was elected a Fellow of the Royal Society, and John Gamble was their factory manager.

They established the factory of Donkin, Hall & Gamble in Blue Anchor Lane, Bermondsey where they began to use tinplate canisters rather than Appert's glass bottles. This was in part due to the fragility of glass and the porous nature of the corks, but glass in England was also subject to an excise duty at that time which added to costs, particularly of the best quality glass. Tin plate would have been a familiar working material to Donkin and Hall and English tinplate was at that time superior to French tinplate. In time Appert also came to use metal containers produced in his own factory. Some, made of tinned wrought iron, appear to have been very robust as one article states they "*were so strong that when emptied they were used as casseroles*". With the dissemination of Appert's book canning companies began to spring up all over Europe and further afield. Donkin, Hall & Gamble remained a leading company until they were taken over by Crosse & Blackwell later in the 19th century.

The original can used by Donkin, Hall and Gamble consisted of three parts, base, body and lid, which were soldered together. The lid had a small hole through which topping up liquid could be added and was itself then covered with a cap that was soldered on before processing. The cap had a hole, known as the brog hole, through which steam could escape during heating; when this was deemed complete the cap was cooled with a cold wet rag and the hole sealed with solder. Cans were opened, rather inelegantly, with the aid

of a hammer and chisel; a technique I understand that is still occasionally employed by students seeking a late night snack when returning from an evening out.

Because of the cost of production, canned foods were expensive and did not immediately become a popular item of mass consumption. They received testimonials from the rich and famous such as Sir Joseph Banks and Lord Wellesley but remained a relatively niche market and were mostly sold as specialist supplies for the Navy and long expeditions. In this they were very successful, though some authors have ascribed the tragic failure of some expeditions to the participants being overcome by lead poisoning or botulism from the canned foods.

Captain William Parry was an early advocate of canned foods and used them to substitute for salt beef on his expeditions in search of the Northwest Passage linking the Atlantic and Pacific Oceans. On his third voyage in 1824 one of his ships, the Fury, had to be abandoned along with its stores. Several years later it was found by a subsequent expedition and the cans were opened and consumed and declared to be in fine condition. More remarkably, two cans, a 4lb can of roast veal and a 2lb can of carrots in gravy, produced for Parry's expedition were displayed at the museum of the Royal United Service Institution for many years, until they were finally opened at the London School of Hygiene in 1936 more than a century after they had been made. They were subject to analysis there and at the Food Manufacturers' Research Association (a forerunner of today's Leatherhead Food Research). Though the cans were blown, the gas that emerged was largely hydrogen produced by electrochemical action of the contents on the material of the can. Thermophilic, aerobic, sporeforming bacilli were isolated but would have been unable to grow in the cans at ambient temperatures and would not have spoiled the product or posed a health hazard. In fact the can contents were declared to be appetizing and in good condition and were fed to rats (and a cat) with no adverse effects.

The success of canned foods was assured when it was decided in 1846 to issue canned meats as a general ration in the Royal Navy one day a week. This made them the subject of even more lucrative supply contracts and quickly led to a serious food scandal. Ironically, at about the same time that 40 year old canned foods were being displayed at the Great Exhibition of 1851 in Hyde Park, huge quantities that had been supplied more recently to the Royal Navy were found to be putrefying and inedible. In January 1852 the *Times* reported that one day's examination of cans of meat (average size 10lbs) at a Gosport victualling yard revealed 2,510 out of 2,707 cans to be masses of putrefaction containing pieces of heart, roots of tongue, ligaments of the throat and pieces of intestine. This led to a public outcry and a Parliamentary enquiry. The supplier responsible was one Stefan Goldner then manufacturing in London, in Houndsditch, and at Galatz (in what is now Romania). He had been supplying the Navy since 1840 without serious problems and was something of an innovator. In 1841 he was granted a patent for the addition of calcium chloride or sodium nitrate to the water baths used in canning which made it possible to increase the temperature of processing from 100°C up to 120-150°C. It seems that in some ways Goldner was a victim of his own success. The condemned supplies came principally from his factory in Galatz which had been established in 1844 and where he did not seem to have enjoyed the most cordial of relations with his employees and collaborators. The less appealing materials seem to have found their way into the cans as a result of poor management and deliberate sabotage by his employees. The separate issue of putrefaction arose because the microbiological basis of canning was still not understood and the significance of slow heat penetration into the larger cans now being used was not appreciated. As a consequence the heating regimes were inadequate to eliminate mesophilic spores at the slowest heating point in the centre of the cans. This was probably compounded by the use of improper materials (intestines containing faeces were even reported in some cans) which contributed high levels of spores.

Figure 3. *The site of Goldner's cannery in Houndsditch today*

The association of raw materials of uncertain origin and canned meats led to canned mutton in the Navy acquiring the soubriquet "Sweet Fanny Adams" after Fanny Adams (no relation), the victim of a brutal murder and dismemberment at Alton in Hampshire in 1867. It later came to mean "nothing at all" at which time the acronym "sweet FA" acquired an alternative expansion.

further reading

- Bell, R.A. (1965) Origins of the Canning Industry. *The Newcomen Society Transactions* **Vol.38** pp145-152
- Farrer, K.T.H. (2001) Goldner's preserved meats and the last Franklin expedition. *Food Science & Technology Today* **Vol.15** pp20-24.
- Graham J. C. (1981) The French connection in the early history of canning. *Journal of the Royal Society of Medicine* **Vol.74** pp374-381.
- Thorne S. (1986) The History of Food Preservation. Parthenon Publishing, Cumbria

Martin Adams
*Sf*AM Hon Vice President

In the twenty-second of a series of articles about statistics for biologists, **Anthony Hilton** & **Richard Armstrong** discuss:

Measuring 'agreement'

Statnote 22

As laboratory analytical methods and products develop it may be necessary to compare two different approaches to estimating the same quantity and the question may arise as to what extent the two methods agree or disagree with each other. For example, a new bacteriological culture media formulation may become available and promise enhancements over existing formulations. Hence, a researcher may wish to compare the performance of the new product against an existing 'gold standard' used in their laboratory before adopting the new product into their protocols. If a new product is to be suitable, it would need to perform at least as well as the 'gold standard' in terms of the level of agreement and repeatability of the data generated using the two methods whilst offering some additional benefit, such as ease of preparation, time saving, or value for money.

Another example where an assessment of agreement between two methods of estimation of a parameter might be useful is in a clinical setting where a 'direct' measurement may be very difficult to make on a patient without adverse effects; consequently its true value is unknown. Instead an 'indirect' method may be used to estimate the measurement and it would then be necessary to evaluate the agreement between the two; how do readings obtained by the 'indirect' method relate to those obtained by the 'direct' method.

Note that studies of 'agreement' are different from those of 'calibration' (Hilton, A. & Armstrong, R.A., 2009) as in the latter, known quantities are measured by a new method and compared with a highly accurate method to obtain a calibration curve.

Scenario

In this scenario, a hypothetical substitute product for nutrient agar, Magi-plate™, has recently become available on the market. This novel product is offered as a dehydrated powder which, when reconstituted with distilled water, triggers an exothermic reaction of sufficient energy to sterilize the media without autoclaving. According to the claims of the manufacturer, the molten agar is simply poured into sterile Petri-dishes and when set offers a culture medium with an identical application range as nutrient agar. This could be an attractive feature for environmental microbiologists on field studies, for example, where access to autoclaving facilities may be limited.

In an initial trial, the agreement and repeatability of nutrient agar and Magi-plate™ to estimate the viable count of *Escherichia coli* in a broth culture was investigated. Twelve flasks containing 10ml of sterile nutrient broth were inoculated with one colony of *E. coli* and incubated with shaking for six hours at 37°C. Following incubation, serial 10-fold dilutions were prepared from each flask in fresh nutrient broth and the surface of a nutrient agar plate and a Magi-plate™ inoculated in duplicate (plate A & B) with 0.1ml of each dilution. In each case, the inoculum was spread over the surface of the media using a sterile spreader and the plates

Table 1. Viable counts (10^6 per ml) of bacteria from 12 samples determined by two methods (Nutrient agar, Magi-plate™) each on two occasions (A, B)

Culture vessel	Nutrient agar		Magi-plate™	
	A	*B*	*A*	*B*
1	1.55	1.54	1.52	1.58
2	1.6	1.61	1.4	1.4
3	1.52	1.66	1.36	1.42
4	1.79	1.45	1.58	1.39
5	1.2	1.12	0.95	1.02
6	1.47	1.7	1.21	1.24
7	1.39	1.58	1.27	1.32
8	1.84	1.78	1.47	1.57
9	1.86	1.8	1.52	1.44
10	1.29	1.37	1.01	1.19
11	1.99	1.89	1.81	1.93
12	1.5	1.49	1.43	1.63

incubated at 37°C for 24 hours. Following incubation, the dilution bearing the largest countable number of colonies was selected for the estimation of the viable count in the flask. Counts were corrected for volume, dilution plated, and the cfu per ml of the original culture calculated for replicate plates A & B for each culture media. The data therefore comprise two separate estimates (A, B) of the counts of bacteria in 12 separate cultures by each of the two methods (nutrient agar, Magi-plate™) and are presented in Table 1.

How is the analysis carried out?

One method that could be used to assess agreement between two sets of data is to calculate Pearson's correlation coefficient 'r' (Hilton, A. & Armstrong, R.A., 2008). As shown by Bland & Altman (1986, 1996), however, 'r' is a measure of the 'strength' of the relationship between two variables and not the degree of 'agreement' between them. A perfect correlation would be present if the points lay along any straight line but only if the points lay along the line of equality (the 45°line) would they indicate agreement. Moreover, a highly significant correlation between two variables can hide a considerable lack of agreement. A better measure of agreement is to consider by how much does one method differ from the other and how far apart can the measurements be before causing problems. These questions can be answered by constructing a Bland and Altman plot of the data (Bland & Altman, 1986).

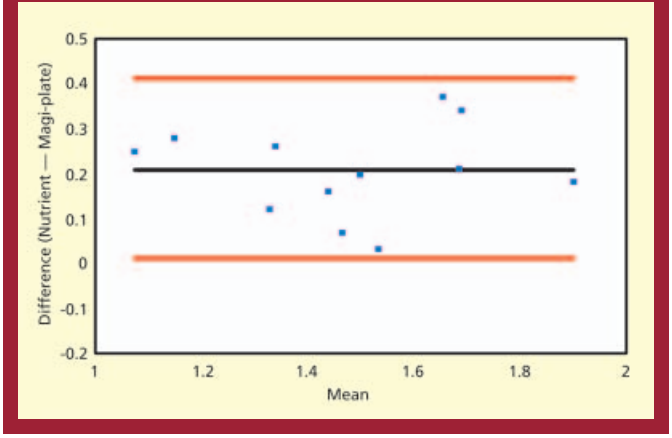
The essential feature of a Bland and Altman plot is that for each pair of values the difference between them is plotted against the mean of the two values. A typical plot is shown in Fig 1. The mean of all pairs of differences is known as the degree of 'bias' and is the central line plotted on the figure. Either side of the bias line are the 95% confidence intervals in which it would be expected that 95% of the differences between the two methods would fall. In the present scenario, the Bland and Altman analysis was used first, to test the degree of agreement within both methods (comparing A with B within a method) and second, to compare the A data only using both methods.

Table 2. Summary of the Bland and Altman analyses to test first, the degree of agreement within both methods (comparing A with B) and second, to compare the A data for both methods

Comparison	Bias	SD	Limits of agreement	Lower limit	Upper limit
Nutrient agar (A with B)	0	0.15	0.30	-0.30	+0.30
Magi-plate™ (A with B)	-0.04	0.32	0.62	-0.66	+0.58
Nutrient agar with Magi-plate™ (A data only)	0.21	0.20	0.20	0.01	0.01

SD = Standard deviation

Figure 1. *A Bland and Altman plot of the degree of agreement between bacterial counts obtained by the nutrient agar and Magi-plate™ methods. The central line (in black) is the 'bias' line and the red lines the 95% confidence intervals*



Interpretation

The Bland and Altman analyses are summarized in Table 2. There is a good agreement within methods, i.e., comparing A with B within each method separately. For the nutrient agar the degree of bias was actually zero and 95% of differences between A and B would fall between -0.30 and +0.30. For the Magi-plate™ data, the degree of bias is -0.04 (95% confidence intervals -0.66 to +0.58). The degree of disagreement, however, was greater between the two methods (Figure 1); the degree of bias being +0.21, i.e., the magi plate data gave, on average, scores of 0.21 less than the nutrient agar (95% confidence intervals -0.01 to +0.41). If relevant, the degree of bias can be used to 'correct' the counts obtained by one method as if they had been obtained by the other (Bland & Altman, 1986).

Conclusion

If a quantity has been measured by two different methods, the degree of agreement between them should not be tested using Pearson's correlation coefficient 'r'. Instead the differences between the two methods should be compared with their mean difference using a Bland and Altman plot. Such a plot illustrates the level of agreement between two methods and enables the degree of bias of one method over the other to be calculated and applied if necessary as a correction factor.

references

- Bland, J.M. and Altman, D.G. (1986) Statistical method for assessing agreement between two methods of clinical measurement. *Lancet* I: pp307-310.
- Bland, J.M. and Altman, D.G. (1996) Measurement error and correlation coefficients. *British Medical Journal* **Vol. 313**: pp41-42.
- Hilton, A. and Armstrong, R.A. (2008) Statnote 14: The correlation of two variables (Pearson's 'r'). *Microbiologist*, **Vol 9**. No.3 September 2008., pp34-35.
- Hilton, A. and Armstrong, R.A. (2009) Statnote 17: Using a regression line for prediction and calibration. *Microbiologist*, **Vol 10**. No.2 June 2009, pp36-37.

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careers

Veterinary Microbiologist: combining an academic career with fundamental research

I began my career by taking a traditional zoology degree and went on to study for a MSc in veterinary microbiology at the Royal Veterinary College (University of London). Following my initial postgraduate studies, I enrolled on a PhD programme at Royal Holloway (University of London) in collaboration with the Veterinary Laboratories Agency (VLA, Defra). During my PhD I worked in Prof Martin Woodward's laboratory on the pathogenesis of avian *E. coli*. Throughout my PhD studies I received tremendous support from Prof. Woodward and Prof. Bramley (my university supervisor), but above all the sponsors of my PhD; The British Egg Marketing Board Research and Education Trust took a continuous interest in my studies and the application of my research to the poultry industry. This gave a real sense of achievement, as I knew I was making a contribution to animal welfare as well as advancing knowledge of *Escherichia coli* and how they cause infections in poultry. During my PhD I undertook a wide variety of science demonstrating at Royal Holloway which I thoroughly enjoyed. Exposure to a teaching environment at this early stage of my career provided me the ultimate goal of working as a University academic.

Following the successful completion of my PhD I was fortunate enough to be offered a post-doctoral position at Royal Holloway (University of London) working on vaccine development for *E. coli* infections in poultry. This post-doc position went very well and resulted in the development of what is now the most widely used *E. coli* vaccine for poultry. I was then offered a post-doc position at the VLA (Defra) working on the pathogenesis of *E. coli* O157:H7 and the development of novel intervention strategies. Again, this position was very high profile as there had been numerous outbreaks of O157:H7 and so I was exposed to many eminent scientists and presented my work both nationally and internationally. This position soon resulted in promotion to workgroup leader and at that point I started to supervise my own PhD students. I found this immensely rewarding, with each student posing a new set of challenges. During the next couple of years I worked on a number of other pathogens, including *Salmonella*, *E. coli*, clostridia, *Campylobacter* and *Brachyspira*. I also worked on 'friendly bacteria' such as *Bacillus subtilis* and *Lactobacillus* as alternatives to antibiotics for livestock.

One of the most interesting projects that I have worked on was the EU Framework programme six network of excellence for zoonoses research (Med-Vet-Net). I managed a project under this network and was member of the coordinating forum and academic board. This project enabled me to work with many eminent scientists throughout the EU and also helped me work towards my goal of visiting every country in Europe! Although the project ended in 2009, the Med-Vet-Net Association was set up to continue some of the collaborative work and facilitate annual meetings and I am now the Vice President of the Med-Vet-Net Association.

Although increasingly busy with work and a young family, like most scientists I was still preoccupied with the need to add another dimension to my CV in order to secure that next promotion. I had always had a great interest in microbiology and pathology, specifically on the veterinary side of things, so I decided that working towards the Royal College of Pathologists membership qualification (FRCPath) would be my next challenge. I was fortunate enough that my boss, Professor Martin Woodward, was extremely supportive and agreed to let me have one day off a week for five years to study at the Royal Veterinary College. I gained the FRCPath qualification in March 2010. Furthermore, during my post-doc years I was also fortunate enough to work towards a number of other qualifications including Fellowship of the Society of Biology (FSB), Chartered Scientist status (CSci) and Fellowship of the Institute of Biomedical Science (FIBMS).

One of my ultimate career aspirations has always been that of lecturer in a university and this was further strengthened through undergraduate demonstrating in the early days of my career. Through my collaborative work with a number of universities, I have been fortunate enough to be invited to lecture on microbial pathogenesis and zoonoses to undergraduate and postgraduate students. However, in 2009 I was approached by the University of Surrey regarding a part-time position as a lecturer in veterinary microbiology: to take a leading role in the development of a new degree programme in veterinary biosciences. This sounded like the perfect opportunity to enter academia whilst retaining my research at the VLA. I applied for the position and was fortunate enough to be offered a part-time senior lectureship post. I now work at the university one day a week undertaking fundamental research, but also lecturing on a number of undergraduate and postgraduate courses. I spend the rest of the time working at the VLA where I am head of pathogenesis and control with a group of graduate, post-doc and PhD students working on understanding why pathogens cause infections and how we might control these pathogens.

I find the diversity, variety and daily challenges of my job fascinating. The fact that I can combine an academic career with my research is very exciting and means that the students I teach receive the most up-to-date information, with real examples to illustrate how what they are learning can be applied in the real world. I would highly recommend a career which combines teaching with research, but to secure that ultimate position you need to stand out from the crowd and offer something different. For me it was skills in an area (veterinary microbiology and pathology) that were in short supply and connections with international laboratories. However, it might be a teaching qualification or management experience that helps you. One thing that is certain is that you need to have clear goals, determination and ultimately a passion for your work. I feel extremely fortunate to be in a job that inspires and stimulates me every day and one where I am still learning.

Dr Roberto La Ragione
Head of pathogenesis and control (VLA)
Senior lecturer in veterinary microbiology, University of Surrey. Vice-President of The Med-Vet-Net Association.

News

Following the birth of her new baby girl Sumeet Kaur has temporarily stepped down from her role as Communications Officer; PECS would like to congratulate Sumeet on her new addition and thank her for the dedication she has shown to the role. We are pleased to announce that Phillip Humphryes will be taking over the role during Sumeet's maternity leave.

Phillip Humphryes

PECS Communications Officer

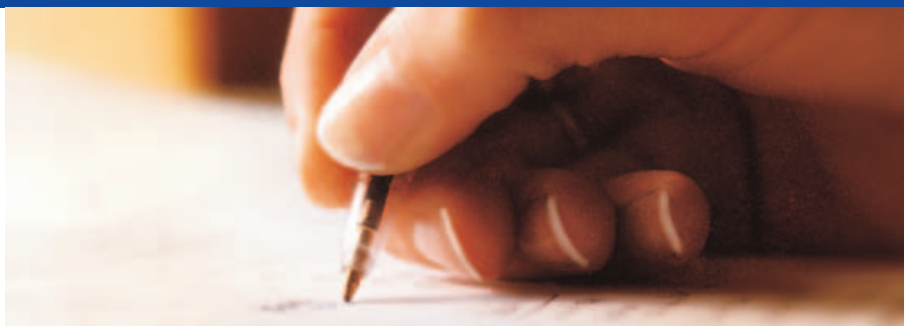
In the loop pecs

News from the S*f*AM Postgraduate and Early Career Scientist Committee

Congratulations!

Congratulations go to PECS member and former member of the events team **James Collins** of Reading University who has been awarded his PhD. PECS would like to wish James all the best in his future career.

If you know of a S*f*AM student or early career scientist who has been awarded a PhD/prize/award then get in touch, email Phillip Humphryes at: P.C.Humphryes@rhul.ac.uk.



Completing a PhD; the good, the bad and the ugly

The PhD experience can vary greatly from student to student and can be affected by several factors. In this article I will discuss some of these aspects, as I share my personal experiences of completing a PhD.

My studentship was funded for three years by the Health Protection Agency (HPA) and was based at the HPA regional microbiology laboratory in Newcastle upon Tyne. I was the only PhD student in the laboratory and so at times I felt isolated and unsure how my research was progressing compared to others. Thankfully my colleagues in the R&D department were an excellent source of support. I also used personal development workshops at Newcastle University as an opportunity to speak to other students. I think having a support network is vital for motivation, encouragement and ultimately success! Being isolated from a university environment was certainly outweighed by the opportunity for networking and the chance to learn about the diagnostic service provided by the HPA. Without this 'industrial' experience I may not have been offered my current post as a Trainee Clinical Scientist.

One of the main factors which affected my PhD experience was my relationship with my supervisors. Communication with my principal supervisor was critical. Throughout my studies we were both in agreement and clear regarding the direction of the project and what needed to be done. This was helped by a thorough and detailed research plan which had to be approved by the university and the HPA. I was fortunate at the time to be my supervisor's only PhD student. His office door was always open and he was generally available for meetings, which made my studies a great deal easier. If meetings with my supervisor were postponed I made sure that they were rescheduled. By taking the initiative in doing this the meeting was not pushed to the back of his 'to do list'.

My research relied on the availability and proper working condition of a molecular detection instrument. During my studies the equipment was out of service, due to an unknown fault, for three months. This of course was during the time I needed to use it most frequently! I expect many students experience factors like this, which are out of their control. Although the progression of one part of my work was delayed, I focused on other aspects of the research. By doing this I probably didn't lose a vast amount of time overall, although it did feel like it at the time. I think a fundamental part of the PhD experience is learning to manage and overcome these types of problems, which arise quite frequently in research. Maintaining my level of determination and motivation and having excellent support got me through the more challenging times.

I was encouraged by the HPA to communicate my research and was able to attend several conferences at which I presented posters or gave oral presentations. Finding funding for conferences can be difficult. Some of my funding was provided by societies like S*f*AM, who offer students grants for conference attendance. However most was provided by the HPA as part of my training. This was a distinct advantage of completing a PhD in an environment outside of academia.

Writing my thesis was the stage I found the hardest, I much prefer to be in the lab than at the computer! Once again support was vital during this stage. Having a supervisory team allowed me to obtain feedback on my writing from three different viewpoints, which helped immensely. My final year was made harder because it was not funded. I had to split my time between a part-time job and my thesis. If I was starting over, I would give much more consideration to 4 year funded studentships or I would plan more carefully for the fourth year so that I didn't have to work while writing.

Overall, in my experience the positive aspects of my PhD outweighed the negative ones. I was fortunate to study to within an encouraging working environment, with colleagues who offered tremendous advice and support. Most importantly I found my project fascinating; which gave me the passion and motivation I needed to get through it.

Vicki McCune

HPA Regional Microbiology Laboratory Birmingham

Students into Work Grant reports

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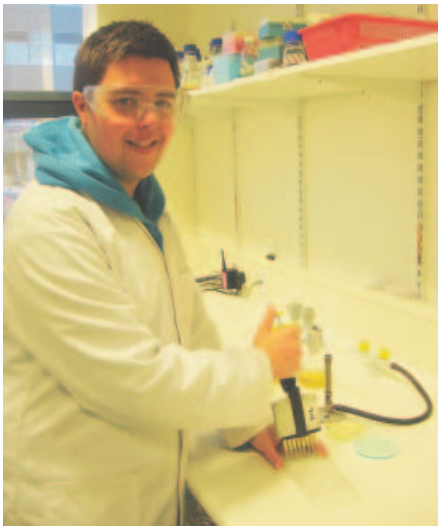
Antimicrobial activities of ionic liquids bearing silver and copper anions



Thanks to the Society for Applied Microbiology (S*f*AM) Students into Work grant, I was given the opportunity to undertake research in the Biomaterials and Drug Delivery group at the School of Pharmacy, Queen's University Belfast under the supervision of Dr. Brendan Gilmore. The aim of this project was to evaluate a series of novel 1-alkyl-3-methylimidazolium [C_nMIM] ionic liquids of varying alkyl chain length (n = number of carbon atoms in the alkyl chain), bearing either silver or copper anions for antimicrobial activity against a panel of clinically relevant pathogens (Gram-negative, Gram-positive bacteria and fungi). Ionic liquids used in this study were synthesized and characterized in the Queen's Ionic Liquids Laboratory (QUILL), School of Chemistry, Queen's University Belfast by Dr Martyn Earle.

Ionic liquids were discovered nearly a century ago but this field of research has attracted huge attention in the past decade, in recognition of the fact that ionic liquids may provide a route to 'green' alternatives within the chemical industry. Ionic liquids are defined as salts with melting points below 100°C comprised of discrete anions and cations. Ionic liquids may be regarded as "*designer solvents*", since their physical, chemical and biological property sets may be "tuned" by independent selection of appropriate cations and anions.

This has lead to the development of ionic liquids for a wide range of applications including their use as green solvents, reaction media for catalysis, in chemical extraction processes and recently, antimicrobial applications. One important, yet somewhat overlooked aspect of ionic liquids research, is their potential environmental/microbial toxicity. This project aimed to examine the possibility of enhancing microbial toxicity of standard 1-alkyl-3-methylimidazolium ionic liquids by incorporating either a silver or copper salt anion, since both copper and silver have a long history in disinfection and infection control.

In order to assess the antimicrobial activity of the ionic liquids synthesized for this study, the Minimum Inhibitory Concentration (MIC) assay was carried out according to Clinical and Laboratory Standards Institute (CLSI) (formerly National Committee for Clinical Laboratory Standards [NCCLS]) guidelines. A range of clinically relevant Gram-positive (*Staphylococcus epidermidis* and *Staphylococcus aureus*) and Gram-negative (*Escherichia Coli*, *Bacillus cereus*, *Proteus mirabilis*, *Pseudomonas aeruginosa* and *Klebsiella aerogenes*) bacteria as well as the representative fungi *Candida tropicalis*, were grown overnight in Muellur Hinton Broth at 37°C in a gyrorotatory incubator. The next day samples were centrifuged at 3000rpm for 15 minutes. The supernatant was then resuspended in Mueller Hinton Broth and diluted by a factor of 1:50. The samples were then transferred to a 96 well microtitre plate. Viable counts were conducted to ensure a final innoculum of $1x10^6$ cfu/ml.

The series of ionic liquids with varying alkyl chain length were dissolved in sterile water and serially diluted to produce a range of concentrations from $1.2x10^{-5}$ to $3.1x10^{-3}$ % w/v. These were then transferred to the 96 well microtitre plate which was incubated in a stationary incubator at 37°C overnight. The next day the plates were assessed visually for bacterial growth. The lowest concentration without bacterial growth is defined as the MIC. Samples were taken from concentrations in and around the MIC and transferred to Mueller Hinton Agar plates which were incubated in a stationary incubator at 37°C overnight, to determine the Minimum Biocidal Concentration (MBC). The plates were then inspected the next day, and the lowest concentration without any growth was determined as the MBC.

When assessed for growth, it was clear that the ionic liquids tested had MIC and MBC values which were similar to or better than other commercially

available disinfectants. For example, benzalkonium chloride was included in these experiments as a control. In each case, the ionic liquids tested had comparable and, in the case of alkyl chain lengths of greater than 12 carbon atoms, superior efficacy to the control. In general antimicrobial activity increased as alkyl chain length of the ionic liquid increased, until the compounds with 14 (or in the case of Gram-positive organisms 16) carbon atoms in the alkyl substituent. The ionic liquids evaluated exhibited potent, broad spectrum antimicrobial activity against all microorganisms tested. Compounds bearing silver anions showed significantly improved antimicrobial activity (MIC reduced by between 5 and 14 times) compared with previously published results for 1-alkyl-3-methylimidazolium chloride ionic liquids. This effect was particularly pronounced for Gram-negative organisms and fungi. In contrast, compounds bearing copper anions whilst exhibiting improved antimicrobial efficacy, were comparable to previously published results for 1-alkyl-3-methylimidazolium chloride ionic liquids described by this group.

I thoroughly enjoyed the Students into Work project and found it to be an invaluable experience which demonstrated the types of research carried out in a dynamic research laboratory. It has allowed me to gain valuable experience in a research laboratory and given me an insight into the work undertaken by PhD students. The time I spent working in the laboratory was very beneficial to me and has given me the ability to make an informed choice about my future career for which, as a final-year student, I am very grateful.

I would like to thank Dr. Brendan Gilmore for his supervision and guidance, and for making it possible for me to undertake the studentship and also to QUILL and Dr Martyn Earle for his guidance on all aspects of ionic liquids synthesis and characterization. I especially wish to thank S*f*AM for funding my research experience. I would highly recommend this scheme to anyone considering undertaking a PhD and a career in research.

Andrew Lowry
Queen's University Belfast

Getting down and dirty on the farm, in Devon — Part II

I have very much enjoyed my experience carrying out a project funded by the Society for Applied Microbiology (S*f*AM) Students into Work Grant. My project was based at North Wyke Research, near Okehampton, Devon. North Wyke Research is a Biotechnology and Biological Sciences Research Council institute part of Rothamstead Research.

The project

The aim of the project was to investigate how the drying and rewetting of soil affects the mobilization and transfer of nutrients and faecal indicator organisms (FIOs) to surface waters via leachate. The investigation looked at the effects on both fallow and grassland soils which had animal slurry applied to them. Twelve hydrologically isolated lysimeters were used, of which six were maintained moist throughout the experiment and the other six were allowed to dry. Of each group of six, three were grassland and three fallow. Two storm events were to be carried out to stimulate leachate flow, one at the start of the experiment when all the lysimeters had approximately the same soil moisture content and one at the end when the six lysimeters had dried. Unfortunately, Devon experienced a very wet summer which meant that the soil blocks were going to take far longer to dry out than the time I had for the project. So, having set up the experiment and simulated the first storm, I was left at a loose end, or so I thought! My supervisor, Chris Hodgson, suggested that I could look at a method to label FIOs with stable isotopes, ^{13}C and ^{15}N. The aim being for use in tracing faecal material through the environment and subsequently their detection could be simplified utilizing isotope ratio mass-spectrometry. We decided that I should develop my microbiological skills before I leapt straight into labeling FIOs with ^{13}C and ^{15}N. So I set about isolating naturally antibiotic resistant FIOs from cattle derived faeces. When using such organisms the mode of antibiotic resistance that a bacterium exhibits has to be considered. The genetic information resulting in resistance may be present on the main bacterial chromosome or it may be encoded on plasmids. If the information is encoded on plasmids then the organisms cannot be considered safe for release into the environment as the resistance can be passed on to other organisms.

Beef cattle faeces were sourced from the farm at North Wyke Research. All faecal material was stored at 4^{o}C immediately after collection prior to analysis. Eight samples of beef cattle faeces were collected; five from Red Devon Cows, one from a Hereford x Friesian cow and two from the Devon Red Bull. The cattle were observed and immediately after defecation the faecal material was collected in sterile plastic bags.

To determine the initial concentrations of FIOs in the faecal material, 5g of each sample was suspended in 45ml of Ringer's solution then 1ml of the eluent was aseptically transferred to 9ml of sterile Ringer's solution (Oxoid, Basingstoke, UK) and appropriate serial ten-fold dilutions were made. Standard methods of membrane filtration were used to determine bacterial concentrations. Samples were washed through the filtration unit with 20ml of sterile Ringer's solution. Sterile membrane filters of 0.45μm pore size (Pall Gellman Sciences) were aseptically transferred to Membrane Lactose Glucuronide Agar (MLGA) (Oxoid) and incubated inverted at 44.5^{o}C (± 0.2^{o}C)

for 18–24 hours for enumeration of *E. coli* colony forming units (CFUs) and Slanetz and Bartley agar (S&B) (Oxoid) incubated at 37°C (± 0.2°C) for 44–48 hours for enumeration of intestinal enterococci (CFUs). FIO concentrations were analyzed in the laboratory within 2 hours of sample collection. Approximately 50g of the remaining faecal material was used to determine the gravimetric water content by drying at 105°C for 24 hours. FIO counts were normalized by transforming to $\log_{10}$ CFU g^{-1} (dry weight). Concentrations of the FIOs ranged from 4-6 $\log_{10}$ CFU g^{-1} (dry weight). Interestingly the concentrations of FIOs detected in the Red Devon faecal material were relatively low, 4 $\log_{10}$ CFU g^{-1}.

To prepare antibiotic resistant cultures I looked at three different techniques. For the first, 0.25g of rifampicin was dissolved in 10ml MeOH. This solution was then filter sterilized and 0.5ml added to 250ml of molten agar. To prepare agar containing nalidixic acid, 500mg of solid antibiotic was dissolved in 4ml of 4M NaOH. This solution was then made up to 20ml by addition of deionized water. This solution was filter sterilized and then 0.25ml added to 250 ml of molten agar. This was carried out using MLGA and S&B agars. Approximately 20ml of molten agar and 1ml of faecal suspension (5g of faecal material suspended in 45 ml of Ringers) were added to empty sterile Petri dishes. The two were mixed by agitation before the agar solidified.

For the second technique 0.1ml aliquots of the initial faecal suspension were spread using a disposable plastic 'hockey' stick on MLGA, S&B and Tryptone (Oxoid) plates containing rifampicin and nalidixic acid. The antibiotics were prepared and added to the molten agar as above.

For the third technique 0.1ml of eluent from two red Devon cow samples and one red Devon bull sample were spread on MLGA plates to culture *E. coli*. After incubation at 44.5°C (± 0.2°C) for 20-24 hours growth was observed on the surface of the agar. There were three distinct colony colours, green, yellow and pink. Gram stains of the colonies were made, and they were all identified as Gram-negative rods. Pure cultures of bacteria were grown on nutrient agar (Oxoid). Isolated colonies were then streaked onto nutrient agar plates containing a range of concentrations of rifampicin and incubated at 37°C (± 0.2°C) for 18–24 hours.

No bacterial cultures grew following the first two methods. However, following the third technique cultures resistant to rifampicin were grown.

To conclude, naturally occurring antibiotic resistant bacteria were successfully cultured from those present in fresh bovine faeces. I approached the work with no knowledge or experience of practical microbiology and very little theoretical knowledge at all. Although I was slightly frustrated by the wet summer in Devon, not allowing me to see the conclusion of the wetting and drying experiment this was a most enjoyable work experience. I feel I picked up the basics of microbiology very quickly, due to good training and I am very pleased to have acquired a range of new skills. The research itself showed me a very different area of environmental research than I have previously experienced and has shown me a different scale of research. Although I already planned to study for a PhD, this time at North Wyke Research has opened up new areas of interest for me. I am very grateful to SfAM for supporting this experience with a Student into Work Grant.

George Kirke
North Wyke Research

Susceptibility testing of new antifungal compounds

While finishing my academic studies in biological engineering at the University of Minho, I received the fantastic offer to carry out a 10 week project with Dr. Armando Venâncio. The project was to adapt the Japanese Society for Medical Mycology (JSMM) standard broth microdilution method of antifungal susceptibility testing for filamentous fungi. The basis for this work arose from the need to test the antifungal action of synthetic chemical compounds in terms of their inhibition of fungal growth and the production of mycotoxins by ochratoxigenic *Aspergillus* strains. In this context, the research was focused on the monitoring of an robust, expeditious and economical method to detect the effect of new chemical compounds on the growth and metabolic acivity of selected fungal strains. The new compounds were synthesized in the Chemistry Department of the University of Minho and the work started with the black *Aspergillus* strains preserved in Micoteca da Universidade do Minho (MUM).

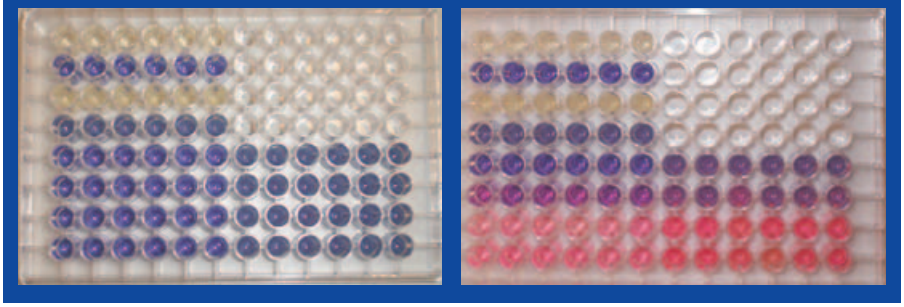
Over the last decades, an increase in the demand for new drugs for crop protection has been observed. Among these, several compounds or mixtures have been tested for their properties against filamentous fungi and/or their mycotoxins. Generally, traditional methods for *in vitro* screening are usually labour intensive and time consuming. This observation is still more relevant when looking at filamentous fungi, due to the filamentous growing nature. In our laboratory, we have been challenged to develop a rapid and miniaturized method for the screening of a large number of compounds against common mycotoxigenic fungi. This assay should be effective in measuring the effect on fungi and on mycotoxin production.

Based on the reduction of a dye by the metabolic activity of microorganisms, we developed a microplate assay where several compounds could be tested at once against one target organism or several microorganisms could be tested for their resistance to one target compound (see Figure 1).

The growth of *Aspergillus* strains, in the presence of each one of the chemical compounds under study, was evaluated during five days in a controlled chamber (25°C). The modifications were detected through a colour alteration of the Alamar Blue™, analyzed by a spectrophotometric ELISA reader (570 nm). The growth of the fungi during incubation was accompanied by a successive modification of the medium colour. These modifications are detectable even before mycelia growth is observed and after five days each well may be extracted with a solvent for evaluation of mycotoxin accumulation.

The main advantages of this method are (i) the possibility of using small amounts of chemicals in the antifungal evaluation and (ii) the possibility of testing several compounds at once, without the need for expensive

Figure 1. *The in vitro assays.*
The image on the left shows preliminary work.
The image on the right shows later work. They show the change in colour due to the metabolic activity of each Aspergillus strain



equipment, making it suitable for screening a large library of compounds and/or strains.

The support of S*f*AM provided an opportunity to expand my scientific knowledge and my microbiology background. I believe that Students into Work Grants support and encourage students to develop a scientific and professional career. Undoubtedly, S*f*AM has given me the possibility to learn more and exchange both ideas and knowledge strategies.

Sandra Araújo
Universidade do Minho (PT)

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Listeria monocytogenes virulence factors

Intracellular pathogens such as *Yersinia*, *Shigella* and *Listeria* spp., are known to cause a wide range of diseases with high morbidity and mortality rates. These bacteria are able to highjack the host's cellular machinery to evade its immune system, allowing them to survive and replicate within the host (Cossart & Sansonetti 2004).

Listeria monocytogenes is a Gram-positive facultative intracellular pathogen, ubiquitous in nature and capable of causing severe foodborne disease in humans, especially immuno-compromised hosts, accounting for up to 10% of community-acquired bacterial meningitis in humans. It is of public health concern due to its ability to grow at low temperatures and pH, and high salt concentration. This bacterium is of special interest when studying intracellular pathogens as it is able to cross three of the human tight barriers, the intestine barrier, the blood-brain barrier and the blood-placenta barrier, meaning it is able to adapt to different cell types. Due to these characteristics it is of special concern for immuno-compromised patients, elderly people and pregnant women (Swaminathan, Cabanes *et al.*, 2007). The mortality rate of immuno-compromised patients infected with Listeriosis is around 30% (Ramaswamy *et al.*, 2007; Swaminathan & Gener-Smidt, 2007).

Most of the virulence genes code for surface proteins which are implicated in the different steps of the *Listeria* infectious process (Cossart 2007; Ramaswamy *et al.*, 2007). The full genomes of *L. monocytogenes* and of the non-virulent, and non-invasive strain of the *Listeria* genus, *Listeria innocua*, have been published and with it new possibilities for the understanding of the mechanisms by which *L. monocytogenes* is able to cross these many barriers in the human body and cause infection.

L. monocytogene has a wide range of mechanisms it uses to invade different cell types. Two of the most important (and better characterized) are those mediated by internalin A (InlA) and internalin B (InlB), which differ in their targets and type of cells that they can target for invasion (Seveau *et al.*, 2007). Intestinal epithelial cells form the first barrier that *L. monocytogenes* has to cross in the human body, and entry is mediated by InlA, whose target cell receptor is E-cadherin. This protein is found in tight junctions between epithelial cells, and is usually not exposed to the areas where *L. monocytogenes* is present. Nevertheless whenever there is a gap in these junctions *L. monocytogene* is capable of using the InlA mechanism to become intracellular (Sousa *et al.*, 2004; Sousa *et al.*, 2005). As InlA binds to E-cadherin it utilizes the signalling pathways associated with it that allows the bacteria to "hijack" the control of the cytoskeleton synthesis and thus

References

- Birmingham, C. L., Canadien v., Kaniuk, N. A., Steinberg, B. E., Higgins, D. E. and Brumell, J. H (2008). Listeriolysin O allows *Listeria monocytogenes* replication in macrophage vacuoles. *Nature* **Vol. 451**, No. 7176: pp350-4.
- Cabanes, D., Dussurget, O., Dehoux, P. and Cossart, P (2004). Auto, a surface associated autolysin of *Listeria monocytogenes* required for entry into eukaryotic cells and virulence. *Molecular Microbiology* **Vol. 51**. No. 6: pp1601-1614.
- Cabanes, D., Sousa, S., Cebriá, A., Lecuit, M., García-del Portillo, F. and Cossart, P (2005). Gp96 is a receptor for a novel *Listeria monocytogenes* virulence factor, Vip, a surface protein. *The EMBO Journal*: pp1-12.
- Cossart, P. (2007). Listeriology (1926-2007): the rise of a model pathogen. *Microbes and Infection* **Vol. 9.** No.10: pp1143-1146.
- Cossart, P. and Sansonetti, P (2004). Bacterial invasion: the paradigms of enteroinvasive pathogens. *Science* **Vol. 304**: pp242-248.
- Ramaswamy, V., Cresence, V. M., Rejitha, J. S., Lekshmi, M. U., Dharsana, K. S., Prasad, S. P. and Vijila, H. M (2007). Listeria—review of epidemiology and pathogenesis. *J Microbiol Immunol Infect* **Vol.40**, No.1: pp4-13.
- Sabet, C., Lecuit, M., Cabanes, D., Cossart, P. and Bierne, H (2005). LPXTG protein InlJ, a newly identified internalin involved in *Listeria monocytogenes* virulence. *Infection and Immunity* **Vol. 673**, No.10: pp6912-6922.
- Seveau, S. Pizarro-Cerda, J. and Cossart, P. (2007). Molecular mechanisms exploited by *Listeria monocytogenes* during host cell invasion. *Microbes and Infection* **Vol.9,** No.10: pp1167-1175.
- Sousa, S., Cabanes, D., El-Amraoui, A., Petit, C., Lecuit, M. and Cossart, P. (2004). Unconventional myosin VIIa and vezatin, two proteins crucial for *Listeria* entry into epithelial cells. *Journal of Cell Science* **Vol. 117**, No.10: pp2121-2130.
- Sousa, S., Cabanes, D., Archambaud, C., Colland, F., Lemichez, E., Popoff, M., Boisson-Dupuis, S., Gouin, E., Lecuit, M., Legrain, P. and Cossart, P. (2005). ARHGAP10 is necessary for alpha-catenin recruitment at adherens junctions and for *Listeria* invasion. *Nature Cell Biology* **Vol.10**: pp954-960.
- Swaminathan, B., Cabanes, D., Zhang, W. and Cossart, P. (2007). *Listeria monocytogenes.* Food Microbiology: Fundamentals and Frontiers. M. P. Doyle and L. R. Beuchat. Washington D.C., ASM Press: pp457-491.
- Swaminathan, B. and Gener-Smidt, P. (2007). The epidemiology of human listeriosis. Microbes and Infection **Vol.9**, No.10: pp1236-1243

promoting bacteria internalization through what is known as a zipper mechanism.

On the other hand, InlB is able to mediate entry into other cell types by interacting with C-Met, a surface protein, which is the receptor for hepatocyte growth factor (HGF). This also leads to the hijack of the host's cellular machinery such as cytoskeleton control and allows internalization of the bacteria. Although InlB and HGF both have the same receptor they do not compete for attachment sites, as it has been observed that they do not share the same conformation and attach to different sites in the Met molecule. The main difference between the two is in the kinetics of the reaction of their attachment to this receptor, InlB being able to bring about a much larger response in the cell than HGF (Seveau *et al.*, 2007).

Once inside the cell, bacteria are surrounded by a vacuole (phagosome if it is a phagocytic cell like a macrophage) and to survive and replicate it must exit this vacuole. In order to leave the vacuole *L. monocytogenes* secretes in particular a lytic enzyme called Listeriolisin O (LLO), that is able to break apart the vacuole by forming pores on it (Birmingham *et al.*, 2008). Once the bacteria have escaped the vacuole they are able to utilize other virulence factors such as ActA, which allows them to use the cellular machinery for actin polymerization thus allowing them to polymerize an actin tail in order to move intracellularly and intercellularly (Swaminathan *et al.*, 2007). When the *L. monocytogenes* cells come across an adjacent cell they are able to cross into them by pushing the host's cell membrane until it becomes surrounded by a double-membrane vacuole in the neighboring cell. Once in the new cell the bacteria evade the double-membrane vacuole (using listeriolysin and phospholipases) and once this is achieved they are free in the cytosol to continue their infectious cycle to new host cells (Swaminathan *et al.*, 2007).

The main goal of our group — the Molecular Microbiology group at the Instituto de Biologia Molecular e Celular (Institute for Cellular and Molecular Biology) in Oporto, Portugal, is to identify and characterize new *L. monocytogenes* virulence factors. For the identification of more potential virulence genes, two approaches are being pursued: comparative genomics (comparing the genome sequence of *L. innocua* and *L. monocytogenes*) and transcriptomic analysis (comparing the transcriptome of *in vitro* grown bacteria to those of *in vivo* infecting bacteria). These two approaches have generated a large number of genes which are potentially important for *L. monocytogenes* virulence. This approach has already allowed the identification of several new *Listeria* virulence factors (Cabanes *et al.*, 2004; Cabanes *et al.*, 2005; Sabet *et al.*, 2005) and the relevance of other genes in *L. monocytogenes* virulence is currently being assessed.

Ana Filipa Henriques
Instituto de Biologia Molecular e Celular (IBMC), Portugal

Helicobacter species and inflammatory bowel disease

Inflammatory bowel disease (IBD) is an idiopathic inflammatory disorder consisting in the most part of ulcerative colitis (UC) affecting only the colon and Crohn's disease (CD) affecting anywhere in the digestive tract. These common disorders most frequently present in young adults (age 20-40) and can be complex and challenging to manage resulting in significant long-term morbidity. There is considerable geographical variation in the annual incidence (2.2 – 14.6 per 100,000) and prevalence (12 – 212 per 100,000) (Loftus & Sandborn, 2002), with these diseases occurring more commonly in Northern Europe (Shivananda *et al.*, 1996, Sinclair *et al.*, 1983).

Despite ongoing research the pathogenesis remains elusive, with several mechanisms proposed. These are not mutually exclusive and include an unidentified persistent pathogen; excessive inflammation related to an abnormally permeable colonic wall; a genetically determined excessive immune response to the normal intestinal bacteria; changes in the balance of populations of intestinal bacteria or a combination of these. Since the first association of small curved Gram-negative bacilli with peptic

ulceration (Marshall & Warren, 1984), the discovery of *Helicobacter pylori* has led to the development of the *Helicobacter* genus, distinct from *Campylobacter*, within the phylum Proteobacteria. These highly specialized organisms have adapted to colonizing host niches that are prohibitive to other bacteria. They exert local and distant pathogenic effects via a variety of complex pathways (Bohr *et al.*, 2007). Our recent work has explored the mechanisms by which gastric *Helicobacter pylori* infection results in inflammation, ulceration and cancer in genetically predisposed individuals. This paradigm may also apply to colonization of the colon with non-*pylori* *Helicobacter* species in relation to human inflammatory bowel disease. Animal models, principally in mice, have provided strong evidence for the role of *Helicobacter* species in colonic inflammation. In several genetically modified mouse models, enterocolitis or typhlocolitis develop when *Helicobacter* species are present in the colonic microbiota and a less severe syndrome or no colitis when *Helicobacter* species are absent from the colonic microbial population (Whary & Fox, 2006). Furthermore *Helicobacter* species have been isolated from cotton top tamarins kept in captivity who develop a syndrome very similar to human ulcerative colitis and who progress to colon cancer within five years (Saunders *et al.*, 1999).

However the role of *Helicobacter* species in human inflammatory bowel disease remains controversial with conflicting results from published studies (Bell *et al.*, 2003, Bohr *et al.*, 2004, Zhang *et al.*, 2006). This conflict may be due to the differing techniques employed. In order to address this question we compared previously developed polymerase chain reaction (PCR), fluorescent in-situ hybridisation (FISH) and Southern blot techniques for the detection of *Helicobacter* on mucosal pinch biopsies from patients with active colitis. Of the 63 patients with active UC recruited into the study all had mucosal pinch biopsies taken from inflamed mucosa and in 43 patients proximal non-inflamed biopsies were also taken. At each site adjacent biopsies were taken for PCR and FISH and analysed in parallel. PCR was performed on extracted DNA using a total of seven pairs of published *Helicobacter* genus, *Helicobacter pylori* and Eubacterial primers, and FISH was performed on de-waxed paraffin embedded sections using *Helicobacter* genus, *H. pylori* and Eubacterial probes.

For corroborative analysis, 20 samples were randomly selected and subjected to nested PCR and Southern blot. There was little similarity between the techniques. Non-pylori *Helicobacter* species were detected in 50 of 63 (79%) patients using FISH, but were not detected in the parallel samples with PCR ($p<0.001$). *H. pylori* was detected in only two samples. There was no significant difference on the basis of site or mucosal state. For the corroborative analysis, nested PCR with Eubacterial primers followed by *Helicobacter* specific primers did not improve the detection rate, but nested PCR with two sets of *Helicobacter* specific primers detected *Helicobacter* species in 9 of 20 samples. This was further improved by Southern blot which detected *Helicobacter* species in 14 of the samples. These results correlate with FISH confirming the presence of *Helicobacter* species in the extracted biopsy DNA, albeit in extremely low numbers. Comparison with a control group of subjects with a normal colonoscopy revealed a statistically significant increase in the proportion of patients with non-pylori *Helicobacter* spp. in the colitis group (23% vs 79%, $p<0.001$).

We have therefore established that detection of *Helicobacter* species from mucosal pinch biopsies varies widely with differing molecular techniques and demonstrated a higher than previously detected rate of non-pylori *Helicobacter* spp. in colitis patients casting doubt on the published negative studies where a single molecular approach has been used. These results in conjunction with recent evidence from a mouse model suggesting that the presence of *Helicobacter* species may act as a provocateur orchestrating the immune reponse to other commensal bacteria (Jergens *et al.*, 2007) present a compelling case for continuing to pursue the *Helicobacter* species as possible causative agents in human inflammatory bowel disease.

John Thompson
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References

■ Bell, S.J., Chisholm, S.A., Owen, R.J., Borriello, S.P. and Kamm, M.A. (2003) Evaluation of *Helicobacter* species in inflammatory bowel disease. *Aliment Pharmacol Ther* **Vol. 18**, pp481-486.

■ Bohr, U.R., Glasbrenner, B., Primus, A., Zagoura, A., Wex, T. and Malfertheiner, P. (2004) Identification of enterohepatic *Helicobacter* species in patients suffering from inflammatory bowel disease. *Journal Clinical Microbiology* **Vol. 42**, pp2766-2768.

■ Bohr, U.R., Annibale, B., Franceschi, F., Roccarina, D. and Gasbarrini, A. (2007) Extragastric manifestations of *Helicobacter pylori* infection — other *helicobacters*. *Helicobacter* **Vol. 12,** pp45-53.

■ Jergens, A.E., Wilson-Welder, J.H., Dorn, A., Henderson, A., Liu, Z., Evans, R.B., Hostetter, J. and Wannemuehler, M.J. (2007) *Helicobacter bilis* triggers persistent immune reactivity to antigens derived from the commensal bacteria in gnotobiotic C3H/HeN mice. *Gut* **Vol. 56**, pp934-940.

■ Loftus, E.V., Jr and Sandborn, W.J. (2002) Epidemiology of inflammatory bowel disease. *Gastroenterol Clin North Am* **Vol. 31**, pp1-20.

■ Marshall, B.J. and Warren, J.R. (1984) Unidentified curved bacilli in the stomach of patients with gastritis and peptic ulceration. *Lancet* **1**, 1311-1315.

■ Saunders, K.E., Shen, Z., Dewhirst, F.E., Paster, B.J., Dangler, C.A. and Fox, J.G. (1999) Novel intestinal *Helicobacter* species isolated from cotton-top tamarins (*Saguinus oedipus*) with chronic colitis. *J Clin Microbiol* **Vol. 37**, 146-151.

■ Shivananda, S., Lennard-Jones, J., Logan, R., Fear, N., Price, A., Carpenter, L. and van Blankenstein, M. (1996) Incidence of inflammatory bowel disease across Europe: is there a difference between north and south? Results of the European Collaborative Study on Inflammatory Bowel Disease (EC-IBD). *Gut* **Vol. 39**, 690-697.

■ Sinclair, T.S., Brunt, P.W. and Mowat, N.A. (1983) Nonspecific proctocolitis in northeastern Scotland: a community study. *Gastroenterology* **Vol. 85**, 1-11.

■ Whary, M.T. and Fox, J.G. (2006) Detection, eradication, and research implications of *Helicobacter* infections in laboratory rodents. *Lab Anim* **Vol. 35**, 25-27.

■ Zhang, L., Day, A., McKenzie, G. and Mitchell, H. (2006) Nongastric *Helicobacter* species detected in the intestinal tract of children. *Journal Clinical Microbiology* **Vol. 44**, 2276-2279.

The activity of lantibiotics against MRSA

Hospital strains of *Staphylococcus aureus* are usually resistant to a variety of different antibiotics. A few strains are resistant to virtually all clinically useful antibiotics except vancomycin, and vancomycin-resistant strains have been reported in recent years. This resistance of staphylococcal strains to conventional antibiotics used to treat staphylococcal infections in general, and MRSA infections in particular, has reached an alarming level (Klein *et al.*, 2007). A contributing factor has been the widespread and/or inappropriate use of antibiotics to treat non-life-threatening infections that has generated a strong evolutionary pressure for the emergence and wide geographic spread of multidrug-resistant *S. aureus* with resistance to particular groups of antibiotics. Thus, there is a pressing need to develop new agents that are active against such resistant strains.

The recent strategy for finding new classes of antibacterial compounds based on targets identified from bacterial genomics has not yet proved successful. This has led to renewed interest in natural products, which have historically been invaluable as a source of antibacterial drugs, such as penicillin and glycopeptides, reflecting their evolutionary origin as "weapons" used by bacteria against each other. Glycopeptides were the first example of peptides that kill bacteria by targeting lipid II, a bacteria-specific membrane component that is essential in bacterial cell-wall synthesis (Breukink, E. & Kruijff, B., (2006). Lipid II has recently been demonstrated as the target of several other natural products, including some classes of bacteriocins (Breukink, E. & Kruijff, B., (2006).

In recent years, there has been much focus on a promising class of bacteriocins known as lantibiotics — these are antimicrobial peptides produced by some bacteria and are generally active against other bacteria belonging to the same or closely-related species. Gram-positive bacteria have attracted the focus of many researchers as producers of class-I bacteriocins, i.e. lantibiotics. The most prominent representative of lantibiotics, nisin, already has a long history of use in the protection of foodstuffs. Lantibiotics have also been considered for application in humans; however, they have not yet been used in the setting of chemotherapy on the same scale as traditional antibiotics.

There are two major groups of bacteriocins: those produced by Gram-negative bacteria and those that are formed by Gram-positive bacteria. The bacteriocins of Gram-negative bacteria were the first to be studied extensively. The colicins, produced by members of the Enterobacteriaceae family, are considered the prototypes. Many of the colicins have been extensively characterized, resulting in comprehensive knowledge of the genetic basis, domain structure, mode of formation, and killing action of these molecules. The colicins are large proteinaceous compounds with domains specific for certain functions, such as binding to receptor proteins in the outer membrane, translocation through the peptidoglycan layer and periplasmic space, and toxic activity which usually resides in the domain closest to the C-terminus of the molecule (Jack *et al.*, 1998).

The bacteriocins of Gram-positive bacteria have been classified into numerous subtypes (Klaenhammer, 1993) (Table 1). Class I, which is composed of the modified peptides (lantibiotics) and contains lanthionine-derived thioether linkages, with either type A (elongated), type B (globular), or multicomponent molecules. Class II that comprises small heat stable, unmodified peptides can further be divided into three subcategories of Class IIa (pediocin-like bacteriocins), which have a strong inhibitory effect on *Listeria* spp. and contain a conserved YGNG sequence motif in the N-terminal half of the mature protein; Class IIb bacteriocins, which require the complementary action of two peptides for full activity (two peptide bacteriocins); all other nonlantibiotics that do not belong to class IIa and class IIb are classified as class IIc (miscellaneous). Class III is composed of large heat labile bacteriocin proteins (lytic and non-lytic). Finally, Class IV covers those complex proteins or cyclic peptides that additionally require carbohydrate or lipid moieties for bacteriocin activity and their mode of action has been poorly studied (Eijsink *et al.*, 2002).

A feature common to all of the Gram-positive bacteriocin subtypes is that they are produced ribosomally as a prepeptide consisting of two parts or pseudodomains: the leader region and the propeptide component. After synthesis of the prepeptide, any amino

Figure 1. *The proposed mechanism of action of lantibiotics in which hydrophilic pores are formed as a result of the attraction that takes place between the positive charge on lantibiotic and negative charge on lipid II of the cell membrane*

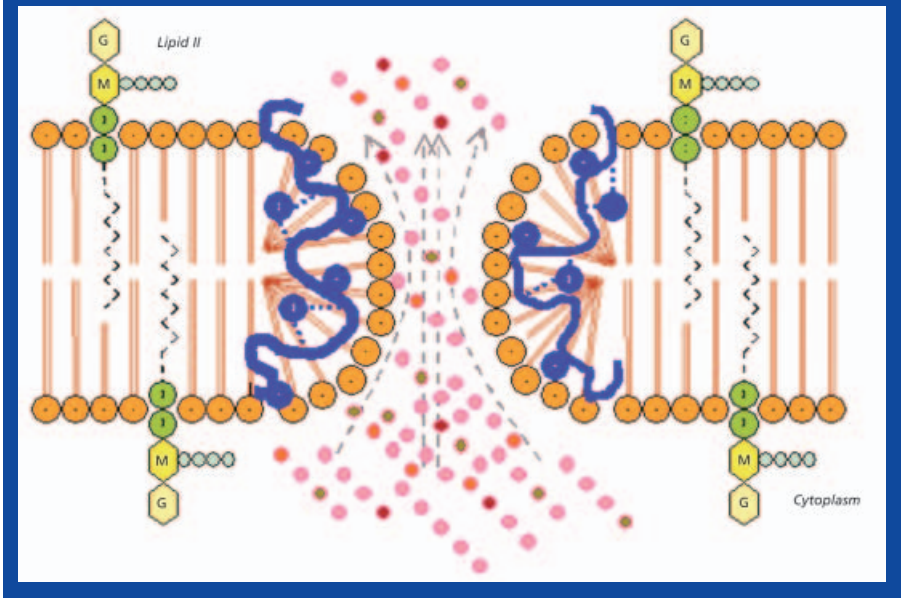

Table 1. The proposed 'Universal' bacteriocins classification [modified from (Eijsink *et al.*, 2002)]

I. Lantibiotics	*II Non-lantibiotics*
Ia. Linear	IIa. Pediocin-like
Ib. Globular	IIb. Multicomponent
Ic. Multicomponent	IIc. Miscellaneous
III. Large protiens	***IV. Cyclic peptides or complex proteins***
IIIa. Bacteriolytic	IVa. Carbohydrate-associated protein
IIIb. Non-lytic	IVb. Lipid-associated protein

acid modifications that may be necessary for the biological functionality of the peptide occur. These modifications appear to be restricted to the propeptide region. Then, during or after transportation from the cell, the leader region is proteolytically cleaved from the propeptide part, thus activating the bacteriocin (Klaenhammer, 1993). It is this mechanism of ribosomal biosynthesis, sometimes followed by post translational modification, that principally distinguishes the bacteriocins from other peptide antibiotics (i.e. those produced in bacterial cells by multi-enzyme complexes) for which no gene encoding a ribosomally-synthesized peptide exists (Jack *et al.*, 1998).

Most bacteriocins carry a net positive charge at neutral pH, their biological activity often increasing with decreasing pH. This is thought to be due to a decreased affinity of the bacteriocin for the cell wall components of susceptible bacteria, leaving more bacteriocin free to interact with the cytoplasmic membrane (Klaenhammer, 1993). The mode of action of the majority of bacteriocins of Gram-positive bacteria is thought to be a specific increase in permeability of the cytoplasmic membrane of sensitive cells through the formation of hydrophilic pores. These pores allow the uncontrolled efflux from the cell of certain essential intracellular components and also usually cause the dissipation of the proton motive force or proton gradient that is essential for the production of ATP (Klaenhammer, 1993) (Figure 1).

Since the natural products lantibiotics are generally produced by and inhibit related organisms, Gram-positive bacteria in general and *Staphylococcus* spp. in particular, they are investigated by research centers for inhibitory activity against the highly resistant strains of *S. aureus*, especially epidemic-MRSA. These approaches are expected to provide the opportunity for the development of new therapeutic agents which can be used to combat the threat of staphylococcal infections caused by MRSA, or even vancomycin resistant *S. aureus* (VRSA). Additionally lantibiotics have significant commercial value and broad applicability and practical methods for their production would have a significant economic impact.

References

- Breukink, E. and Kruijff, B., (2006) Lipid II as a target for antibiotics. *Nature Reviews*
- *Drug Discovery*. **Vol. 5**, pp321-323.
- Eijsink, V.G., Axelsson, L., Diep, D.B., Havarstein, L.S., Holo, H. and Nes, I.F., (2002) Production of class II bacteriocins by lactic acid bacteria; an example of biological warfare and communication. *Antonie van Leeuwenhoek*. **Vol. 81**, pp639-654.
- Jack R.W., Sahl, H.-G. and Bierbaum, G., (1998) *Lantibiotics and related peptides*. Berlin; London: Springer.
- Klaenhammer, T.R. (1993) Genetics of bacteriocins produced by lactic acid bacteria. *FEMS Microbiology Reviews* **Vol.12**, p39.
- Klein, E., Smith, D.L. and Laxminarayan, R., (2007) Hospitalizations and deaths caused by Methicillin-Resistant *Staphylococcus aureus*, United States, 1999–2005. *Emerging infectious Diseases* **Vol. 13** No.12: pp1840–1846.

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Evidence Based Infection Control

Increasing incidence of hospital acquired infection due to *Clostridium difficile* is a cause of real concern. A new report shows that **Polywipe™** Sponge Swabs (Medical Wire) are particularly effective in the detection of *Clostridium difficile* on surfaces in the near patient environment.

It was shown that when combined with an enrichment step, *C. difficile* could be isolated and identified from surface concentrations as low as 2 cfu on a 30cm x 15cm aluminium sheet, even when dried for one hour.

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 phosphate buffer, and individually sealed in an easy to open peel pouch. Using sterile disposable gloves (which can be supplied) the sponge is used to sample the surface being tested. The sponge is then placed in a suitable bag or container and taken to the laboratory for analysis.

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Pro-Lab diagnostics proudly presents the Prolisa™ EHEC EIA, a high quality tool to help diagnose life-threatening disease due to Shiga-like Toxin-producing *E. coli* (STEC), a leading cause of bacterial infections today.

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Antibiotic resistance mechanisms detection kits

Three new kits from A/S Rosco in Denmark will help in the detection and identification of antibiotic resistance mechanisms. Based on established manual phenotypic methods the products are simple to use and unlike conventional paper discs Rosco discs are stable at room temperature for two months. The following kits are available:

- A combined ESBL/AmpC kit,
- An AmpC confirmation kit
- A Carbapenemases MBL/KPC confirmation kit.

An optional Excel based programme simplifies the interpretation of the combined ESBL/AmpC kit. Further support is offered on the Rosco website in the form of a 100 page guide to the detection of resistance mechanisms which covers subjects such as screening foe plasmid mediated quinilone resistance, detection of hypermutable strains and detection of resistance mechanisms by automated methods.

further information

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New generation of Whitley Workstations launched

Don Whitley Scientific introduces the A85 Anaerobic Workstation, the latest in the range of Whitley Workstations. The A85 is an anaerobic culture station with integrated 30 litre airlock. For gloved or bare-hands working it features the patented Whitley multi-functional, oval porthole system. These ports act as mini-airlocks for transferring up to 40 x 90mm Petri dishes at the same time as an operator's arms are inserted or withdrawn from the workstation.

Additional Features:

- All functions controlled via a colour touch-screen display
- Ability to control temperature from 5°C above ambient up to 45°C
- Automatic de-humidification system with no user maintenance required
- Optional refrigeration unit

The A85 can be run on anaerobic gas or on three separate cylinders of hydrogen, carbon dioxide and nitrogen. The airlock can transfer up to 90 plates into the workstation at any one time, with no compromise of the internal environmental conditions.

Building on DWS's 30 years of experience in workstation technology, this latest iteration makes full use of the latest technology, providing a workstation for every modern microbiology laboratory.

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Lab M's new MacConkey Agar homes in on Enterococci

Microbiology specialist Lab M, has added a modified MacConkey Agar to its range of dehydrated culture media. MacConkey Agar No.2 contains bile salts No. 2 for the recognition of Enterococci and is especially useful when these organisms are present alongside coliforms and non-lactose fermenters in water, sewage and food products.

Enterococci appear on MacConkey Agar No.2 as small, intensely coloured, red-purple colonies. Colonies of non-lactose fermenters appear colourless, while bile tolerant Gram-positive organisms, such as Staphylococci and non-faecal Streptococci, are completely inhibited.

Able to tolerate a wide range of environmental conditions, enterococci are frequently sought as indicators of faecal pollution. To ensure public health, raw, potable and waste water needs to be carefully and efficiently monitored for microbial contamination. *Enterococcus* species are also responsible for many clinical infections including those of the urinary tract, bacteremia, bacterial endocarditis, diverticulitis, and meningitis.

The new MacConkey Agar No. 2 is the latest addition to Lab M's comprehensive portfolio. It makes the detection and identification of Enterococci straightforward, enabling effective monitoring in both water treatment and food industry environments.

further information

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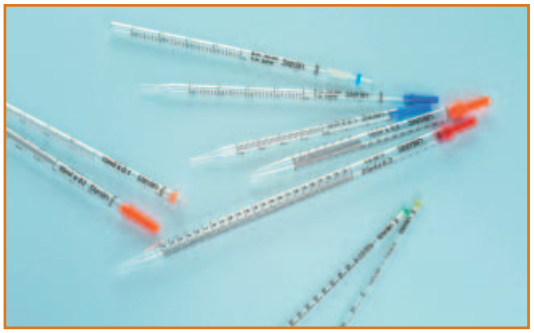

Sterilin Pipettes offer best quality assurance yet for endotoxin-sensitive applications

Sterilin Serological Pipettes are now certified non-pyrogenic to 0.01EU/ml—a level that is significantly lower than other pipettes. The range has also been validated non-haemolytic in accordance with BS EN ISO 10993-4:2002

Biological Evaluation of Medical Devices. Certified non-pyrogenic to a lower level than ever before, Sterilin Serological Pipettes greatly reduce the risk of endotoxin interference in routine laboratory analyses (such as LAL testing) and, therefore, help to ensure the integrity of results. Validated non-haemolytic, the pipettes protect

samples and provide valuable assurance that they will not interfere with haemolysis test results.

Sterilin Serological Pipettes are manufactured from crystal grade polystyrene for excellent clarity. With crisp black text, ascending and descending graduations, and negative graduations for extra capacity, volumes are extremely easy to read and accurate to +/- 1%. The range includes standard pipettes (1, 2, 5, 10, 25 and 50ml) in addition to 'Shortie' pipettes (5 and 10ml), which are ideal for use in laminar flow cabinets. The gamma-irradiated pipettes are individually wrapped in paper peel or plastic film to maintain quality during storage.

further information

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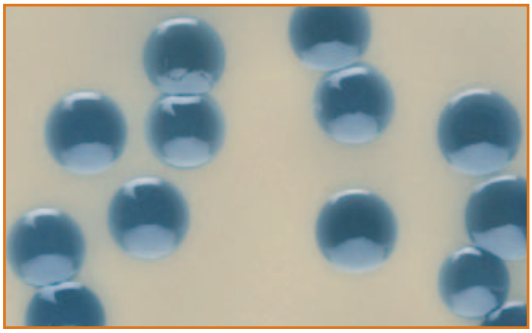

Oxoid *Brilliance*™ Staph 24 Agar Identifies staphylococci in foods within 24 Hours

Oxoid had launched *Brilliance*™ Staph 24 Agar—a selective and diagnostic chromogenic medium for the isolation and enumeration of coagulase-positive staphylococci (CPS) in foods, within 24 hours.

Brilliance™ Staph 24 Agar allows the isolation and enumeration of CPS 24 hours earlier than with traditional media (such as Baird-Parker Egg Yolk Tellurite Agar) which take at least 48 hours for a result. On *Brilliance*™ Staph 24 Agar, CPS will grow as dark blue colonies on a clear agar background, allowing rapid, easy identification and enumeration within 24 hours.

Brilliance™ Staph 24 Agar detects coagulase-positive staphylococci, including pathogenic coagulase-positive, non-aureus staphylococci, such as *S. intermedius*. It also -prevents growth of nontarget organisms, therefore, eliminating extensive confirmatory testing and miscalculation of cell counts.

The Oxoid *Brilliance*™ Staph 24 Agar method has been validated and approved by MicroVal according to the ISO 16140 standard against the reference method ISO 6888:1999-Horizontal method for the enumeration of coagulase-positive staphylococci (*Staphylococcus aureus* and other species) - Part 1: Technique using Baird-Parker Agar medium for meat, dairy, seafood, bakery products and composite food.

further information

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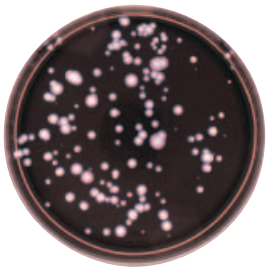
New Application of ProtoCOL 2 Colony Counting Technology Helps Speed up Detection of Legionella in Contaminated Water Supplies



Synbiosis announces its innovative ProtoCOL 2 automated colony counter has been extensively tested to enable rapid, accurate counts of *Legionella* on any *Legionella* detection media.

The Synbiosis technical team found that by using the ProtoCOL 2 system, 600 *Legionella* plates could be accurately processed per hour, approximately 30 fold more than can be achieved using time consuming, error-prone manual techniques. The team used ProtoCOL 2's ground-breaking red, blue and green LED lighting (patent pending) with the dark screens shut to allow excellent reflection-free imaging of shiny buffered charcoal yeast extract media and *Legionella* colonies.

They tested ProtoCOL 2's method of capturing three different coloured images and automatically combining them to generate life-like full colour images. They established that this method ensured easy identification and counts of the Legionella colonies from background flora on *Legionella* growth media.

Martin Smith of Synbiosis commented: "Plates of water samples tend to vary widely from low to very high counts. Automating the counting process and recording the results consistently is critical. Testing ProtoCOL 2, we have proved the system delivers this, ensuring accurate quantification of *Legionella* in water samples, thus offering microbiologists an excellent method of rapidly checking the safety of water supplies and equipment."

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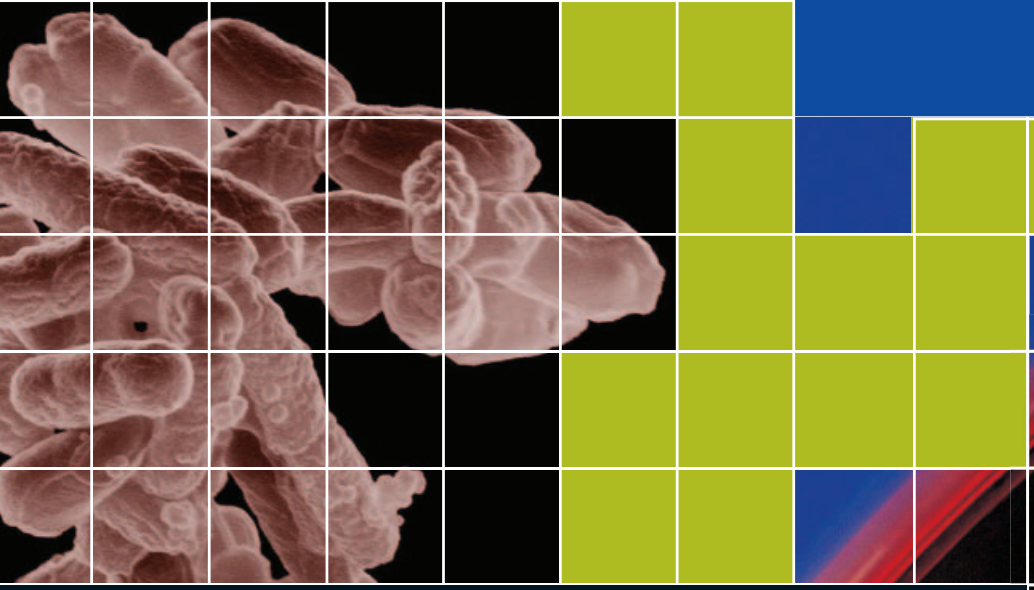

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