Microbiologist

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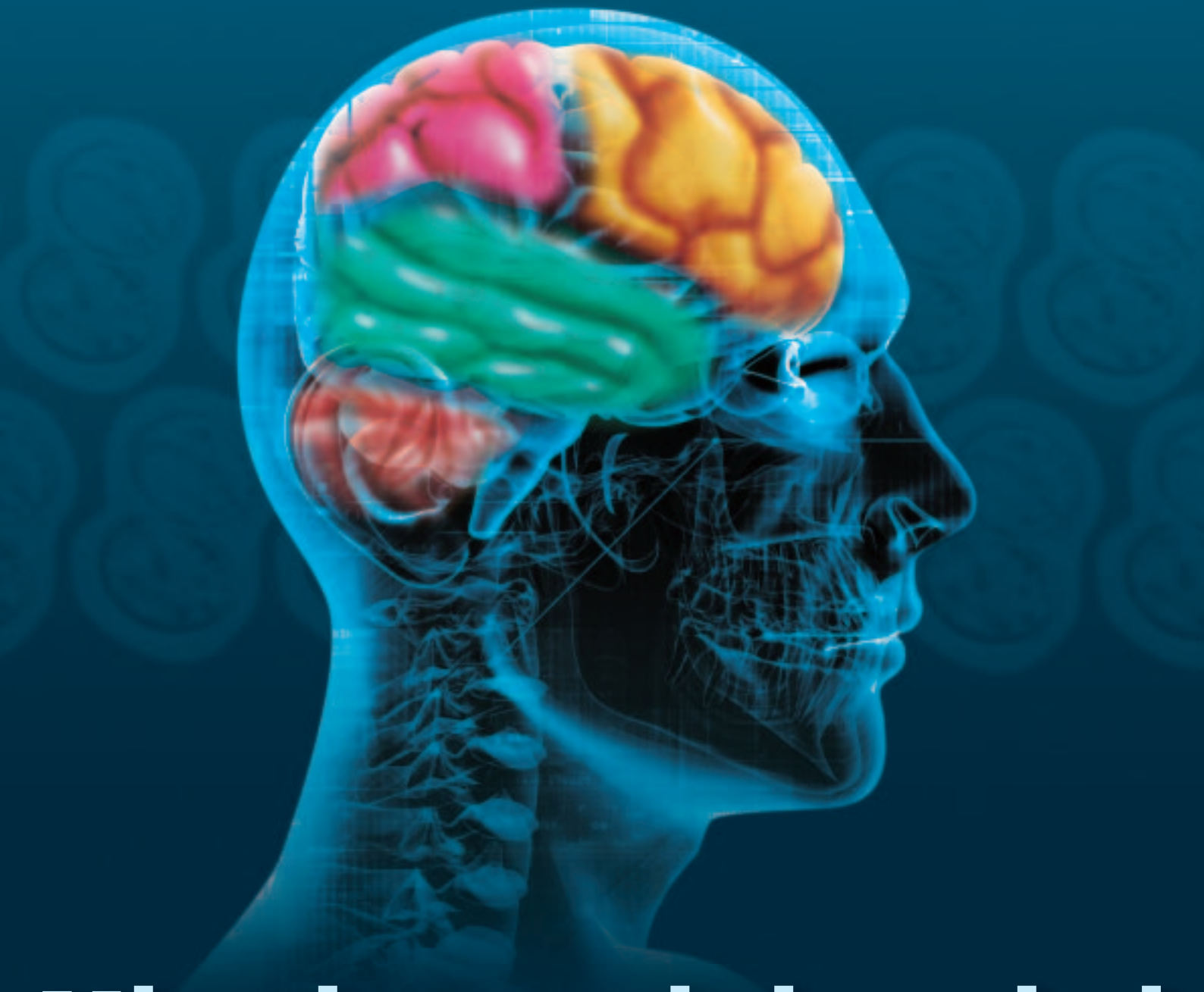

Microbes and the mind

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September 2011 ■ Vol 12 No 3 ■ ISSN 1479-2699

Microbiologist the magazine of the Society for Applied Microbiology

contents

members

publications

news

features

meetings

commercial

We honour Dr Fred Skinner

Microbes and mood

information

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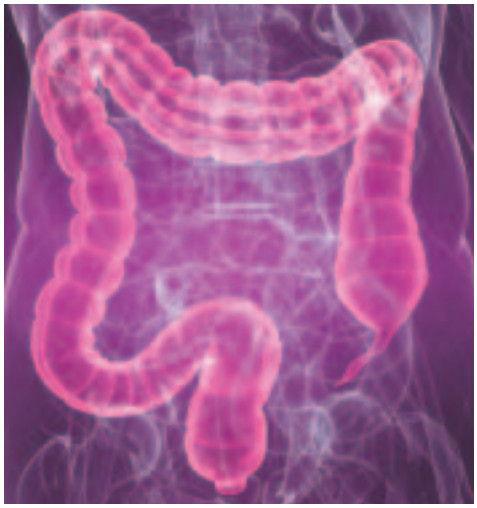
editorial

Lucy Harper talks about the captivating subject of microbes and the mind



This issue of *Microbiologist* covers the captivating subject of microbes and the mind. We all know that microbes alter our physical health: the gut is colonized by "good bacteria", protecting us from pathogenic bugs and that infection by virulent pathogens can cause disease. But a recent paper by Sven Pettersson and colleagues published in Proceedings of the National Academy of Sciences* has found the *behaviour* of mice was altered by the microbial composition of the gut. In short, mice who had their gut microbiota essentially 'removed' were less anxious and behaved in a way considered less risk-averse than their counterparts with normal gut flora. They conclude that: "*…the microbial colonization process initiates signalling mechanisms that affect neuronal circuits involved in motor control and anxiety behaviour…*" and "*…the observed behavioural changes imposed by the presence of the gut flora in rodents, reported in this paper, may have wider implications when considering psychiatric disorders in humans*". Although a lot more research is needed, it is possible that the gut microbiota may have an effect on psychological as well as physical health.

Our first feature article, by science writer Frank Swain focuses on parasites, in particular *Toxoplasma gondii*, and the mind. He says: "*The idea that an infectious agent might be at the root of mental illness is not a new one — in fact,* T. gondii *came under suspicion over a 100 years ago, in an editorial published by Scientific American.*"

With the link between parasites and behaviour being well-established in animals, could infection with parasites alter human behaviour? Read more on page 30.

The second feature article describes the role of microorganisms, in particular *Mycobacterium vaccae* in major depressive disorder. Professor Graham Rook, Professor Christopher Lowry and Professor Charles Raison take an immunological look at the association between inflammation and depression. They tell us about the microorganisms involved: "*The bottom line is that they are organisms associated with faeces (microbiota such as Bacteroides, helminths and faecal-oral transmission of infections/carrier states), animals (farm or pet) and mud.*" Turn to page 32 to read more.

In this issue we also hear from two individuals who are very important to the Society. Our new President, Professor Martin Adams introduces himself and describes his passion for food microbiology and the history of London (page 7). We also hear from the first and well-deserved winner of the S*f*AM Distinguished Service Award, Dr Fred Skinner who talks about some of his varied and favourite experiences over the many years he's been involved with the Society (page 14).

*Heijtz, R. D., Wang, S., Anuar, F., Qian, Y., Bjorkholm, B., Samuelsson, A., Hibberd, M. L., Forssberg, H. and Pettersson, S. (2011). Normal gut microbiotia modulates brain development and behaviour. *Proceedings of the National Academy of Sciences (PNAS)*, **Vol. 108**, No. 7, pp3047-3052.

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

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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.
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- Invitation to the annual *Environmental Microbiology* lecture.
- Fostering cross disciplinary research.
- A 25% discount on the extensive Wiley–Blackwell collection of titles.

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

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

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

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

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

MEETINGS: We hold three annual meetings; the Winter Meeting is a one-day meeting with parallel sessions on topical subjects. The Spring Meeting is a one–day meeting tailored for personnel in clinical microbiology. The Summer Conference is held every 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.

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

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

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- 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).

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We welcome *Sf*AM's new President

Q Martin, as incoming President, do you think you could give us a bit of background information about yourself? Whereabouts did you grow up for example?

A I was born and lived in the East End of London as a child. When I was still quite young, we, like many people living in Bethnal Green, moved out to Essex. So most of my childhood was actually spent living in Essex and I lived there until I went to university.

Q Tell us a bit about your background in Essex, particularly at school, where did your interest in science begin? What made you choose science?

A Well, basically I enjoyed it. But you know, I enjoyed quite a range of subjects at school. I suppose one of the things I considered important was that I should study something that would give me a job at the end of it.

I started my career as a chemist, I took a BSc in chemistry at Warwick University. It was called molecular sciences then — a bit more trendy sounding than chemistry — it's not a modern thing thinking up new names for old subjects. Although it was called molecular sciences, it was a chemistry course with biochemistry as an option. I then went from Warwick to Manchester to do a PhD in microbial chemistry and that was really my first exposure to microbiology, in connection with secondary metabolites produced by fungi. Even when I left Manchester I still regarded myself essentially as a chemist.

Q So what was the title of your thesis?

A It was the Biosynthesis of the diterpenoid antibiotic aphidicolin — a secondary metabolite produced by *Nigrospora sphaerica* — or something like that.

Most of it was organic chemistry, but I had to grow the organisms and use fermenters and shake flasks and things like that. So I had to learn some practical microbiology which wasn't always a smooth process. I remember being shown how to sub-culture my organism soon after I arrived, by my fellow PhD students who were microbiology graduates. Being a chemist I screwed the tops on all the slope bottles really tightly, because that's what chemists do, and of course I used to come in every day, look in the incubator and think: "*well it's still not growing*" and then somebody said "*you need to let a bit of air in*" so I learnt that quite early on.

Q Can you tell us about that picture? (LH points to a picture hanging in Martin's office).

A It's actually a picture that I discovered, well saw, in a display at the Science Museum and the caption said that it was a microscopy course at Battersea Polytechnic, which was the forerunner to the University of Surrey. So I wrote to the Science Museum and asked where this picture came from and they sent me back some details. It came from the Greater London Picture Archive and it's actually a class of student nurses. Although one or two of them are doing

president's column

Lucy Harper interviews *Sf*AM's incoming President, **Professor Martin Adams** and finds out about his background in Chemistry, Food Microbiology and his interest in all things historical

microscopy, you can see one there doing a titration by the looks of it, so it's probably some sort of general science class. There's a demonstrator in the background, I think it must have been taken around the beginning of the twentieth century.

Q So your knowledge of microbiology began through your PhD studies. Can you tell us how that knowledge developed and what made you remain within the field?

A When I left Manchester I got a job at the Tropical Products Institute (TPI), which was based in central London and was part of the Scientific Civil Service. It was a scientific unit attached to what was then the Ministry of Overseas Development and it did research, development and advisory work for developing countries with the aim of helping them get greater benefits from their renewable resources. I went to work in the Microbiology and Fermentation Section, originally to work on the chemistry of spoilage of tropical fish, but priorities changed and I ended up working more on the fermentation side.

I started at TPI in 1974 and in the seventies there was a lot of interest in things like fuel alcohol, biogas and single cell protein, things that are topical again now. There was a big project there trying to enrich the nutrient value of cassava by growing a mould on it — rather like the traditional far eastern food tempe, which is produced by growing *Rhizopus* on soya beans. The idea was to try and make something similar but using cassava. The product was described as cassava cheese, but it never really took off. I went on to develop my own project: making vinegar using simple traditional acetification techniques. The main substrate for this was export reject bananas. A very high proportion of bananas that went to packing stations in the Windward Islands were rejected, usually on pretty minor grounds, like having blemishes or being small, but they were perfectly OK if you ripened them. The project started because somebody wanted to use locally-produced vinegar in making hot pepper sauce and so we developed a low technology process to make banana vinegar. In fact when I moved office recently I threw out a bottle of this banana vinegar which was getting on for about 30 years old now. It still smelt OK. The project really worked very well. We got a lot of help from people at Sarson's, the vinegar company which used to be on Tower Bridge Road, and I used to go down there and collect the starter culture from them. We used a very simple process using recycled barrels that were made under the old railway arches somewhere in East London. I took the process to the Windward Islands and it went quite well until they had a hurricane and everything was destroyed. As far as I know it just died a death after that. During this time we also made vinegar from other things including, mango, pineapple, cocoa sweatings, cashew apples and palm sap. The palm sap vinegar involved a palm called the Nipa palm which grew in brackish waters. It grew a lot in South East Asia and was abundant in Gulf Province in Papua New Guinea where I joined a bigger project run by the department of Minerals and Energy of Papua New Guinea. Their project was primarily to produce fuel alcohol from Nipa palm sap and vinegar production was a bit of a sideline.

Most people think of vinegar as something you slosh on chips but what people often forget is that most of it goes into food processing. If you can produce different sorts of vinegar, you can expand to produce all sorts of different food product such as pickles and chutneys. So it's a more important product than it might seem at first. I really enjoyed the vinegar work and I had learnt a bit more microbiology by then. I had also improved my bacteriology — I had never done any bacteriology before then.

We then moved on to lactic fermentation, particularly fermented fish products, of which there are a number, once again mainly in South East Asia. The idea was to improve the utilization of by catch (low value species caught with the main catch). There are fermented fish products like fish sauce which are really just an autolyzed fish, but there are some which genuinely involve a lactic acid fermentation and so we looked at some of these fermented products mainly in Thailand and the Philippines. In the UK, we did a lot of laboratory work fermenting whiting which we used mainly because it was cheap and easy to get from Billingsgate Market. The project involved me spending long periods standing by a meat-bone separator and chucking loads of whiting in. Of course in these fermentation experiments you always needed a control and in this case the control was essentially just rotting fish. So some of the smells that developed were really pretty horrible!

Another part of the work the Section did was training, development and support work in conventional food microbiology for industries in developing countries. There was a lot of demand for running short courses on food microbiology and I gradually moved into this as well. So I became a more mainstream food microbiologist and delivered short courses in all sorts of different places around the world.

The TPI has changed since I left to go to the University of Surrey. The remnants of what was the TPI are now the Natural Resources Institute and it's based at the University of Greenwich. It's no longer a Government Department but it still does quite a lot of training, I understand.

When a job became available at Surrey, one of the requirements was an interest in fermented

foods, so I thought I would apply. At the time I was quite happy where I was, but I thought this looked like a great opportunity. I got the job, came here in 1984 and have been here ever since. It's been great at Surrey I've had some wonderful colleagues over the years and have really enjoyed the combination of teaching and research.

Q You talked about a lot of the work you did at TPI being on foods in South East Asia, does that mean you had to do quite a lot of travelling yourself?

A Yes I did a fair bit of travelling, as part of that work and I suppose that was one of the things that led me to apply for the job at Surrey, because a lot of the work was overseas and I had a young family. When I worked overseas it was for relatively long periods at a time. I could go to Thailand or Papua New Guinea for two months and I went to the Seychelles once for three months [LH: that sounds awful]. Oh it certainly had its upsides but with a young family it was a bit of a wrench and I didn't always get to stay in nice hotels. When I was in Papua New Guinea I was living in a sort of Portakabin in a swamp area without electricity and collecting rainwater for washing. I'm not by nature an outward bound type. Since I've been at Surrey I've still done quite a lot of travelling but it's been more on my own terms and for shorter periods.

Q So what made you move into academia from a Government Department?

A I had enjoyed the teaching I'd been doing at TPI and it gave me a taste of running training courses, so I felt this was the kind of thing I would like to do. Also, to be honest when I left TPI the prospect for Government funded research and research institutes wasn't very bright because everything was being shrunk if not shut down completely and overseas aid was not a big priority. I thought working at a university might also offer better job security, but it was something that I really wanted to do as well and I thought if I didn't try, I would never know and I don't regret it at all.

Q During your career have there been any role models — any key people who have influenced your work or any teachers that inspired you?

A There have been several. I said earlier that I always enjoyed science but liked other subjects as well. I've always admired people who are diverse in their interests and have a broad appreciation of things other than their immediate job, something that I think Denis Healey called "*having a hinterland*". I've met quite a few people like that over the years — several through S*f*AM. My PhD supervisor was like that — John Bu'Lock. He also started off as a chemist and moved into microbiology. But he was also an eminent antiquarian, a Fellow of the Society of Antiquarians and wrote, among many other things, a book on pre-occupation Cheshire. He had a real depth of knowledge in areas other than chemistry and microbiology and I thought he was quite an inspiring character. Then when I went to the TPI I had a head of section whose name was William Trevelyan (Trev) and he was a similar sort of character — incredibly knowledgeable in all sorts of areas. He taught himself Russian so he could read Russian scientific papers, was incredibly well read and could quote great chunks of *The Three Musketeers* from memory, an unforgettable character. He was also a really first-rate scientist. Before joining the TPI, he worked for Distiller's so he knew masses about industrial fermentations and yeast biochemistry. In fact, while I was at TPI, a paper that he had published in Nature in the 1950s, was ranked by the Science Citation Index as a citation classic. He was asked to produce an article about the origin of the work which was on paper chromatography of sugars — something that is never done anymore — but this was used and cited so extensively that it ranked as a citation classic.

Q If you admire people with a breadth of knowledge, is this a trait you aspire to yourself? I ask because I know you're very interested in history. Perhaps you could tell us a bit about where this interest came from, how it's manifested itself and what you plan to do with it, if anything?

A I've always been interested in history, particularly social history and the history of science and technology. As you know I've done a couple of articles for *Microbiologist* on historical topics. I'm also a Board member of the Greater London Industrial Archaeology Society (GLIAS), a group which concerns itself with London's industrial past. Nowadays everyone thinks of London as largely an office environment with businesses in tower blocks and so on, but London was a huge manufacturing centre with all sorts of trades and activities. Obviously a lot of these have disappeared: people don't often preserve industrial remains because many tend to be aesthetically not very pleasing, but there are still quite a lot of reminders around. One example is the Sarson's vinegar brewery which I mentioned before. It has been converted into flats — very expensive flats no doubt, but the fabric of the building is still there and there are still lots of other sites like that dotted around London. I am interested in Three Mills in Bow and wrote an article on it for the *Microbiologist*. Because of its association with developments in

brewing, distilling, the acetone-butanol fermentation, citric acid production and penicillin production I think you could make a claim for it being a World Heritage Site for Industrial Microbiology, if there are such things.

Q What other professional activities have you been involved with — aside from serving on the *Sf*AM committee as Meetings Secretary, Vice-President and now as President?

A I was on the SGM education group a few years ago and I've been a member of the Microbiology in Schools Advisory Committee for a number of years. I've also done things like act as a consultant for various bodies such as the International Foundation for Science (IFS) — an international body that is based in Sweden and funds researchers in developing countries. I review grant applications for them. They give relatively small amounts of funding, a few thousand dollars, nothing like the funds which are involved in grant applications here, but they're very good at helping young researchers. Say for example, somebody's done a PhD in Europe or the States and they return to their home country for an academic job and they want to get some research going, the IFS is a very good source of funding for this. I have also done work for the United Nations Development Program and the World Health Organisation over the years too.

Q You're at the early stage of your Presidency of *Sf*AM: what are your aims and goals for the Society?

A I think this is a great time to be involved with *Sf*AM. One of the important things is to maintain the momentum and the progress we've made over the past few years. The meetings are very successful, we've an increasing membership and we have a very generous programme of grants and awards including Geoff Hanlon's initiatives on capacity building in developing countries. This is something that relates back to my time at TPI so I'm quite keen to see that developed. But from a personal point of view I would like to see *Sf*AM do more work in public outreach, to encourage an interest in microbiology, especially in children. Another thing I want to explore is *Sf*AM support for practical training in microbiology for people working in labs but whose training may have been in a different discipline or needs updating. I would like to see *Sf*AM support practical courses to upgrade skills and understanding of basic microbiology skills that are in danger of being neglected. A lot of techniques used nowadays are based around the molecular techniques and some of the basic skills involving microscopy and culturing, aseptic technique and things like that might go by the wayside. I think that whilst molecular techniques are without doubt the future, we mustn't lose sight of the underpinnings: some of the old-fashioned stuff which might get overlooked. If you can't maintain a pure culture then there's not much hope for any molecular techniques that you care to apply to it.

Q Interesting stuff ahead thank you. Now can you tell us a little more about yourself? You mentioned when you were working at TPI having a young family and that being a reason you wanted to find something a little more home oriented...?

A Yes well they're not young anymore (laughs) I've got two sons and Pauline my wife, of course. Both my sons went down non-science routes, they both did arts subjects — obviously I was a terrific role model (laughs). My eldest son went to Manchester University and did politics and then did a PhD in Sociology and he now works for a Trade Union in Manchester. The younger one is in Manchester as well, so I have a good family connection there, and he's just finished a PhD on aspects of the history of anarchism — so microbiology doesn't loom very large in their spheres of interest. Still, I've got a grandson aged three so maybe I should start working on him.

Q OK, so last question then, just so we get a picture of your life at the moment, what are you going to be doing after this interview?

A Well, I've got a couple of phone calls to make and then I'll probably go home — I have a draft PhD thesis to read…

Martin Adams
President of the Society

ceo's column

Philip Wheat reports on the latest developments within the Society

Regular readers of this column will remember that in the September 2010 issue of *Microbiologist* I suggested that you book early if you intended to come to the 2011 Summer Conference. At that time I did anticipate that the meeting would be popular and this has proven to be very true. I am writing this in June 2011 and since early April 2011 all the hotel bedrooms we had booked have been allocated. Furthermore, a few days ago we had to close delegate registration as the capacity of our lecture rooms had been reached. So once again I recommend you book early for next year's Summer Conference to secure your place. Whilst I'm talking about the 2012 Summer Conference, I am pleased to announce that next year we are once again returning to Edinburgh (2 to 5 July 2012). The venue will be the George Hotel which is situated in the centre of the city. Next year's meeting will have more than one scientific theme: Antimicrobials, Bioremediation and Bacterial Adaptation (see page 27).

Discussions amongst the Executive Committee have resulted in the decision to introduce a new award — the **Distinguished Service Award**. This award is intended to recognize an individual member's significant and long standing contribution to the Society. It gives me great pleasure to announce that the first recipient of the award is **Dr Fred Skinner** who has been a member of the Society since 1949. Dr Skinner was presented with his award at a celebratory lunch attended by myself, the President and Vice-President and members of Dr Skinner's family (see page 14). The Distinguished Service Award will be awarded sparingly (not annually) to individuals who have contributed to the health of the Society over a significant period of time. There are a number of selection criteria for individuals to be considered for the award. These include:

- Individual members will only be considered for the award if they are proposed and nominated by two existing Society members. Any individual Society member will be allowed to propose one candidate only in a five year period.
- All nominations for the award will be assessed by the Executive Committee. The Executive Committee will discuss the suitability of candidates and decide whether or not to support the nomination. Any decision will be final and there will be no appeals process.
- Nominees will normally have served as an Officer of the Society. In addition, individuals who have served in the role of Chief Editor for one of the Society journals will also qualify to be nominated.
- Nominees will normally have held membership of the Society for a considerable continuous period of time e.g. at least 25 years.
- Nominees will normally be actively involved with Society affairs at the time of nomination. This may include, for instance, attendance at Society meetings, being a member of one of the Editorial Boards, membership of Society Subcommittees or contributing to contents of *Microbiologist*.

Anybody requiring further information should contact me (pfwheat@sfam.org.uk).

Finally, I was fortunate enough to attend the American Society for Microbiology (ASM) General Meeting in May this year. I enjoyed meeting many existing and new members. In fact, we signed up a record number of new members at the ASM this year, so to all those new members, welcome to the Society, we're delighted to have you on board. However, during discussions with existing members whilst at the ASM General Meeting, it became apparent that there remains confusion over the availability of grants to our non-UK members. I would like to reiterate that ALL grants are available to all Full Members irrespective of your country of residence. Once again I must encourage all members to assess the full range of grants which are available, full details can be found by visiting www.sfam.org.uk. Please note that all grants require a minimum of two subscription payments before a member is eligible to apply.

Philip Wheat
Chief Executive Officer

Statistical Analysis in Microbiology: StatNotes
By Richard A Armstrong and Anthony C Hilton.
Published by Wiley-Blackwell/*Sf*AM, 2010

StatNotes has been designed specifically for microbiologists who are involved in experimental research and need to draw accurate conclusions from their findings. It features 28 StatNotes that together enable you to understand the basic principles of statistics, choose the correct statistical methods to analyse your experimental data, and work with a variety of commercially available statistical software packages. Written specifically for microbiologists, StatNotes enable you to choose which statistical methods should be applied to analyze and draw correct conclusions from your experimental data.

Bad Bugs Book Club

Delegates at this years' Summer Conference in Dublin were invited to join Professor Joanna Verran of Manchester Metropolitan University in a critical discussion of the book '*Toxin*' by Robin Cook. For those who haven't read '*Toxin*' the book is set in America in the late 1990s and follows the story of a doctor trying to trace the source of the *E. coli* which killed his daughter. As the novel progresses we learn more about meat processing plants, and the supposed 'dark side' of the meat industry. The meeting was very well attended. Although most of the attendees were scientists, the diversity of attendees' backgrounds provided different insights and opinions on the book. Toxin paints a very bleak picture of the meat industry in America in the 1990s and a discussion about the accuracy of this view ensued. Fortuitously, a couple of the book club attendees had been working in the meat industry in America at the time and soon set the record straight. Over a few glasses of wine, the story and microbiological content of the book were thoroughly discussed, several members were vocal in their dislike of the book, although others found it oddly amusing. Whilst conversations occasionally digressed away from the book Jo managed to gently steer us back on topic and discussions were held over the progression of the disease in the young girl, the portrayal of the meat industry and the potential for contamination in meat processing facilities. Everyone seemed to thoroughly enjoy themselves and the discussions continued late into the evening. If you would like more information on the Bad Bugs Book Club visit Jo's website: www.sci-eng.mmu.ac.uk/intheloop.

Clare Doggett

membership matters

Environmental Microbiology Lecture 2011

The 2011 *Environmental Microbiology* Lecture will be presented on 10 October at the Royal Society of Medicine, London by **Professor Willem M. de Vos**, distinguished professor of Helsinki University, Finland and Professor of Microbiology of Wageningen University, the Netherlands. The title of his presentation will be "***Microbes Inside***". Professor de Vos is a very distinguished worker in the field of environmental microbiology and he acts as an Editor for the journal *Microbial Biotechnology*. He has co-authored over 400 peer-reviewed papers and his outstanding work has been recognized by numerous international awards. For members unable to attend, the lecture will be available online immediately after the event.

Scientific Meeting Attendance Grant or President's Fund? **You** decide!

Are you going to a scientific meeting? Do you need funding? Do you know which of our grants to apply for?

The **Scientific Meeting Attendance Grant** will fund your travel, accommodation and registration fees at any relevant scientific meeting, including SfAM meetings, up to a value of £300. This is ideal if you wish to attend a conference or one-day meeting/symposium but you're not presenting a poster or giving an oral presentation or contributing to the meeting in any other way.

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.

Australia

R. de Jonge; A. Hussain; C. Nourse; R. Ulanovsky; S. Hedge

Belgium

J. Bare; L. Delbrassinne

Bermuda

H. Haigh

Canada

N. A. Cheeptham

China

S. Fu

Columbia

L. M. Alzate

Denmark

A. M. Bojesen; S. Cavil

France

M. Gourmelon

Gibraltar

N. N. Sene

Greece

F. Parlapani; D. Sergelidis

India

Abhilash

Ireland

D. Bolton; R. Coyne; S. Crowley; G. Kearney; T. Kennedy; K. Lynch; M. McKenna; R. Moran; A. Mussida; G. Redmond

Italy

M. Al Moghazy

Malaysia

M. Faseleh Jahromi

Mexico

M. J. Granados Baeza

Nigeria

N. U. Abanno; E. Y. Aderibigbe; F. A. Adesioye; B. J. Akinyele; S. Bakare; O. Famurewa; Y. A. Jeff-Agboola; T. O. Mohammed; S. A. Odunfa; A. A. Ogunjobi; A. Oluyege; O. O. Oyebamiji; E. A. Peters

Qatar

S. Al-Zeyara

Russia

E. Belova; N. Luneva

South Africa

O. A. Aiyegoro; M. Cameron; P. A. Gouws; A. I. Hassen

Turkey

S. Ulusoy

UK

K. Anderson; D. Bangura; J. Bond; M. Chaney; M. A. Chapman; F. Colles; P. J. Dadson; H. Davies; C. Dedi; A. Devaynes; K. D. Dumbrell; C. Edwards; R. Ferguson; N. K. Fry; A. K. George; H. Gibbins; A. Hamidi; S. Hasib; P. Hatton; R. Hazelwood; S. J. Heron; C. Hill; S. J. Hooper; B. Kepplinger; M. R. Kidger; M. Lagator; R. Lahmer; P. Lucas; H. Mahmood; C. J. Megson; E. G. Mmadubuko; H. S. Mohd Afsar; L. S. Morris; A. A. Piotrowska; S. Rattenbury; S. J. Rees; J. Rollason; C. Rotta; A. K. Rucka; J. M. Scott; A. Simpson; I. Snowball; K. Suddards; K. Turner; N. H. Waterhouse; B. Winterbourn; G. Yaze; C. S. Young

USA

M. Barton; H. Barton; A. Binnevose; M. Byappanahalli; F. Hashem; A. Matthews; V. Mayo; K. Mitchell; J. Mott; L. Mrachek; S. Mueller-Spitz; R. J. Rae; M. J. Rodriguez Mora; A. Rodriguez-Palacios; S. Rumbuc; M. B. Saffo; K. Selvam; C. Sheffield; A. Underwood; T. Whitehead

Vietnam

A. T. V. Nguyen

The **President's Fund** is designed for you if you're presenting a poster or giving an oral presentation at a relevant scientific conference, meeting or workshop, including *Sf*AM meetings. It will fund travel, subsistence and conference fees up to a value of £1200.

And don't forget, you don't need to reside in the UK to be eligible to apply for any of our grants — but you do need to have been a member for at least one full subscription year and have paid at least two membership subscription fees, and if you've received a grant from us recently, check the terms and conditions before you re-apply — there may be a limit to the number of grants you can apply for in a given time period.

For more information about all our grants and awards, please visit:
www.sfam.org.uk/grants.php

Distinguished Service Award

Following the decision of the Executive Committee to introduce a **Distinguished Service Award**, all at the S*f*AM would like to congratulate **Dr Fred Skinner** on being the first, very worthy winner of this award. Fred has been a Member of the Society since 1949 and has previously served on the Main Committee. Fred was presented with his award at a special lunch with the previous President and Vice-President of the Society along with some of Fred's family members and the CEO of the S*f*AM. Lucy Harper talks to Fred about his distinguished career.

Dr Fred Skinner receiving his award from the previous President of the Society, Professor Geoff Hanlon

Q To begin, would you mind letting us know how long have you been a member of S*f*AM?

A A long time! I have no record of the actual date when I joined the Society, known then as the Society for Applied Bacteriology, but I was certainly attending London meetings in the early 1950s so must have been a member at that time. For some years I took no active part in the Society's activities. Perhaps the Society still has records of the membership in those far-off days [We do indeed, Dr Skinner has been a member since 1949].

Q How did you first get involved with the Society?

A I was introduced to the Society by my colleagues in the Soil Microbiology Department at Rothamsted Experimental Station which I had joined in 1947. The Society's activities were directed very much in the direction of agriculture in those days so it seemed reasonable and desirable to join it.

Q Can you tell us a bit about the various activities within the Society in which you've been involved?

A They were many and varied! At a meeting of the Society for General Microbiology in about 1964 I was approached by Dr Tom Gibson who suggested that I might be interested in becoming a joint Editor of the *Journal of Applied Bacteriology* to replace Dr Jayne-Williams who wished to retire. I would be working with George Sykes, the Senior Editor. I accepted the invitation and so began my long association with the editorial work of the Society. George and I worked together until 1972 when he retired; then I continued for two more years with R.G.Board

and J. G. Carr. I took up Journal editing again in 1982 by which time I had retired from Rothamsted. My special task in 1982 was to work with our new publisher, Blackwell Scientific Publications to ensure that our Journal would appear just as we wanted it to. I continued as a Journal Editor, working with a succession of colleagues right up until 1991.

Quite soon after starting work on the Journal, I became involved with the Technical Series of books which were intended to be useful works of reference to have at hand on the laboratory bench. It was then the practice of the Society to hold an autumn Demonstration Meeting at a convenient university department so that members could display their contributions on a particular theme. Material from the meeting held in 1964 on '*Identification Methods for Microbiologists*' was published in 1966 as the first volume in the Technical Series of useful handbooks. It was intended to be cheap, which it was, and it sold well. This book was edited by B.M. Gibbs and myself and I continued as Series Editor until 1992.

In 1971 a decision was made to publish the Summer Conference Symposium papers, which had previously been included in journal issues, as hardback volumes. The first book, based on the meeting at Liverpool, was '*Microbial Aspects of Pollution*', edited by George Sykes and myself, Journal Editors at that time. It fell to me to oversee the editing and production of the next 11 volumes, all published by Academic Press. After 1984, Blackwell produced the Symposium Series as only one hardback volume, the remainder being softback supplements to the Journal.

One thing leads to another so it was no great surprise that I found myself appointed as a Trustee of the Society in 1976. My main task was to receive all the dividend vouchers relating to our investments, countersign each one and forward them to the Society Treasurer. This was quite an interesting duty actually to keep an eye on the Society's finances and keep track of our increasing prosperity.

I should mention at this point the Publication Experiment which I and John Norris, the General Secretary, proposed in 1969. This project, which took up much time and created much work, was eventually dropped in 1974. It is impossible to describe this proposed experiment in a few words so I can only refer readers to the full account of it that appeared in '*The Society for Applied Microbiology; A Short History*' by Max Sussman (2006).

The only other activity that comes to mind is that of being a representative of the Society on the Parliamentary and Scientific Committee for several years in the 1980s.

Q So you've been involved with S*f*AM in quite a variety of ways! One of these has also been meetings — I've seen you at many of our meetings over the years, do you know how many S*f*AM meetings you've attended?

A Not really; I have not kept count. Obviously a lot, but very few since 2000. The last Summer conference I attended was at Edinburgh in 2006.

Q What is your favourite memory associated with S*f*AM?

A This is difficult to answer as I have so many memories of events over the years. There is one that does stick in my memory however, and that is my installation as President on the occasion of the Society's Diamond Jubilee in 1991. I recall the rather special Society Dinner on that occasion, with pleasant background music and much dancing afterwards. I have never found the Society in more festive mood!

Q If you wouldn't mind, I'd like to ask you to pass on your wisdom to the next generation of members coming through the Society by asking: what advice would you give to other members of S*f*AM regarding how to make the most of their membership?

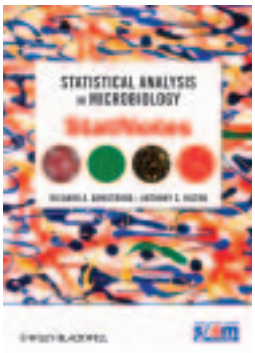
A I have always thought that one gains much from attendance at meetings. Rarely have I left a meeting without having acquired a new idea. Also, there is the advantage of meeting members working in other disciplines; progress in research often starts when different fields of work meet. Of course, you can make many new friends too. That is all the advice I feel qualified to give because I realize that the culture of employment today is very different from what it was in my early days at work, I understand that it is now much more difficult for workers to devote time to any extramural activities.

Q And finally, how do you feel about being awarded our Distinguished Service Award?

A Very honoured and rather humbled. As I mentioned in a letter to the President, the work one does is rarely done in complete isolation. Whatever I have been able to do for the Society over the years would have been of little value without the support, assistance and expertise of many other members of the Society. I am extremely grateful to have been able to help the Society attain its present place in the scientific community.

Lucy Harper
Communications Manager

Book review



Statistical Analysis in Microbiology: StatNotes

By Richard Armstrong and Anthony Hilton
Publisher: Wiley-Blackwell
Publication date: December 2010
ISBN: 978-0-470-55930-7. Price: £33.50
Reviewer: Joanna Verran — including feedback from Lisa Coulthwaite, James Redfern, Sarah Jackson and Ava Brockbank.

I was delighted to see that the 'StatNote' series from the *Sf*AM magazine *Microbiologist* has been collated and edited into a book, and I'm really pleased to provide a review. In fact, to glean more opinions from potential users, I also asked a colleague with significant teaching in microbiology and statistics to comment, as well as some of my microbiology postgraduate researchers.

My colleague, having read and collected many of the StatNote series, said that the book was a very timely and welcome publication. There are many statistics books available, and it is never easy to find a publication where the level is appropriate and where student readers are not quickly lost. The book covers the core topics within our current undergraduate and postgraduate Biology and Biomedical Sciences taught statistics unit and would support student learning as a base text — with focus towards the use of appropriate statistical tests within their individual research projects. It is, of course, nice to see a book dedicated to microbiology — but we would be happy to recommend it to all our students in Healthcare Science as a useful 'first reference'. References to more advanced texts on the different statistical procedures described would have been useful.

I think I can safely say that no statistics book will be loved by students, but there were plenty of positive comments about this one! The student reviewers particularly appreciated the use of microbiology-focused scenarios — in fact some used the scenarios as introduction to content, rather than as an illustration of method. One suggested that each statistical method could have been accompanied by a list of additional relevant scenarios, to help those readers who might use the book as a quick reference as opposed to reading whole chapters. Others found the 'which test to use' key difficult to follow. On reflection, all of these comments demonstrate the students' search for 'the test' to use for their data: in my opinion, the book helps in this decision-making process by providing an accessible, relevant, useful and valuable resource. Tried, tested and appreciated through its serial publication in *Microbiologist*, this book should find a place on many a microbiologist's desk, bench or shelf!

BBC Bang goes the theory LIVE

The BBC One's '*Bang goes the theory LIVE*' has been engaging the public with science over the past two years with an interactive science experience. The event, which is touring the UK, consists of various interactive stands, experiments, information and LIVE science demonstrations by the presenters of the show.

I joined the team at the Coventry 'Godiva' festival on 3 July 2011 where, as well as science demonstrations, live music and other activities filled the day. Over 10,000 people visited the free '*Bang goes the theory LIVE*' tent on 3 July 2011, making it one of the best attended shows of the tour. During the day, presenters from the TV show gave live science demonstrations, with volunteers from the audience interacting on activities such as: "Which is the best glue: pear drops or rhubarb and custard?"

I helped out with the Society of Biology's stand where we had a number of interactive science activities which were enjoyed by children and adults alike. One activity used red cabbage as a pH indicator. This activity aimed to make people aware of how everyday liquids and foods are acid, alkali or pH neutral. The younger children and teenagers were particularly excited by this activity, especially when adding mouthwash to the lemon juice, which showed a change from acid to a neutral/alkali solution. Another activity, involved adding white flowered plants to water with food dye. Not only did this create different coloured flowers, but it demonstrated how a plant takes up water and where it goes.

The Society of Biology stand also contained an 'I love biology' wall — where everyone could write their answer to the question: "What do you love about biology?" The responses included a love of animals and plants, but I did notice a '*Pseudomonas aeruginosa*' amongst the 'pandas' and 'penguins'.

I also helped with an interactive 'Match the animal to their habitat' game. This was a hit amongst the younger children, who enjoyed sticking the animals in their correct location. Some of them even managed to do better than their parents!

One final activity was an interactive board called "Where are my organs?" This was a great activity as it made the children realize how many organs are inside us. It also educated adults, explaining what each organ does and how it is associated with disease.

Overall the day was tiring, and being in a hot tent proved a slightly challenging environment. However seeing that children of all ages were amazed by science, particularly biology, made the day highly rewarding and a huge success.

Samantha Price
PECS Events Team, De Montfort University

2011 SfAM AGM

The 80th Annual General Meeting of the Society for Applied Microbiology was held on Wednesday 6 July at 4.45 pm at the Clontarf Castle Hotel, Dublin.

Present:

There were 39 members were present at the meeting.
In attendance: Philip Wheat, Lucy Harper.

1. Apologies for absence

No apologies were received.

2. 79TH Annual General Meeting

The minutes of the 79th Annual General Meeting held in Brighton in 2010 were published in the December 2010 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 2010

Copies of the Annual Report of the Society for 2010 had been distributed previously. This report was accepted.

5. Adoption of the annual report 2010

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

6. 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 list of new members and resignations throughout the previous year for consultation if requested.

7. Election of New President

Mark Fielder thanked Geoff Hanlon for his work during his time of office and presented Martin Adams as the new President of SfAM. There were no objections and unanimous agreement by a show of hands. Martin Adams took office from this moment.

8. Result of ballot and election of new committee members

Martin Adams reported that this year there are two committee vacancies. Clare Taylor and Christine Dodd are retiring by rotation and were thanked for their contributions and hard work during their term of office. They were both nominated to continue on the Main Committee for a further term of three years.
Mark Fielder then stated that three nominations had been made to the committee and a subsequent ballot had resulted in Christine Dodd — nominated by Mark Fielder and seconded by Martin Adams and Clare Taylor — nominated by Samantha Law and seconded by Sally Cutler — serving on the SfAM Main Committee for a further three years.

9. Any other business

John Rigarlsford raised the issue of industry representation on SfAM's Main Committee, stating that in previous years the Main Committee had comprised around 50% industry representatives.
Geoff Hanlon responded stating that we currently have at least one industry representative on the Main Committee and Phil Wheat suggested if anyone knows an industry representative who is interested in standing on the Main Committee they are welcome to be nominated.
Janet Corry enquired as to whether membership of SfAM was increasing and Phil Wheat stated that there has been a net increase in membership of around 500 to 600 members since 2005. Steve Davies also reported that the net worth of the Society had increased and John Rigarlsford acknowledged that in the current economic climate this was a fantastic achievement.
Sue Passmore then commented that she was pleased that Don Whitley had been awarded Honorary Membership this year, an honour that was well deserved.
Janet Corry highlighted the success of this Summer Conference in Dublin and asked whether the high level of attendance was due to the location, the topic, the duration or the format or a combination of these. Martin Adams stated that the topic and location were probably factors but that, more significantly, the financial health of the Society meant it could afford to subsidize members' attendance significantly.
Janet Corry then mentioned the death of an active member of the Society from Greece, Souzana Sotiracopoulos. She enquired as to whether mention had been made in *Microbiologist*. Lucy Harper responded saying that her death had indeed been recorded in the June 2011 issue of *Microbiologist*.

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 Media Workshop June 2011

The Standing up for Science Media Workshop, organized by Sense About Science, was held at The Linnean Society, London, in June and I was lucky enough to be given the opportunity by S*f*AM to attend. The workshops allow early career researchers, medics and engineers to explore the wide world of public engagement and how to actively interact with media and a wide range of groups on difficult and controversial debates. The workshops aim to provide early career researchers the opportunity to form views on how science is portrayed and communicated, and to better understand how the media works by questioning the people at the frontline.

After registration and a chance to chat and introduce ourselves, we were all gathered in the grand lecture room to formally start the workshop. The day was divided into three panel sessions and two group sessions. The first session "Science and Media" was a discussion on the changing image and role of science and scientists in the public domain. It included presentations and a question and answer session, and was led by three panellists, Dr Alan Dangour, Senior Lecturer at the London School of Hygiene and Tropical Medicine; Dr Robin Lovell-Badge, Head of Division of Stem Cell Biology and Developmental Genetics, Medical Research Council and Dr Deirdre Hollingsworth, Imperial College Junior Research Fellow in infectious disease epidemiology. The panellists shared with us both their good and bad experiences with the media and left us with important key messages; to always be consistent in the story no matter what, to make sure we know what message we want to send to the public and to be well prepared beforehand. The overall message was to

go ahead, promote our scientific work and stand up for science, it is a challenge, fun, great way to meet people and to make contacts and it is important for funding applications. It also has the potential to help in shaping policy. One issue that was raised was whether it was acceptable to discuss work that hasn't been peer-reviewed with the media and this led to a very lively discussion with all the panellists.

Following the first panel session the participants were split into four small groups, and the first group task was a discussion on our perception of how the media reports scientific stories, and the impact of these stories on the scientific community. The issue of how to make sure "good science" and not "bad science" is propagated was also discussed. The group discussion was summarized into key points which were thoroughly discussed in the second panel session "What Journalists are Looking for". In this session, we shared views with a panel of three journalists; Tom Feilden, BBC Radio 4's Today programme science and environment correspondent; Richard Van Noorden, assistant news editor for Nature and Claire Coleman, a freelance features journalist who writes across a number of topics for a variety of publications. The journalists explained how they approach stories, balance the need for news and entertainment with reporting science, and deal with the accusations of polarizing debates and misrepresenting the facts. Claire explained that it is important for scientists to have a message to deliver but it is also important for us to understand what pressures the journalists are under when they are writing a story. Claire also explained the differences between journalists and editors and the influence that some of these editors have on the journalists themselves to reshape and edit the story to make it more attractive to the general public. Tom emphasized the importance of building a good relationship with journalists. The overall message was to be open-minded, honest and clear when working with journalists; we are all passionate about science and all want facts and news to reach the public in as responsible, balanced and entertaining a way as possible.

After a fascinating discussion with the journalists, we returned again for another group session to discuss the obstacles that we, early career researchers and scientists, face in engaging with the public and the media. The main issues raised were, fear, lack of confidence and self-belief in their ability to face the media and respond to journalists' questions. These were issues faced by the researchers as well as their superiors. Lack of training, communication, contacts and proper media outlets for young scientists were also factors preventing us from engaging with the media. A discussion about how to overcome all these obstacles was carried out

in the third and last session "Standing up for Science-the nuts and bolts". The panellists for this session were, Simon Levey, Research Media Officer, Imperial College, London; Tamlyn Peel, VoYS and Julia Wilson, Sense about Science. Between the panellists they offered practical guidance for early career researchers to get their voices heard in debates about science. All three panellists emphasized the importance of our participation in these debates to promote good science and respond effectively to bad science, even if we are junior members in the field. They also provided us with top tips on how to interact and respond when we come face-to-face with a journalist, Finally we were all encouraged to join the Voice of Young Science network (VoYS) and participate in VoYS activities to play an effective role in standing up for science.

This workshop has provided me with the necessary knowledge and skill to face the media, stand up for my work and take control in sending the right message to the public without being misrepresented. Following a previous bad experience with the media, I had found it very difficult to engage with the media again. However, this workshop, with all the bad and good experience stories from leading scientists and journalists, was very useful in encouraging me to stand up for science, learn the lessons from the bad experience and to begin to promote science to the public in a balanced and sensible way. I also found the VoYS network very interesting and I have joined the network. I would encourage any young scientist to follow in the footsteps of more than 6,000 VoYS members who are scientists, medics and engineers. With limited places on this popular workshop, I'm very grateful to S*f*AM, a firm believer in supporting all members especially young scientists, for sponsoring me and giving me this great opportunity to attend this valuable workshop.

Manar Al-Mashadrani

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.

journalWatch

News about the Society's journals

Journal of Applied Microbiology

The following articles are the most read articles in 2011 to date in the Journal of Applied Microbiology.

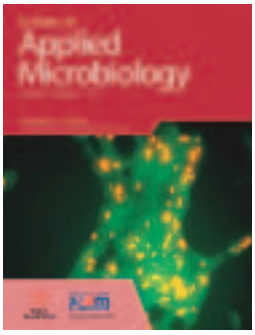
Antimicrobial agents from plants: antibacterial activity of plant volatile oils. H. J. D. Dorman and S. G. Deans. **Vol. 88**, Issue 2.

Antimicrobial activity of essential oils and other plant extracts. K. A. Hammer, C. F. Carson and T. V. Riley. **Vol. 86**, Issue 6.

A study of the minimum inhibitory concentration and mode of action of oregano essential oil, thymol and carvacrol. R.J.W. Lambert, P.N. Skandamis, P.J. Coote and G.J.E. Nychas. **Vol. 91**, Issue 3.

Comparative evaluation of the hygienic efficacy of an ultra-rapid hand dryer vs conventional warm air hand dryers. A.M. Snelling, T. Saville, D. Stevens and C.B. Beggs. **Vol. 110**, Issue 1.

A history of influenza. C.W. Potter. **Vol. 91**, Issue 4.



Letters in Applied Microbiology

The following articles are the most read articles in 2011 to date in Letters in Applied Microbiology.

Extraction methods and bioautography for evaluation of medicinal plant antimicrobial activity. A. Nostro, M.P. Germanò, V. D'Angelo, A. Marino and M.A. Cannatelli. **Vol. 30**, Issue 5.

Antibacterial activity of selected plant essential oils against *Escherichia coli* O157:H7. S.A. Burt and R.D. Reinders. **Vol. 36**, Issue 3.

Antibacterial activity of plant extracts on phytopathogenic *Xanthomonas campestris* pathovars. S. Satish, K. A. Raveesha and G. R. Janardhana. **Vol. 28**, Issue 2.

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In-vitro antimicrobial activity and chemical composition of Sardinian Thymus essential oils. S. Cosentino, C. I. G. Tuberoso, B. Pisano, M. Satta, V. Mascia, E. Arzedi and F. Palmas. **Vol. 29**, Issue 2.

Environmental Microbiology

The following articles are the most read articles in 2011 to date in Environmental Microbiology.

Referees' quotes — 2010. **Vol. 12**, Issue 12.

Global patterns in the biogeography of bacterial taxa. D. R. Nemergut, E. K. Costello, M. Hamady, C. Lozupone, L. Jiang, S. K. Schmidt, N. Fierer, A. R. Townsend, C. C. Cleveland, L. Stanish and R. Knight. **Vol. 13**, Issue 1.

Heavy use of prophylactic antibiotics in aquaculture: a growing problem for human and animal health and for the environment. F. C. Cabello. **Vol. 8**, Issue 7.

Microbial metatranscriptomics in a permanent marine oxygen minimum zone. F. J. Stewart, O. Ulloa and E. F. DeLong. **Early view**, 7 January 2011.

Fresh fruit and vegetables as vehicles for the transmission of human pathogens. C. N. Berger, S. V. Sodha, R. K. Shaw, P. M. Griffin, D. Pink, P. Hand and G. Frankel. **Vol. 12**, Issue 9.

Environmental Microbiology Reports

The following articles are the most read articles in 2011 to date in Environmental Microbiology Reports.

Alkane degradation under anoxic conditions by a nitrate-reducing bacterium with possible involvement of the electron acceptor in substrate activation. J. Zedelius, R. Rabus, O. Grundmann, I. Werner, D. Brodkorb, F. Schreiber, P. Ehrenreich, A. Behrends, H. Wilkes, M. Kube, R. Reinhardt and F. Widdel. **Vol. 3**, Issue 1.

Environmental reservoirs of *Vibrio cholerae* and their role in cholera. L. Vezzulli, C. Pruzzo, A. Huq and R. R. Colwell. **Vol. 2**, Issue 1.

Powering microbes with electricity: direct electron transfer from electrodes to microbes. D. R. Lovley. **Vol. 3**, Issue 1.

The global methane cycle: recent advances in understanding the microbial processes involved. R. Conrad. **Vol. 1**, Issue 5.

Crystal ball – 2011. **Vol. 3**, Issue 1.

Felicity Howlett
Wiley-Blackwell

bioFocus

Mark Downs reports on the vital role of technicians

The Society of Biology is a single unified voice for biology:

- advising Government and influencing policy.
- advancing education and professional development.
- supporting our members.
- engaging and encouraging public interest in the life sciences.

For further information visit:

www.societyofbiology.org

Technicians are the unsung heroes of many science based organizations, but their contribution is beyond question. They often have unique skills and expertise that underpin the ability of companies, schools, the NHS and universities to perform their roles successfully. It is not easy to define the term "technician", as the Technician Council rapidly discovered after its inception in early 2010. The range of biology-based technicians is enormous covering general and clinical microbiology, animal husbandry, plant science, ecology and health care; the list is almost endless.

There has been concern for some time, that intermediate level scientists (for example new graduates) and technicians do not have clear career progression routes. There is also a sense that they lack the status of others within the science sector. These individuals support vital research, teaching and contract work, but are usually ineligible to apply for Chartered Biologist or Chartered Scientist status.

To try to address this, the Science Council, whose Board I joined last year, is currently developing a new registration scheme for technicians and intermediate level scientists. This scheme aims to raise the profile of technicians and to support a number of initiatives which will enhance learning and development opportunities. Stakeholders throughout the science community will contribute to the development of the scheme and registration criteria.

The Society of Biology is committed to the success of this registration scheme; biology is the most diverse of the sciences, and bioscience technicians work in vastly different disciplines and roles. The register will give technicians working in different fields a new shared sense of identity, and provide a much needed method to assess and recognize competence across a professional range that is perhaps broader than within other science subjects. Registration will enable us to work with partners to deliver more consistent advice and guidance about development opportunities, to share good practice, and to gather better data about the sector.

The Society of Biology already manages several professional registers: the UK Register of Toxicologists; the International Register of Fetal Morphologists, and the Register of Eligibility for Qualified Persons. These registers are highly valued by members — they formally identify levels of competence and expertise, which are difficult to evidence by other means — and also by the industries and regulators of the relevant sectors they represent, as they support confidence and reassurance in the data that registered members generate and their interpretation of it.

I am delighted to say that the Gatsby Charitable Trust has agreed to support us in this endeavour. Over the next two years we will develop and firmly embed a system that will enable technicians and intermediate level scientists in the biological sciences to become early participants in the Science Council's new registration framework. We hope this will help increase their status alongside the opportunity to offer better co-ordinated and rigorous continuing professional development.

In a structure that is very similar to Chartered Scientist, we envisage that the Science Council will issue registration licences to competent bodies which will in turn offer and manage professional registers. Wearing our hat as an umbrella organization for the learned society sector across biology, we hope to offer the opportunity for any biology technician to join, working with our members to promote the benefits and opportunities this should bring. Timescales are not yet fixed but after wide consultation in the spring, we will aim to launch the pilot programme as soon as possible in 2012.

In parallel, the NHS is looking at ways to develop the NHS career framework through its "*Modernising Scientific Workforce in the UK*" initiative. This will include the work of many technicians and the associated training and education needed to support them professionally. In looking at the Technician's Register we will seek to work closely with the NHS to ensure as much synergy as possible.

Professional registers and the inherent responsibilities for their membership to abide by a code of conduct, including continuing professional development, have been a part of the historic career landscape for many of the professions. This new initiative alongside broader work on apprenticeships and sector skills gaps is set to be a major area of work for all professional bodies over the next five years and the Society of Biology is keen to take an early leadership role for biology.

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

policyMatters

Beck Smith reports on science policy

The Higher Education White Paper: an increasingly grey area

After months of anticipation, the Government's new Higher Education White Paper, 'Higher Education: Putting Students at the Heart of the System' was published on 28 June 2011

(Article reprinted from The Biochemist 33 (5) © The Biochemical Society 2011)

Following on from the Browne Review and the subsequent change to fee levels at English Higher Education Institutions (HEIs), there have been many unanswered questions about how these changes would be managed and what their potential impact will be on the Higher Education landscape. However, despite weighing in at 84 pages, the White Paper leaves many of these questions unanswered. Instead, it reiterates information which had been leaked or trailed in the previous weeks and months and, on contentious issues, promises to consult. The Higher Education sector remains in a state of flux, with deadlines for changes issued but the mechanisms for change yet to be fully formed.

At the centre of the White Paper, and echoed in its title is the, '*challenge facing Higher Education in putting the undergraduate experience at the heart of the system*' (i). But this challenge is not new — the shift towards placing students at the heart of the system began in earnest under the Labour Government in January 2004 with the introduction of 'top up' fees and students increasingly seen as customers with increasing expectations of HEIs. However, successfully addressing this challenge has become crucial for HEIs as a result of radical changes to the mechanism of Higher Education funding.

The reforms proposed to help HEIs tackle this challenge are wide-ranging. This article will analyse two of the most high profile reforms — the increased provision of information for students prior to application and the freeing up of student number controls so that popular institutions are able to expand.

How the new funding model will work according to the White Paper

- Prior to starting at a higher or further education institution, students will be able to apply for a loan. The amount a student borrows will be dependent on how much their university or college decides to charge in graduate contribution, any waivers or discounts it offers; and the decision of students themselves on how much they want to borrow.
- The loans will be paid back via the tax system, once a graduate is in employment and earning over a threshold of £21 000. Graduate contributions will be based on a variable rate of interest related to income and capped at RPI +3%. The Government estimates that around 70% of the overall exchequer costs of issuing and financing the loans will be repaid over a maximum 30 year period. The Government will bear the costs of the remaining 30% (costs of those students whose earnings don't reach £21 000 or those who are unable to work because of caring responsibilities) to maintain progressive elements of the scheme.
- The Government will still provide a core grant to HEFCE for distribution between universities and colleges as a contribution to the costs of the most expensive subjects, such as medicine, the laboratory sciences and engineering. HEFCE will also receive around £2 billion in teaching grant, around £7 billion in tuition loans, as well as around £1.5 billion in quality-related research grant.
- With respect to living costs, the Government will provide £2 billion of grants and scholarships and £3.5 billion in loans.

Summarized from Chapter 1: Sustainable and fair funding pages 14 to 24

Putting the undergraduate experience at the heart of the system: information is power?

The changes to the structure of Higher Education funding are dramatic, with Government funding shifting away from teaching grants towards repayable loans for students.

As funding will follow the student, the Higher Education sector is expected to be much more accountable and responsive to the student rather than Government. It is this shift which acts as both the driver and the justification for many of the other reforms proposed in the White Paper.

In order to decide where they study (and where they take their funding), students are going to be given access to much more information which initially will come in one of the following three forms:

- Key Information Set (KIS): to be made available by September 2012, KIS are comparable sets of standardized information for each undergraduate course developed by HEFCE following a period of consultation. KIS include information about student satisfaction, course information, employment and salary data, accommodation costs, financial information (fees) and students' union information.
- Graduate salary information: to be made available by summer 2011 through the Unistats website to enable comparison between different subjects at different institutions.
- Current student profiles: UCAS and HEIs have been asked to make available course by course, new data showing the type and subjects of the actual qualifications held by previously successful applicants.

As this information will take several forms and come from several different places — students will need to be supported in successfully interpreting and navigating this information. As stated in the White Paper, "*The greatest potential value for users comes in linking different datasets and tracking typical students through their journey from school, through higher education, into a career.*" While this may be true, it could be argued that GCSE students are best placed to benefit most from this data (as they have not yet started their 'journey')

but how much support will be made available for students in enabling them to interpret datasets and make informed choices?

It is difficult at this stage to fully understand how these changes may affect the numbers of students choosing to study science. However, it is possible to speculate that the change in fee structure in addition to the provision of more detailed information could act as a barrier to some students choosing science. Why?

Should universities choose to offer differential fees, it is likely that science courses will cost more as a result of the increased costs of providing these courses. Access to the study of science should be irrespective of an ability to pay.

In analysing potential earnings, KIS does not discriminate between those in further training and those in employment. As many scientists and engineers go on to undertake postgraduate qualification straight after their undergraduate degrees, this would not provide an accurate reflection of the potential earning power of a science graduate.

Will freeing up student number control increase student choice?

One of the areas of the White Paper that has received the most attention is the proposed reform that will 'free up student number controls — while ensuring that overall costs are managed' (ii). Translated this means that total student numbers won't alter (thus ensuring overall costs are managed) but that a number of existing student places will be made available to HEIs meeting certain criteria on a competitive basis.

In 2012/13 this will take the form of:

- Unrestrained recruitment of high achieving students — scoring equivalent of AAB. This is expected to equate to approximately 65,000 students.
- A flexible margin of approximately 20,000 places for providers with average fees of at or below £7 500 (post-waivers).

Crucially, it has not yet been made clear how and from where these 20,000 places will be taken, with the White Paper stating only that 'places will be removed from institutions' core allocation on a pro-rata basis, once AAB places have also been removed' (iii). As this mechanism is one of the issues now being consulted on, it will be some time before the situation becomes clear.

Initially it was felt that the unrestrained recruitment of high achieving students would naturally benefit the Russell Group institutions that have some of the highest entry requirements in the sector. However, in its reaction to the White Paper the Russell Group has voiced concern about the proposed reforms:

"[…] *We also agree that universities with high demand for courses from highly-qualified students should be allowed to expand. But care should be taken to ensure that such a very selective lifting of the cap doesn't make it harder for some universities to maintain teaching in strategically important subjects like sciences and languages*."

"*We are also concerned that under the 'core and margin' proposal, student numbers could be cut from all institutions, including those which have strong demand from well-qualified applicants and offer high quality teaching. We are not convinced that re-distributing those student places to institutions charging lower fees will necessarily drive up quality or improve student choice*."

The Russell Group is not alone in its concern that lifting the cap may favour the humanities where the proportion of AAB students is higher. In an article for the Times Higher Education (THE), Professor Ebdon chair of the Million+ group is quoted as saying, "*There is no way you could create an engineering place at £6 000 or even £7 500, even with some additional money from HEFCE* (iv)."

With the total number of students remaining the same, the 85,000 places were described by Rama Thirunamachandran (Deputy Vice-Chancellor and provost of Keele University – writing in a personal capacity) as, "*merely a rearranging of the deckchairs*" (v). While it is possible that some AAB students will be able to get into their first choice institution, this option relies on additional places being made available within these institutions. Furthermore, by attempting to increase student choice through the reallocation of 20,000 places with fees at or below £7 500 are they risking students being forced to choose institutions based solely on price?

What happens next?

These reforms look set to dramatically affect the Higher Education landscape in England and it is unlikely that all HEIs will be able to effectively adapt to this new environment. Many of the proposals in the White Paper will require legislative change to deliver them and the Government is currently aiming to bring a Higher Education Bill before Parliament in 2012.

In this interim period, there is an opportunity for the scientific and higher education community to make its voice heard. Consultation will be taking place at two levels and you are encouraged to use your Learned Society and its membership of the Society of Biology to comment on the proposals in the White Paper. A broad level consultation seeks comments on the overall strategy outlined in the White Paper (deadline 20 September 2011) in addition to a series of specific consultations covering:

- Early repayment (open now and closes 20 September 2011).
- The regulatory framework for the higher education sector (begins August 2011 and closes October 2011).
- Teaching grant priorities and student number controls in 2012/13 (open now and closes September 2011).
- Teaching grant priorities and student number controls in 2013/14 (begins winter 2011/12 and closes spring 2012)

The lack of new information and clear direction within the White Paper provides an opportunity for the scientific community to raise its concerns and for them to be heard. Let's not waste it.

references

- [i] Department for Business, Innovation and Skills, Higher Education — 'Students at the heart of the system', June 2011 — point 2.
- [ii] Department for Business, Innovation and Skills, Higher Education — 'Students at the heart of the system', June 2011 — page 50.
- [iii] Department for Business, Innovation and Skills, Higher Education — 'Students at the heart of the system', June 2011 — point 4.20.
- [iv] Times Higher Education — 'White Paper: rules may favour the humanities, 7 July 2011.
- [v] Research Fortnight — 'White Paper merely rearranges the higher-education deckchairs,' 13 July 2011.

If you wish to contribute to a response to any of the consultations listed in this article, please contact Lucy Harper **(lucy@sfam.org.uk)**

Beck Smith
Head of Policy, Biochemical Society

Spring Meeting 2011 Report

5th broadening microbiology horizons in biomedical science meeting

Latest developments in respiratory infections

Stratford Q Hotel, Stratford-upon-Avon, UK, Wednesday 13 April 2011

This year's Spring Meeting once again took place in the Stratford Q Hotel, Stratford-upon-Avon. The venue provided a delightful setting for what promised to be a fascinating day of talks on respiratory tract infections (RTIs).

The morning session was chaired by the CEO of S*f*AM, Phil Wheat. After welcoming everybody he passed on Twitter information regarding some of the lectures. He also took the opportunity to alert delegates to the introduction of the new Scientific Meeting Attendance Grant. Eligible members can now apply for up to £300 toward the cost of attending an applied microbiology meeting (including, but not restricted to, S*f*AM meetings).

As is customary at the Spring Meeting, the scientific programme started with the Procter and Gamble Applied Healthcare Microbiology Award lecture. This year's recipient was John Threlfall of the Health Protection Agency, Colindale. His presentation had the title ***Salmonella* — always one step ahead**. He reminded the audience of the food animal reservoirs for these organisms and showed how high the estimated financial burden of this disease is. Despite the recommendations of the Swann report (1969), salmonellosis is still a problem, both here and abroad.

Although the total number of reported *Salmonella* infections in the UK has declined, sporadic infections and outbreaks still occur, mainly due to *Salmonella* Enteritidis. A particular feature of recent years has been the emergence of a monophasic serovar of *Salmonella* Typhimurium (antigenic structure 1,4,[5],12:i and phage type DT193). This strain has caused nine large outbreaks.

John concluded his talk on a positive note by giving examples of national and international collaborations between those dealing with human aspects and those dealing with veterinary aspects of salmonellosis. Successful collaborations have included the One Health Initiative, the Enter-Net surveillance network, the European Food Safety Authority (EFSA) and the Med-Vet-Net network.

The tackling of known problems was illustrated by the ban on imported infant mice from Georgia, USA. These mice, which were being fed to snakes, were shown to be contaminated by a particular strain of *S.* Typhimurium which was then transmitted to the snakes. Snake owners, especially children, were subsequently infected.

The remainder of the morning's lectures addressed infections of the respiratory tract. Norman Fry of the Health

Protection Agency, Colindale gave an update on **Respiratory *Bordetella* Infections**, ranging in time from the description of *Bordetella pertussis* in 1906 through to *Bordetella ansorpii* which is currently awaiting formal description. *Bordetella holmesii* is now being isolated from blood culture samples and is associated with septicaemia in young adults with underlying disorders.

After describing the evolution of the pertussis vaccination policy, Norman summarized the diagnostic methods which are now available. An unfortunate consequence of the shift away from culture of *Bordetella* species has been the declining number of isolates being sent to the reference laboratory. Epidemiological investigations are hampered by this so delegates were encouraged to refer as many isolates as possible. In response to questions at the end of his talk, Norman clarified that the 'anaerobic' species, *Bordetella petrii*, is facultatively anaerobic in contrast to all other *Bordetella* species which are aerobic. We also learned that mice can't cough, in the context of trying to understand why *B. pertussis* is an obligate human pathogen!

The next topic was **Legionnaires' disease** and was presented by another speaker from Colindale, Tim Harrison. Tim commented on how 'media-friendly' this disease is because journalists relish the political dimension of having somebody to blame. He stressed that though uncommon, *Legionella pneumophila* is still causing outbreaks and still killing people, despite extensive efforts to control it.

The primary diagnostic method is now urinary antigen detection (UAD) which is particularly good for severely ill patients. Tim explained that respiratory samples from UAD-positive patients could be sent to Colindale for culture. He then described how sequence-based typing (SBT) has been useful in three different scenarios: investigation of a point source outbreak, investigation of a hospital endemic strain and investigation of a travel-associated infection. One puzzling observation is the differing distribution of sequence types from clinical samples and environmental samples. ST47 is one of the commonest types causing human infection but is not common in environmental samples. An ST47-specific assay is about to be used to see if this sequence type can be found in water samples.

The final speaker of the morning session was Robin Nicholas of the newly-formed Animal Health and Veterinary Laboratories Agency (AHVLA). His talk, entitled **RTIs in animals**, was given with particular reference to mycoplasmas. Robin used five animal groups as examples of interesting infections: desert tortoises affected by *Mycoplasma agassizi*; rooks and carrion crows harbouring *Mycoplasma sturni* and *Pasteurella multocida*; porcine respiratory disease associated with multiple organisms including *Mycoplasma hyopneumoniae* and *Mycoplasma hyorhinis*; respiratory disease in semi-captive deer to which *Mycoplasma capricolum subsp. capripneumoniae* was probably transmitted by goats and finally, bovine respiratory disease (BVD) complex which has a *Mycoplasma bovis* component.

The morning was brought to a close by Phil thanking the members of the trade whose support of the meeting made attendance more affordable for delegates.

Louise Hill-King

The afternoon presentations consisted of RTIs from a clinical perspective. The first speaker was Patricia Fenton from Sheffield's Children's Hospital, she discussed **RTIs in children** specifically one common (bronchiolitis) and one rare (childhood empyema). Bronchiolitis occurs as epidemics during November to January usually (>95%) in children over 2 years of age. Of these children 2% will need hospital admission and 1% will die. Issues surrounding this large intake of children with the disease include: lack of cots,

John Threlfall, receiving the Procter and Gamble Applied Healthcare Microbiology Award from Alex Blanchard of Procter and Gamble

separation of the cohort from other patients and that a multidisciplinary approach to the disease is required. Planning for the onset of the epidemic occurs from August onwards. Organisms that have been identified as contributing to the disease include: influenza, respiratory syncytial virus (RSV), paraflu, adenovirus and coronavirus. Upon admission to hospital rapid identification tests (using point-of-care testing kits) are conducted to establish the causal agent, this aids in infection control, cost effectiveness and giving worried parents a diagnosis. Childhood empyema (trapped lung) is often caused by *Streptococcus pneumoniae*, a five year audit (86 cases) showed that the average age of children contracting the disease is 5.7 years. These children on average, have a temperature of 39ºC, have usually been in the district general hospital, spent 10 days on the ward and have a neutrophil count of 16 x 10^9/l.

John Simpson from Newcastle University then discussed **RTIs in the intensive care patient** and the difficulty in making a diagnosis of pneumonia; especially in relation to ventilator associated pneumonia (VAP) which 30% of patients on a ventilator contract and has a 24 to 50% mortality rate. The main organisms associated with VAP are *S. pneumoniae*, MSSA, *E. coli*, *Klebsiella* spp. and *Pseudomonas aeruginosa*. The major issue raised by John was how good is clinical acumen in the diagnosis of pneumonia compared to microbiological identification? In two studies, one carried out in the USA and one in France, of those diagnosed by clinicians to have pneumonia only 38% and 31% respectively were confirmed as accurate diagnosis by microbial identification. The prevention of VAP is best achieved through care bundles including alcohol hand hygiene, education and 2% chloride oral care. John also told us an interesting story about how he cured Emma, a chimpanzee at Edinburgh Zoo, of pneumonia!

The penultimate lecture was presented by Frank Edenborough of Northern General Hospital, Sheffield, **the role of a microbiologist in relation to cystic fibrosis (CF) patients** was discussed. 1 in 2,500 babies have CF, with these children having maldigestion and malabsorption and thus being 2 SDs below normal growth, in addition patients have a persistent cough often cause by a *Pseudomonas* spp. However, an array of organisms contribute to the condition, in childhood respiratory viruses, MRSA, MSSA and *Haemophilus influenzae* are the main contributors. In teens to adulthood *Ps. aeruginosa* and environmental Gram-negatives such as *Serratia* spp. and *Klebsiella* spp. are the main causal agents. Treatment can be achieved through prevention, prophylaxis, eradication, suppression, aggressive treatment, surveillance and segregation. The real message portrayed by Frank was the role he wanted the microbiologist to play. He encourages us to be interested, play a role in mutual education, give a flexible service, test alternative antibiotics, report new microorganisms, ensure rapid testing and to have a set of standardized standards in all laboratories.

To finish Derek Macallan from St George's University, London informed us about **RTIs and the immunocompromised patient** by presenting six case studies of patients with HIV and RTIs. *Pneumococcus* spp. and TB were highlighted as the main causal agents, antiviral therapy (ART) for HIV can also be associated with the unmasking of TB or other pulmonary syndromes. One approach may be to screen for latent TB before starting ART. Other problems associated with HIV and RTIs is the presence of multiple pathogens in the lungs, Kaposi's sarcoma, lymphoma and the difficulty of treating Pneumocystis pneumonia.

The day ended with a cup of tea and cake with many delegates expressing how informative and useful the day had been.

Katie Laird

SfAM events in 2012 — save the dates!

Wednesday 11 January 2012

Winter Meeting

- **Microbiological safety of imported food**
- **Microorganisms and climate change**

■ Including the Denver Russell Memorial Lecture

The Royal Society, London, UK

Wednesday 18 April 2012

Spring Meeting

6th 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

2 - 5 July 2012

Summer Conference

● **Microbial resistance to antibiotics and biocides** ● **Natural and experimental adaptation in bacteria** ● **Bioremediation**

■ Including the Lewis B Perry Memorial Lecture: Globalization of antimicrobial resistance. *Didier Pittet, University Hospital in Geneva*

The George Hotel, Edinburgh, UK

For further information on these events please visit sfam.org.uk or contact Sally Cryer
■ Email: sally@sfam.org.uk ■ Telephone +44 (0)1234 761752

Wednesday 11 January 2012

Winter Meeting

- **Microbiological safety of imported food**
- **Microorganisms and climate change**

■ 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:	**Martin Adams**
10.30 – 11.15	**The Denver Russell Memorial Lecture:** To be confirmed
11.15 – 11.50	**Monitoring the microbiological safety of imported foods** Caroline Willis, HPA, Southampton, UK
11.50 – 12.25	**www.spatialepidemiology.net — tools for mapping infectious disease epidemiology** To be confirmed
12.25 – 13.30	**Lunch**
Session A	**Microbiological safety of imported food**
Chair:	**Andy Sails**
13.30 – 14.05	**From the banal to the bizarre — microbiological hazards and imported foods** Sue Jones, HPA, Southampton, UK
14.05 – 14.40	**Salad days — foodborne outbreaks due to imported fruit and vegetables: hazards, vehicles & sources** Christine Little, HPA, Colindale, UK
14.40 – 15.00	**Tea and coffee**
15.00 – 15.35	***Salmonella* and imported eggs and poultry** Sarah O'Brien, University of Liverpool, UK
15.35 – 16.10	**Safety of imported foods — a commercial perspective** Kaarin Goodburn, Chilled Food Association, UK
Session B	**Microorganisms and climate change**
Chair:	**Mark Fielder**
13.30 – 14.05	**Microbes as climate engineers** Dave Reay, University of Edinburgh, UK
14.05 – 14.40	**Climate change and communicable disease: what are the risks?** Andrew Nichols, University of Plymouth, UK
14.40 – 15.00	**Tea and coffee**
15.00 – 15.35	**Assessing the impact of climate change on vector-borne viruses in the EU through the elicitation of expert opinion** Paul Gale, AHVLA, UK
15.35 – 16.10	**Antibiotics and climate change** Marion Wooldridge, VLA, UK
16.10 – 16.45	**Shifting trends in pathogen dynamics on a changing planet** Paul Hoskisson, University of Strathclyde, UK
16.45	**Close**

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

2012 WINTER MEETING BOOKING FORM and INVOICE

SfAM WINTER MEETING WEDNESDAY 11 JANUARY 2012

Only ONE person per form please. CLOSING DATE FOR REGISTRATIONS: Wednesday 4 January 2012
EARLY BIRD DISCOUNT of £30.00 is applied to all bookings made before **Friday 16 December 2011**

Cancellation policy: Up to 30 days prior to the event all cancellations will be subject to a 10% cancellation fee, up to 14 days prior to the event there will be a 50% cancellation fee, and no refunds will be given on cancellations made within 7 days of the event.

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Non member	£100 ☐	£130 ☐
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YOUR INTERESTS

Please indicate which of the two afternoon parallel sessions you wish to attend

Session A: Microbiological safety of imported food ☐ **Session B:** Microorganisms and climate change ☐

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Defence against the dark arts

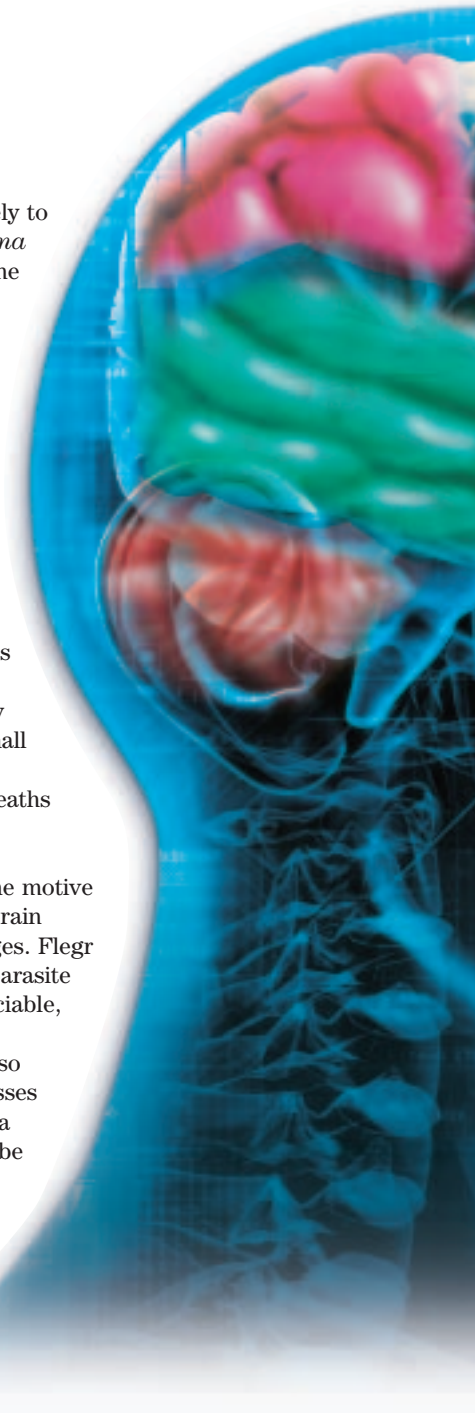
In the top floor of the Faculty of Science of Charles University in Prague, one room is filled with the soft thud thud thud of restless shifting feet. Opposite a table laden with biscuits and soft drinks, students listening to techno music through clunky headphones dance on plastic mats, following instructions that flash up on laptops in front of them. This strangely silent disco looks like any group of graduates letting off steam, but this isn't the rec room, it's the lab.

For the past 20 years, Professor Jaroslav Flegr has been designing games for his students to play, from simple reaction tests to the *Dance Dance Revolution* marathon currently underway. The light-hearted challenges underlie a more serious question: is a common brain parasite dimming the cognitive powers of his students? The parasite in question is *Toxoplasma gondii*, a small protozoan with great ambitions. Although it takes cats as its definitive host, and can only complete its life cycle there, *T. gondii* practices a startling promiscuity when it comes to secondary hosts. The parasite is typically spread by rodents, which ingest spores deposited in cat droppings, but *T. gondii*'s scattergun approach means that it can be found in almost any warm-blooded animal, from dogs to dolphins, and notably all of our major livestock — cattle, pigs, sheep, goats. And, of course, humans. It's a major success story of the single-celled kingdom, cropping up across the planet at an extraordinarily high prevalence: depending on where in the world you're reading this, your chances of harbouring *T. gondii* are between 30 and 80 per cent.

The parasite's ability to cause serious and even fatal birth defects in mammals meant that for a long time *T. gondii* was primarily a concern to farmers and expectant mothers. For everyone else, *T. gondii* was something you'd eventually expose yourself to, most likely through eating undercooked meat, that would produce mild flu-like symptoms before dying or lying dormant in your muscle and nervous tissue. Unless you became acutely immunocompromised (at which point *T. gondii* wakes up and begins eating big holes in your brain), you'd carry the bug for the rest of your life without any noticeable effect. Well, that was the idea at least.

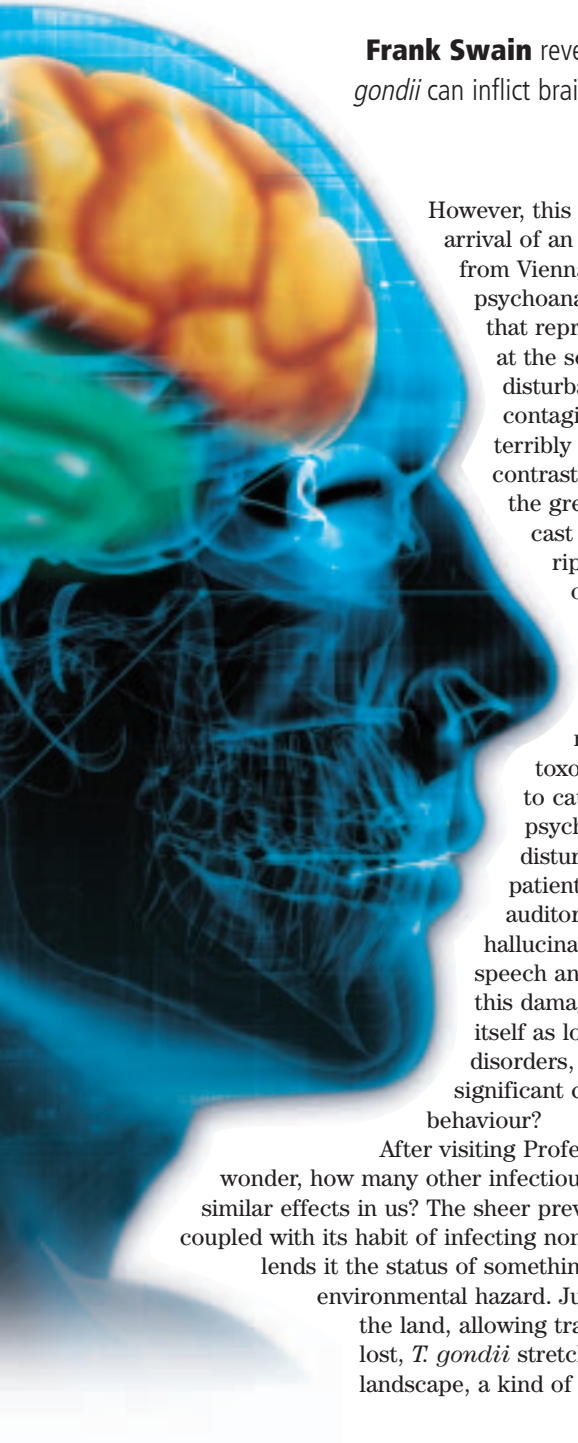
You see, *T. gondii* has a very interesting trick. It can produce dopamine. Not for itself, of course; the protozoan has no mind of its own that would need a neurotransmitter. But its hosts do. And dopamine is the skeleton key that *T. gondii* uses to unlock the mammalian brain. Rats, as it happens, have a longstanding animosity toward cats, which is a problem for any *T. gondii* hoping to make the leap up the food chain. So the microbe sets about reprogramming the rodent brain, making it braver, more intrepid, willing it to take risks. The rats' instinctual fear of the smell of cats, stamped millennia-deep in the rodent brain, is papered over. So too its cautious neophobia. And this new cavalier attitude ends up putting the rat in the jaws of a passing cat, and the parasite into the gut of its definitive host.

Professor Flegr wondered if *T. gondii* might attempt the same transformation on humans. After all, how different do a rat and a human look from the inside? It's all blood and bone and dopamine to a parasite. From previous research, Flegr knew that humans exposed to *T. gondii* showed diminished reaction times. He visited local hospitals and took blood samples from those who had been involved in traffic accidents, in particular those who had been at fault in traffic accidents where alcohol wasn't a factor. He found that they were almost three times as likely to test seropositive for *Toxoplasma* than the general population. The link implied that the effects of exposure to *T. gondii* — a change in risk perception, and a slowing of reflexes, were both strong enough to increase the chances of an accident and yet subtle enough that the victim was not aware of their altered state of mind. It appeared to be a very real and very serious effect of *T. gondii* infection. Road traffic accidents claim the lives of some two million people worldwide every year; a parasite with even a small hand in that would still be responsible for thousands of deaths annually.



Like a suspect in the dock, *Toxoplasma* has the means, the motive and the opportunity to inflict brain damage and behavioural changes. Flegr found women exposed to the parasite became more outgoing and sociable, while men expressed greater insecurity. Researchers have also implicated the parasite in illnesses such as schizophrenia. The idea that an infectious agent might be at the root of mental illness is not a new one — in fact, *T. gondii* came under suspicion over a 100 years ago, in an editorial published by *Scientific American*.

Through co-evolution, parasites shaped our bodies. What about our minds?



Frank Swain reveals how *Toxoplasma gondii* can inflict brain damage and cause behavioural changes

However, this coincided with the arrival of an exciting new science from Vienna called psychoanalysis, which held that repressed desires were at the seat of most mental disturbance, and the idea of contagious insanity seemed terribly unfashionable by contrast. It was only after the great waves that Freud cast had died down to ripples that people once again began to entertain the idea of an infectious agent responsible for diseases of the mind. Acute toxoplasmosis is known to cause severe psychological disturbances in some patients, giving rise to auditory and visual hallucinations, disorganized speech and delusions. Might this damage also manifest itself as long-term mental disorders, or even subtle but significant changes in behaviour?

After visiting Professor Flegr, I had to wonder, how many other infectious diseases produce similar effects in us? The sheer prevalence of *T. gondii*, coupled with its habit of infecting non-target species, lends it the status of something approaching an environmental hazard. Just as fog obscures the land, allowing travellers to wander lost, *T. gondii* stretches over the human landscape, a kind of mental fog that blurs our perceptions of the real world. The question is: why aren't our brains better at fighting this kind of deception?

Of course, *Toxoplasma* is not the only parasite to have evolved an extraordinary ability to adapt a host's behaviour. Examples abound through the animal kingdom — Carl Zimmer dedicated an entire chapter to behavioural manipulation in his bestseller *Parasite Rex*. The larvae of the *Hymenopimecis* wasp convince the spider they latch onto to abandon its normal web architecture and instead follow a set of blueprints of the insect's own devising. The result is a sturdy, well anchored cocoon in which the larvae can safely undergo its transformation into an adult wasp. Closer to home, the *Plasmodium* protist responsible for malaria is a parasite of mosquitoes as much as one of mankind. After infecting a mosquito, it suppresses the insect's feeding behaviour until it is ready to be passed on through the animal's salivary glands. Every blood meal carries the risk of being swatted; the protist wants to make sure each one counts. In relationships such as these, where the parasite's dictated behaviour acts as a direct threat to survival of the host, should we expect their brain to evolve in response just as their bodies have? Should a mosquito not grow a mental shell as impenetrable as its physical one? Instead of physically defeating the parasite, might a host develop tolerance or immunity to the parasite's behavioural tweaks, incorporating redundancy and error-checking in its behavioural loops like a robust piece of software? I put the question to Professor Robert Poulin at the University of Otago, New Zealand. "*I've been asking myself the same question for years*," he replied. "*Why don't hosts put up a better fight against manipulation? Whatever the actual mechanism, I am not aware of any case of a host actively resisting. Animals have numerous adaptations to avoid parasites, or eliminate them if they succeed at infecting the host; if the parasite gets through these, however, it wins*."

Part of the problem is the difficulty in identifying what this kind of resistance would look like, whether it be the upregulation of certain genes or a shift in brain chemistry in response to parasitic infection. These are events playing out in a vague stage somewhere between psychology and physiology, and require an understanding of the physical foundations of behaviour that we perhaps do not have yet. But it seems unlikely that we have arrived at this point without the effects of behavioural manipulation leaving some kind of mark in the architecture of our brain. Like the students dancing in Flegr's loft to music no one else can hear, the patterns of behaviour in our brains may be choreographed to some invisible, long silent orchestra.

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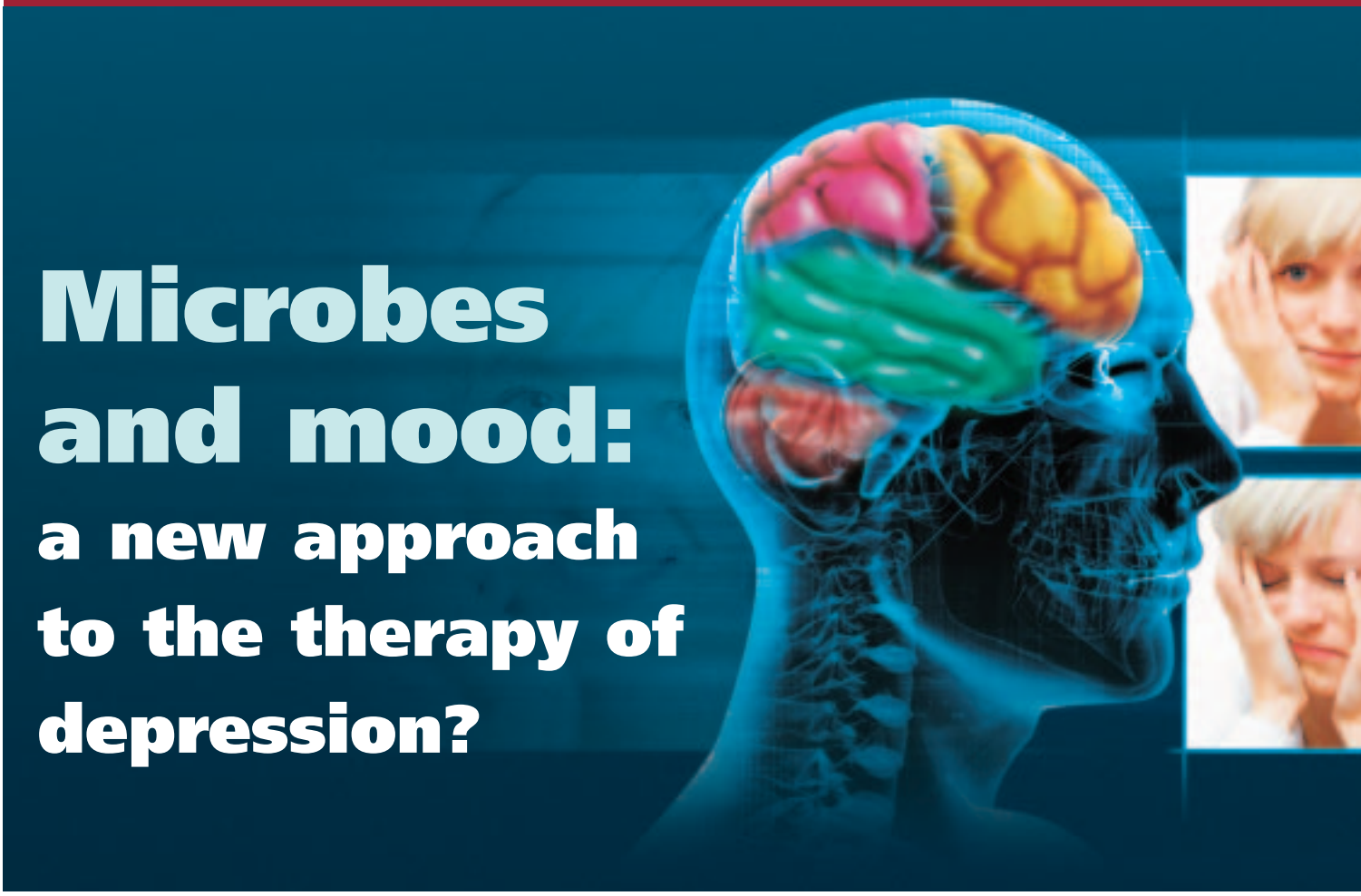
Frank Swain
Science Writer

Microbes and mood: a new approach to the therapy of depression?



Depression is associated with inflammation

Human depression is associated with inflammation, although there have been recent contradictory findings, a few of which are discussed later within this article. Some risk factors for depression are inflammation-inducing risk factors and several of these are listed in Table 1. These include obesity (resulting from release of proinflammatory cytokines by adipose tissue and by macrophages aggregated around visceral fat stores), and chronic inflammatory disorders such as inflammatory bowel disease (here, the incidence of depression correlates with the level of circulating proinflammatory cytokines). Indeed depression is often accompanied by raised levels of proinflammatory cytokines even when no other illness is detected (Raison *et al.*, 2010). Recent meta-analyses have confirmed that there is a dose-response relationship between depression and the inflammatory markers C-reactive protein (CRP), interleukin (IL)-1, IL-6 and tumour necrosis factor (TNF)-α (Howren *et al.*, 2009; Dowlati *et al.*, 2010). Major depressive disorder (MDD) is also known as clinical depression and is characterized by a low mood that engulfs the sufferer and is accompanied by low self-esteem, together with a lack of interest in normally enjoyable activities. Patients with this disorder have reduced circulating levels of the major regulatory mediators, IL-10 and TGF-β (Raison *et al.*, 2010).

Table 1. Lifestyle factors that increase inflammatory mediators and are also risk factors for depression

Chronic inflammatory illness (allergies, autoimmunity, inflammatory bowel disease etc.)
Psychosocial stress
Social isolation
Obesity
Sedentary lifestyle
Diet
Smoking
Female sex
Diminished sleep
Therapeutic use of IFN and/or IL-2

Does this mean that the proinflammatory cytokines themselves, when chronically raised, drive symptoms of depression (interestingly, *brief* exposure to raised cytokines can have the reverse effect, as discussed later)? There is strong evidence to suggest that prolonged elevations of inflammatory cytokines do indeed drive depression. Administration of proinflammatory cytokines (IL-2, interferon-α [IFN-α], used as treatments for hepatitis or some cancers), induces states strikingly similar to naturally occurring depression that are treatable with antidepressant drugs, confirming the cause-effect relationship (Musselman *et al.*, 2001; Capuron *et al.*, 2009). Presumably this also accounts for the common occurrence of depression after influenza, a virus that drives high levels of IFN-α.

Another type of evidence comes from monitoring the consequences of treating depression. Treatments that reduce depressive symptoms simultaneously lower levels of inflammatory mediators, or increase levels of regulatory ones (Raison *et al.*, 2010). By contrast, stressors, which promote depression, tend to downregulate the correlates of immunoregulation such as CD25+γ Treg, IL-10 and Foxp3 (Buske-Kirschbaum *et al.*, 2007; Freier *et al.*, 2009).

Taken together, and adding the well-documented ability of proinflammatory cytokines to drive "sickness behaviour" in rodents (Dantzer *et al.*, 2008) (an effect that can be opposed by IL-10), these findings suggest that prolonged imbalance between proinflammatory and anti-inflammatory mediators

Immunological expressions explained	
CRP	C-reactive protein — a marker of inflammation
IL-6	Interleukin-6 — a pro- and anti-inflammatory cytokine
TNF-α	Tumour necrosis factor alpha — a cytokine involved in systemic inflammation
IL-10	Interleukin-10 — an anti-inflammatory cytokine
TGF-β	Transforming growth factor beta — a protein that controls cellular proliferation and differentiation
IL-2	Interleukin-2 — an immunoregulatory cytokine (cell activation)
IFN-α	A type I cytokine
CD25+	A type of suppressor regulatory T-cell
Treg	Regulatory T-cells
Foxp3	Forkhead box P3 — a protein which regulates the development of regulatory T-cells
Th1, 2 & 17	T helper cells

can lead to depressive symptoms. But, it is precisely such an imbalance that is partly to blame for the alarming increases in chronic inflammatory disorders (allergies, autoimmunity, inflammatory bowel disease) in developed countries. Why is this happening? Is depression increasing in parallel with these disorders? And can we exploit these phenomena in novel treatments?

The "hygiene" or "Old Friends" hypothesis

The hygiene hypothesis, or as we prefer to call it, the "Old Friends" hypothesis, suggests that one reason for the increasing incidences of chronic inflammatory disorders, (both Th2-mediated and Th1/Th17-mediated (Rook & Stanford, 1998; Bach, 2002)), in developed countries since the mid-19th century is the depletion from the urban environment of organisms that accompanied mammalian evolution. Because it was necessary for these organisms to be tolerated, co-evolutionary forces ensured that they came to play essential roles in the optimal functioning of immunoregulatory pathways (Rook, 2010). A failure of immunoregulatory mechanisms really can lead to simultaneous increases in diverse types of pathology. For example, genetic defects of Foxp3 lead to the X-linked autoimmunity–allergic dysregulation syndrome (XLAAD) that includes aspects of allergy, autoimmunity and enteropathy (Wildin *et al.*, 2002).

Which organisms are involved? The bottom line is that they are organisms associated with faeces (microbiota such as *Bacteroides*, helminths and faecal-oral transmission of infections/carrier states), animals (farm or pet) and mud (Table 2) (Strachan 1989; Riedler *et al.*, 2001; Aichbhaumik *et al.*, 2008; Round & Mazmanian, 2009; De Filippo *et al.*, 2010; McDade *et al.*, 2010). Humans were continuously exposed to these organisms from early in evolution, right through the 1st Epidemiological Transition (Neolithic, agriculture and husbandry) and were not deprived of them until the 2nd Epidemiological Transition (urbanization). Table 2 lists a few of the organisms to which we refer collectively as "Old Friends", to emphasize our long association with them, and our evolved dependency on their presence (Rook, 2010).

The many experimental models in which a wide variety of helminths have shown an immunoregulatory effect were reviewed recently (Table 3) (Osada & Kanazawa, 2010), and a nice example of a human clinical trial using a helminth to treat multiple sclerosis has been published by Fleming and colleagues (Fleming *et al.*, 2011). The important question in the present context is whether depression is affected by the mechanisms underlying the "Old Friends" hypothesis and whether it is, therefore, increasing in parallel with the chronic inflammatory disorders (Rook & Lowry, 2008; Raison *et al.*, 2010). If it is, can we use immunoregulation-inducing "tolerated" microorganisms to treat it? Would clinical trials with such organisms be justified in MDD?

Rates of depression and the environment

While there is no universal agreement, there is evidence that rates of MDD are increasing in developed countries, as

Table 2. Examples of the three overlapping categories of organism implicated in the "hygiene" or "Old Friends" hypothesis

1) Organisms that form part of the co-evolved human microbiota that are altered by modern diets, living conditions and antibiotics.
2) Infections commonly present in early man, usually harmless, transmitted by the faecal-oral route very early in life, that have been depleted since urbanization (e.g. helminths, hepatitis A virus, *Toxoplasma*, *Salmonella*).
3) Harmless environmental organisms in mud, untreated water and fermenting vegetable material ("pseudocommensals"; lactobacilli, environmental saprophytes) that are eliminated by the modern city lifestyle.

Table 3. Type of animal model*	Helminth
Allergy	*Heligmosomoides polygyrus*
	Schistosoma mansoni
	Strongyloides stercoralis
Autoimmunity:	*Schistosoma mansoni*
Type 1 diabetes	*Trichinella spiralis*
	Heligmosomoides polygyrus
Experimental autoimmune encephalomyelitis (EAE)	*Schistosoma mansoni*
	Schistosoma japonicum
	Trichinella spiralis
	Fasciola hepatica
Colitis	*Heligmosomoides polygyrus*
	Schistosoma mansoni
	Hymenolepis diminuta
Arthritis	*Schistosoma japonicum*
	Schistosoma mansoni
	Hymenolepis diminuta

* Reviewed and referenced in (Osada & Kanazawa, 2010)

expected if there is an association with chronic inflammatory disorders, stress and obesity (Raison *et al.*, 2010). Moreover, moving from the developing world to the US increases the risk for MDD. For example, Mexican immigrants to the US have rates of depression similar to those seen in Mexico. However, individuals of Mexican descent born in the US have higher rates of MDD that are equivalent to the US population at large, suggesting that it is American life itself — and not acculturation shock — that accounts for the increase (Vega *et al.*, 2004).

Can we use microorganisms to treat depression?

There is evidence that MDD is increasing as a result of environmental factors, in parallel with chronic inflammatory diseases. These diseases, as with MDD itself, provide good evidence for an underlying imbalance between anti-inflammatory and proinflammatory mechanisms (Rook, 2010). These chronic inflammatory diseases are beginning to be subjected to clinical trials with immunoregulation-inducing helminths (*Trichuris suis*, *Necator americanus*). Preliminary results are encouraging (Summers *et al.*, 2005a; Summers *et al.*, 2005b; Fleming *et al.*, 2011). So what about MDD?

We do not know whether administering *Trichuris suis* in the clinical trials listed above led to improvements in mood. This effect was not sought, which is a pity, because in experimental animals altering the microbiota has profound effects on behaviour, stress responses, and coping (Forsythe *et al.*, 2010). For example, germ-free mice have exaggerated hypothalamic-pituitary-adrenal stress responses that can be reversed by reconstitution with *Bifidobacterium infantis* (Sudo *et al.*, 2004). Similarly, a dietary manipulation that caused profound changes in the microbiota simultaneously caused significant improvements in working and reference memory, as well as reduced anxiety (Li *et al.*, 2009). One of the ways in which changes in the microbiota operate is via modulation of function and numbers of regulatory T-cells (Treg) and the balance of Treg to effectors, both in the gut and in the brain (Round & Mazmanian 2009; Lee *et al.*, 2010), so we would expect improvement in depressive symptoms during these trials.

Changes relevant to CNS effects were, however, evaluated in several clinical trials using heat-killed *Mycobacterium vaccae*. This environmental saprophyte (an "Old Friend" from mud!) induces Treg that downregulate chronic inflammatory states (Zuany-Amorim *et al.*, 2002). *M. vaccae* has undergone clinical trials for allergic disorders, psoriatic arthritis and some cancers. In several studies the patients who had received one or more intradermal injections of a heat-killed preparation of *M. vaccae* showed unexpected improvements in quality of life scores (O'Brien *et al.*, 2000; Dalbeth *et al.*, 2004; O'Brien *et al.*, 2004). *M. vaccae* activates human dendritic cells (DC) through an unexpected pathway — via the transcription factor cAMP response element-binding protein (CREB) rather than via nuclear factor-κB (NF B) (Le Bert *et al.*, 2011). This is interesting because CREB is increasingly implicated in the control of Treg (Wen *et al.*, 2010) and CREB becomes phosphorylated during successful treatment of MDD (Gass & Riva, 2007). So, we postulate that the beneficial effect on quality of life (and related emotional constructs) was due to correction of the anti-inflammatory to proinflammatory balance, leading to changes in downstream intracellular signalling cascades that ultimately result in cessation of the depressogenic stimulus. However, animal studies with *M. vaccae* have revealed a second quite different pathway by which *M. vaccae* might have antidepressant properties.

Transient acute effects of inflammatory responses

The clinical effects cited above led to investigation of the CNS effects of peripheral administration of *M. vaccae* in a mouse model, and to the discovery that intratracheal or subcutaneous administration activated a specific subset of serotonergic neurons in the interfascicular part of the dorsal raphe nucleus (DRI) of mice (Lowry *et al.*, 2007). This activation of DRI serotonergic neurons was associated with increases in serotonin metabolism within the medial prefrontal cortex (mPFC), consistent with an effect of immune activation on mesolimbocortical serotonergic systems. These systems are heavily implicated in the control of mood. Also, these effects were temporally associated with reductions in immobility in the forced swim test (a standard test for antidepressant activity (Lowry *et al.*, 2007)). The antidepressant-like neurochemical and behavioural effects were acute effects peaking 12hrs after injection. They then waned rapidly, and so are clearly distinct from the more sustained effects attributable to the long-term raising of the ratio of proinflammatory to anti-inflammatory mediators. We envision that activation of serotonergic neurons by peripheral immune activation, if sustained over a long period of time (weeks or months), would lead to dysregulation of serotonergic systems implicated in antidepressant pathways, and increased vulnerability to MDD. *M. vaccae*, by increasing immunoregulation and anti-inflammatory mediators, could thus prevent dysregulation of serotonergic systems caused by chronic inflammatory conditions. One of us (C.L.) is actively investigating the pathway involved in the acute effect, and it might well be possible to exploit the underlying mechanism for more long-term effects by triggering it in a different way.

Alternative views

A few workers, particularly Schwartz and colleagues at the

Weizmann Institute in Israel, have argued that inflammation mediated by T-lymphocytes with specificity for brain antigens is essential for neuroprotection (Kipnis *et al.*, 2002). The cells implicated were Th1 cells, but the data show clearly that these were protective only in the presence of other cell types, suggesting that the role of the Th1 cells was to attract regulatory cells to the relevant sites (Rook *et al.*, 2011).

Workers within the same institute also suggested that brain-recognizing lymphocytes could protect mice and rats from behavioural changes triggered by stressors (Lewitus *et al.*, 2008; Lewitus *et al.*, 2009), though no particular cell type was identified. More recently Kipnis (who had previously worked with Schwartz but is now at the University of Virginia) and his colleagues noted that the performance of cognitive tasks led to accumulation of IL-4-producing T-cells in the meninges. They also found that there were cognitive defects in IL-4-knockout mice, or following depletion of T-cells from meningeal spaces by treatment with anti–very late antigen 4 (anti-VLA-4) (Derecki *et al.*, 2010). These IL-4-secreting cells then led to alternative macrophage activation (Derecki *et al.*, 2011), and to regulatory events including increased IL-10 and decreased TNF . Thus the issue might now be resolved, with agreement that protecting both structural and functional aspects of neuronal function requires regulatory pathways, perhaps particularly IL-10.

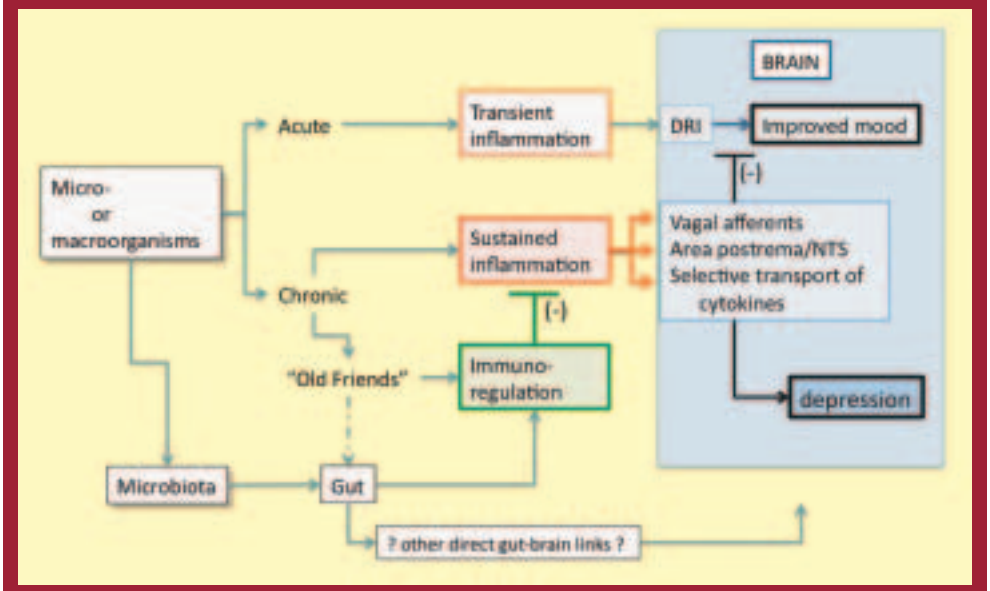
A more bizarre claim appeared very recently in the Proceedings of the National Academy of Sciences (PNAS) (Warner-Schmidt *et al.*, 2011). The authors used a dataset from the "sequenced treatment alternatives to relieve depression" (STAR*D) study to investigate retrospectively the effect of simultaneous administration of non-steroidal anti-inflammatory drugs (NSAID) or analgesics on the efficacy of selective serotonin reuptake inhibitors (SSRIs) in treatment-resistant depression. The authors concluded that the patients who took NSAID or other non-anti-inflammatory analgesics (such as acetaminophen) were less likely to go into remission. Unfortunately, the data were not controlled for pain, and so cannot be interpreted, because pain itself strongly predicts antidepressant non-response and people with pain are more likely to take acetaminophen or NSAIDs (Fava *et al.*, 2004). Mouse data accompanying this paper appears to have been looking at the acute effects of inflammatory mediators discussed earlier, and might therefore have been analogous to the work of Lowry and colleagues (2007), and are not relevant to the effects on mood of sustained increases in proinflammatory cytokines.

Conclusions

There is overwhelming epidemiological, clinical and experimental evidence that prolonged increases in levels of proinflammatory mediators can cause symptoms of depression. A similar imbalance is implicated in the increases in a range of chronic inflammatory diseases, and new immunoregulation-inducing treatment strategies are being devised and are entering clinical trials. These should also be trialled as treatments for MDD. In addition, a further unexpected pathway has been discovered, involving specialized serotonergic neurons in the DRI. These can be acutely activated by inflammatory stimuli, and this appears to represent a short-term behavioural boost that will be replaced by depression if the inflammatory stimulus is prolonged and unremitting. Nevertheless this pathway might be exploitable when it is fully understood, if it can be triggered in an intermittent manner by an alternative non-inflammatory strategy.

These findings provide a rationale for ongoing clinical trials in depression of treatments such as infliximab, a neutralizing antibody to TNF-α. Other anti-inflammatory or immunoregulatory strategies are also under consideration.

Figure 1. *Some of the ways in which micro- or macroorganisms can modulate cognitive function and mood (excluding direct infection of the CNS)*



Acute transient inflammation can activate serotonergic neurons in the interfascicular part of the dorsal raphe nucleus (DRI) via activation of spinal afferents. This results in an antidepressant-like behavioural effect demonstrable in standard laboratory models. On the other hand chronic inflammation, signalling via vagal sensory afferents, or following entry of cytokines into the CNS via the circumventricular organs where there is no blood-brain barrier (e.g. area postrema/nucleus of the tractus solitarius (NTS)), or via selective transport mechanisms, leads to inhibition of DRI neuron activity and to depression. Concomitantly, exposure to micro- or macroorganisms modulates the microbiota, both directly by local competition, symbiosis or colonization, or indirectly by modulating the immune system, and so altering the relationship between the gut immune system and the microbiota, leading to changes in the balance of strains and species. There are poorly understood gut-brain links that then modulate CNS function. Finally, and crucially, the presence of immunomodulatory "Old Friends" will activate immunoregulatory pathways (DCreg and Treg) leading to termination of inappropriate chronic inflammation, thus to diminished depressogenic cytokine signals. The "Old Friends" will also further modulate the microbiota in ways that would be predicted to protect against depression.

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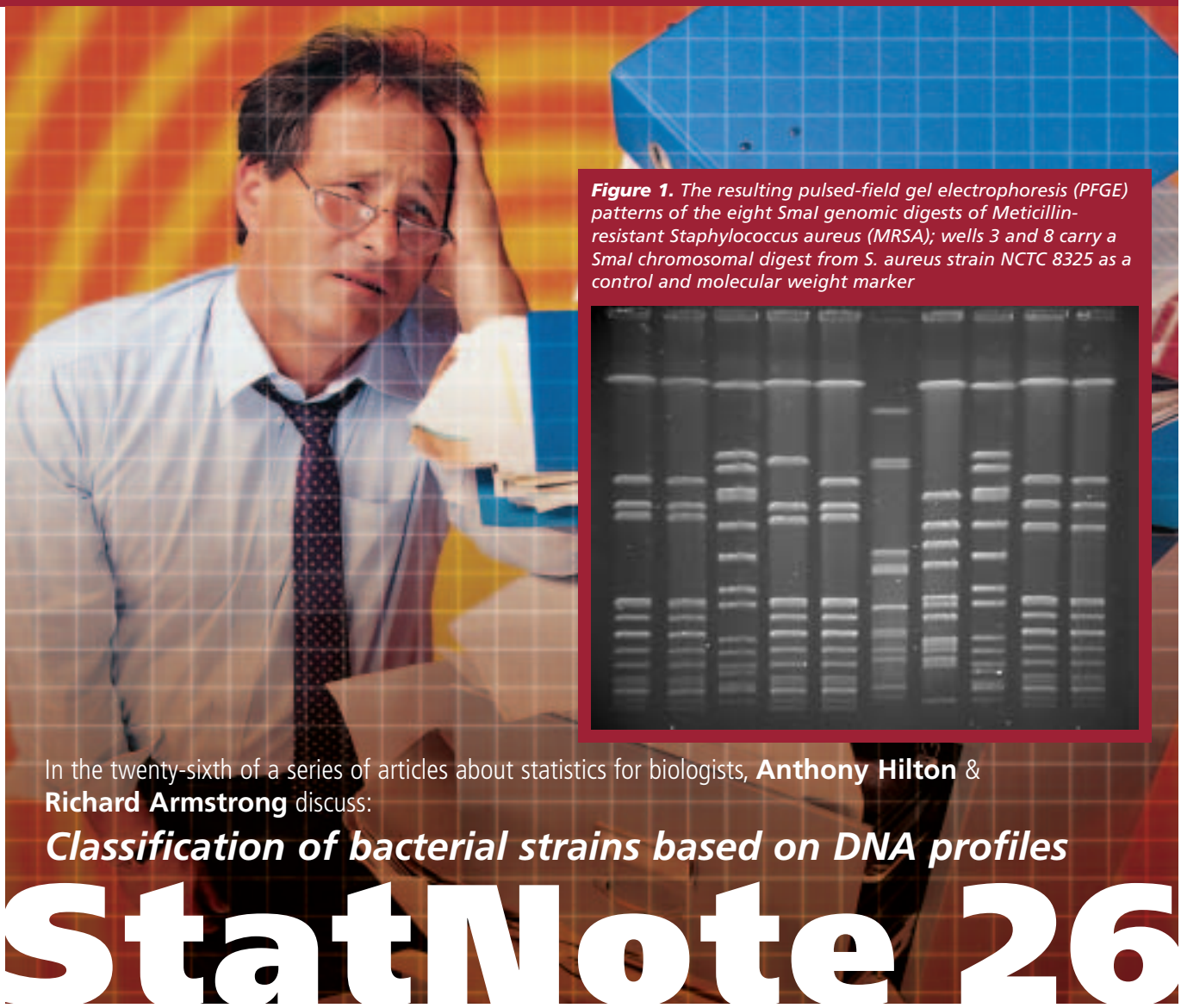


Figure 1. *The resulting pulsed-field gel electrophoresis (PFGE) patterns of the eight SmaI genomic digests of Meticillin-resistant Staphylococcus aureus (MRSA); wells 3 and 8 carry a SmaI chromosomal digest from S. aureus strain NCTC 8325 as a control and molecular weight marker*

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

Classification of bacterial strains based on DNA profiles

StatNote 26

Introduction

The analysis of bacterial genomes for epidemiological purposes often results in the production of a banding profile of DNA fragments characteristic of the genome under investigation. These may be produced using various methods, many of which involve the cutting or amplification of DNA into defined and reproducible characteristic fragments. It is frequently of interest to enquire whether the bacterial isolates are naturally classifiable into distinct groups based on their DNA profiles. A major problem with this approach is whether classification or clustering of the data is even appropriate. It is always possible to classify such data but it does not follow that the strains they represent are 'actually' classifiable into well-defined separate parts. Hence, the act of classification does not in itself answer the question: do the strains consist of a number of different distinct groups or species or do they merge imperceptibly into one another because DNA profiles vary continuously? Nevertheless, we may still wish to classify the data for 'convenience' even though strains may vary continuously, and such a classification has been called a 'dissection' (Kendall & Stuart, 1966). This StatNote discusses the use of classificatory methods in analysing the DNA profiles from a sample of bacterial isolates. An approach to analysing and representing the relationship between isolates in a non-hierarchical manner using principal components analysis (PCA) will be discussed in the next StatNote.

Scenario

Eight unknown isolates of MRSA and a culture of *Staphylococcus aureus* strain NCTC 8325, as a control, were incubated for 18 to 24 hours at 37°C in Brain-Heart Infusion (BHI) broth. Following incubation, the bacterial cells were harvested and 20 milligrams (wet weight) of cells were re-suspended in 1ml NET-100 (0.1M Na_2EDTA (pH 8.0), 0.1M NaCl, 0.01M Tris-HCl (pH 8.0)) and mixed with an equal volume of molten low melting point chromosomal grade agarose (0.9% (w/v) in NET-100; BioRad, UK). The prepared blocks were incubated for 24 hours at 37°C in 3ml lysis solution (6mM Tris pH 7.6, 100mM EDTA pH 8, 100mM NaCl, 0.5% lauroyl sarcosine and 1mg/ml lysozyme) with 20 units of lysostaphin (Sigma, UK). The initial lysis solution was removed and the blocks were incubated for 48 hours at 50°C in 3ml ESP (0.5M EDTA pH 9, 1.5mg/ml proteinase K (Sigma, UK) and 1% lauroyl sarcosine). The blocks were washed at room temperature twice for 2 hours followed by two 1 hour washes using TE buffer (10mM Tris and 1mM EDTA, pH 8). A portion of each agarose block (1×1×9mm) was digested with 20 units of *Sma*I (Roche, UK) in 0.1ml buffer for 16 hours at 25°C. The digested DNA samples were subjected to PFGE (CHEF Mapper system, BioRad, UK) (Bannerman *et al.*, 1995). Gels were stained with 1μg/ml of ethidium bromide for 45 minutes and destained for 45 minutes in distilled water. Gels were visualized under UV illumination and photographed using the GeneGenius Bio Imaging System (Syngene, UK). All

Table 1. Band distances, migrated in millimeters, from the origin of the gel for each of the DNA preparations extracted from eight strains of Methicillin-resistant *Staphylococcus aureus* (MRSA) and a culture of *S. aureus strain* NCTC 8325 as a control

	Bacterial strains									
Band	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**
1	17	17	18	17	17	26	18	18	18	18
2	46	46	38	39	46	40	50	38	45	45
3	52	52	42	53	52	42	58	42	52	52
4	56	56	48	56	56	66	64	48	58	58
5	80	80	58	79	80	70	69	58	79	79
6	85	85	66	84	85	71	79	66	84	84
7	89	89	76	89	89	81	82	76	89	89
8	94	94	80	94	94	88	85	80	94	94
9	98	98	91	98	98	89	91	91	98	98
10	102	102	95	102	102	93	92	95	102	102
11	103	103	98	103	103	96	93	98	103	103
12	104	104	104	104	104	104	97	104	105	105
13	105	105	105	105	105		99	105		
14							109			

images were saved using the tagged image file format (TIFF). Figure 1 represents the resulting PFGE patterns of the eight *Sma*I genomic digests of MRSA; wells three and eight carry a *Sma*I chromosomal digest from *S. aureus* strain NCTC 8325 as a control and molecular weight marker (Murchan *et al.*, 2003).

Data

The data comprise the band distances migrated in millimetres from the origin of the gel for each of the DNA preparations and are presented in Table 1. Note that unlike the data for a multiple regression analysis (see StatNotes 24, 25), there is no dependent (*Y*) variable; the data comprise a series of independent (*X*) variables representing the bacterial strains.

Analysis

Theory

If there are 's' bands defined by distance from the origin of the gel, each bacterial strain could be represented by a point in an s-dimensional coordinate frame, any one point having coordinates represented by the distances travelled by the defining bands. If in this s-dimensional frame, the points formed a hypersphere then the strains sampled would constitute a single homogeneous group. Alternatively, the strains could be clustered into two or more separate hyperspheres. Moreover, if the strains formed a single non-isodiametric cluster such as an ellipse then the strains may be neither homogeneous nor divisible into separate groups but would essentially be continuously distributed without distinct 'gaps'.

There are several methods available for classifying data (Pielou, 1969). Hence, classification methods may be 'hierarchical' or 'reticulate', 'divisive' or 'agglomerative', 'monothetic' or 'polythetic'. Moreover, several methods are available for measuring the similarity or 'distance' between strains. The most commonly employed hierarchic clustering methods include nearest-neighbour, furthest-neighbour, and the un-weighted pair–group method using arithmetic averages (UPGMA) (Clifford & Sokal, 1975), the most frequently used of which is UPGMA. When employing UPGMA to construct a dendrogram (tree diagram), an assumption is made during the calculation that each molecular strain-type diverges equally from the others, and it is this approach that will be adopted in this StatNote.

How is the analysis carried out?

The first problem to be considered in any classification analysis is the nature of the variables and whether the measurements have been made on the same or different scales. For example, each strain may have been defined by band distance and intensity of the band and if both types of data were included, the analysis would be biased by the variable with the greatest mean and range. Hence, such data are often 'standardized' by converting them so that they are members of the standard normal distribution, i.e., a distribution with a mean of zero and a standard deviation of one unit (see StatNote 2). Second, a distance measure 'd' needs to be selected which reflects the similarity of one strain to another. There are various methods of computing distance but the most straightforward is to compute 'd' as if the 's' variables are dimensions making up an s-dimensional space, *viz.*, to use 'Euclidean distance' as a measure of similarity. Third, a linkage rule needs to be selected and as discussed above, the method based on UPGMA has been the most commonly used to analyse bacterial strains. Nevertheless, note that the 'nearest-neighbour' method is often the default option available in various statistical packages and also offers a satisfactory method of classification.

Most of the major statistical packages such as SPSS and STATISTICA offer multivariate classificatory methods and although the 'mechanics' of carrying out the analyses may differ in detail, they use a similar approach. We will illustrate the analysis of our data using STATISTICA software.

Interpretation

The dendrogram obtained from the data in Table 1 using UPGMA and Euclidean distance methods is shown in Figure 2. The process of classification is agglomerative, individual strains being combined with those that they resemble most

Figure 2. *The resulting dendrogram obtained from the data in Table 1 using the hierarchic clustering method UPGMA and Euclidean distance as a measure of the 'similarity' between bacterial strains*

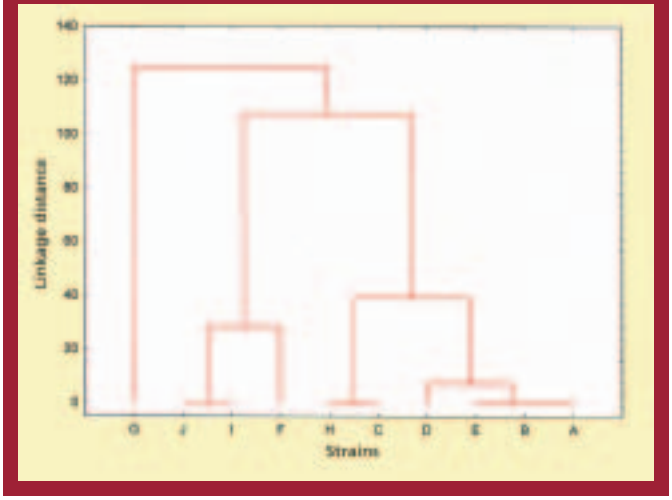
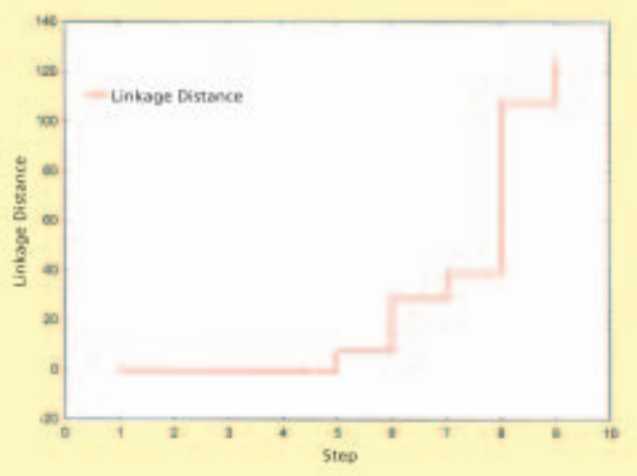


Figure 3. *A graph of the 'amalgamation schedule' obtained from the data in Table 1 the hierarchic clustering method UPGMA and Euclidean distance as a measure of the 'similarity' between bacterial strains*



closely and then successively, the groups are combined as the dendrogram is ascended. Hence, the data from wells I/J, C/H, and A/B/E immediately form three groups, the members of which are each identical according to band distances and, therefore, cluster at a linkage distance of 0. Furthermore, D is the strain most closely related to A/B/E and F is most closely related to I/J. Strain G appears to be the most unrelated to the others based on band distance, but at a linkage distance of approximately 125 all strains have been combined into a single group.

An obvious question to ask is how many groups should be retained? A useful additional plot in the interpretation of the data is the 'graph of the amalgamation schedule' and is shown in Figure 3. As linkage distance increases, larger and larger clusters are formed but with a greater degree of within-cluster diversity. The first four steps describe the linking of J and I, H and C, and E with B and A. Step 5 describes the linking of E/B/A with D while step 6 describes the linking of J/I with F. The process continues until all strains are amalgamated at step 9. A clear discontinuity in the graph suggests that many clusters are being amalgamated at the same linkage distance and this level can be used as an approximate 'cut-off' to determine the number of groups to retain. In Figure 3, for example, this discontinuity occurs at a linkage distance of approximately 40. Hence, drawing a line across the dendrogram in Figure 2 at this level would suggest the presence of three groups of MRSA strains, *viz*., strain G alone, strains I/J and F, and strains A/B/C/D/E and H.

Conclusion

The use of classificatory methods is popular in the interpretation of DNA banding data from bacterial strains. The analysis results in a dendrogram which illustrates the relationships between individual strains by combining them into groups. There are two problems with this approach. First, there is no guarantee that the data are actually classifiable. Second, there are many possible variations of the statistical analysis and their relative merits and usefulness with reference to DNA banding data have not been established. An alternative method of analysis is to make no assumptions as to the relationships between the strains. Such a non-hierarchical method of analysis involving factor analysis (FA) and principal components analysis (PCA) will be described in the next StatNote.

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The world of social media — and how to use it effectively!

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

Over the last decade the term 'social media' has quickly become part of our everyday conversation, however, how many of us are really conscious of how it can help us? And perhaps more importantly, how aware are we of the digital footprint we leave when we go online? With a lot of employers now performing background checks based on our use of social media it is more important than ever to be in control of our online presence. So to get you all blogging, tweeting and podcasting as quickly and professionally as possible the PECS team have compiled a brief introduction to this digital world.

Social networking

- Scientists know more than anyone just how important networking can be. Whether it be collaborating on a piece of research or simply searching for a new job, communicating with the right people can make all the difference.
- Social networking therefore, offers an important tool to expand not just our social circle but our professional connections as well.
- The basic premise is simple with the user creating an online profile describing their interests, qualifications, hobbies etc. The user can then create connections to other user's profiles, people with similar interests, and in doing so exponentially expand their social group.
- A number of websites offer the service including Facebook (www.facebook.com/), Myspace (www.myspace.com/) and Linkedin (www.linkedin.com/).

Twitter

- Often the most daunting to the uninitiated, Twitter (http://twitter.com/) has amassed over 225 million users since its inception and is successfully used by politicians, celebrities and journalists alike.
- An online profile is created, in a similar manner to social networking, allowing the user to post short messages or 'tweets' about things that interest them.
- These 'tweets' must be less than 140 characters which forces the user to be clear and concise about the information they wish to convey.
- Users can subscribe to 'follow' multiple other users. Each time a person tweets, everyone who follows them is updated via their timeline. This means it is possible for millions of people (or the number of people who follow you) to read what you have to say.

Blogs

- A blog is a personal website allowing the user to write short articles about topics of interest to them, often in response to news articles or scientific publications.
- Users often advertise their blogs using other social media such as Facebook and Twitter; this has been shown to increase 'traffic' to blogs by up to 30%.
- *Get started by making your own blog here*: www.blogger.com.

Podcasts

- Podcasting allows users to record themselves talking about issues that interest them and then make the audio data files (termed podcasts) available online for others to listen to.
- This gives followers the opportunity to stay abreast of current developments and expand their knowledge base whilst on the move.
- Examples of popular podcasts include Nature (www.nature.com/nature/podcast/), the Royal Society (http://royalsociety.org/stay-in-touch/rscience/) and the Guardian (www.guardian.co.uk/science/series/science).

What next?

- Set up a Twitter account (http://twitter.com/).
- 'Follow' other bloggers and read their blogs so you have an idea of what makes both a good and bad blog post.
- 'Follow' journalists, news and organizations so you can stay up-to-date with the latest news and developments (@SfAMtweets).
- Set up a blog and write your first blog post (www.blogger.com).
- Advertise your blog post using 'Twitter' and 'Facebook'.

For help and guidance: Speak to Sam via email: pecs@sfam.org.uk, Facebook: www.facebook.com/sfamfb or Twitter: @samanthalprice.

Samantha Price
PECS Events Team, De Montfort University
and
Phillip Humphryes
PECS Communications Officer, AHVLA

PECS NEWS

Phillip Humphryes has stepped down from his Committee position as communications officer; PECS would like to thank Phillip for all his hard work and wish him well for the future. We are pleased to announce that Irene Freire-Martin has been appointed as his replacement.

Phillip Humphryes
PECS Communications Officer, AHVLA

Overseas Development Award

Training in HIV drug resistance genotyping

about this award

The *Overseas Development Award* was set up to assist overseas members in developing skills through funding laboratory visits, training and lectures. This award has now been amalgamated with the *Endangered Culture Collection Fund* and replaced with a new grant, the ***International Capacity Building Fund***. This fund provides resources to enhance education and training of applied microbiology in developing countries and allows a greater diversity of funding applications than the previous two grants. If you would like to know more about this grant please visit: **www.sfam.org.uk/grants.php**

I have been working at the Pontificia Universidad Javeriana in Bogota, Colombia for three years as a Professor, teaching Virology and Clinical Virology and I am also a member of our local Infectious Disease Research Group which was established in 1999. Our team is considered one of the top special interest groups in our University and in Colombia as a whole. In my position at Javeriana University I am expected to develop a project which involves HIV patients from our University Hospital where we will test drug resistant mutations that have never been genotyped for those patients. This is to provide scientists and clinicians with a better understanding of how disease resistance develops in Colombian HIV patients and how best we can help treat these people in the future.

The main reason we wish to study HIV genotypic resistance and develop a testing protocol is because at the moment Colombia does not have any primary resistance mutations information, even though the statistics report 6,842 new cases of HIV infection in 2008. Furthermore, at the University Hospital San Ignacio, which has links to Javeriana University, there is an infection surveillance unit working with newly diagnosed HIV patients, to use new protocols in order to research previous mutation problems which may be contributing to their drug resistance and increased viral loads. Also in the future we will test transmission resistance of mutations in patients who have become unresponsive to treatment.

My special thanks to the Society for Applied Microbiology for the Overseas Development Award that allowed me to take training in HIV genotypic resistance testing in the Antiviral Unit (AVU) of the Health Protection Agency (HPA) under the supervision of Dr Andrew Buckton between 29 June and 17 July 2009. The training involved instruction in genotypic testing from plasma and dried blood spot samples from HIV patients. It was very interesting and extremely helpful to learn from this group, which is a leader in the UK in the study of HIV genotypic resistance testing and also is one of the World Health Organisation (WHO) global specialized HIV drug resistance laboratories.

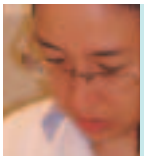
I was welcomed by Dr Buckton who gave me initial instructions about how the AVU works and HIV drug resistance (HIVDR) information surveillance in the UK. Then he took me around the HPA laboratories and facilities, and specifically, the virology section. In my first week I received training in the HIV-1 genotypic test from an HIV patient's plasma whose immune system was no longer responding as it should to antiviral therapy due to their viral load and compromised immune status. This was carried out using RT-PCR and Nested PCR which included protocols to amplify specific genes.

In my second week Dr Buckton showed me a dried blood spot (DBS) protocol that he had standardized in his group for surveillance and genotypic testing. Using techniques developed at HPA and elsewhere, I was able to see many advantages of this technology, mainly for developing countries where it will be easy to collect and store samples. We discussed suitable protocols for use back in Bogota given our more limited resources. The advice given by Dr Buckton and his staff was very useful to help me understand how I could use the methodologies examined in my country.

The level of organization of HPA and their laboratories was very impressive and the amount of equipment and the use of consumables made it easier to understand those relevant methodologies. At the end of my training Dr Buckton explained how to interpret sequencing reports which gave me a guide to know how to extrapolate the mutations resistance that I would find in my patients.

I am very grateful to the S*f*AM for giving me the opportunity to take this training which has broadened my horizons in the field of microbiology, and specifically in HIV genotyping. The Overseas Development Award has also let me acquire a sense of reinforced motivation for my research in HIV patients from my country, and also given me the opportunity to meet and interact with senior scientists working on different projects with a common theme. I owe a debt of gratitude to Dr Peter Green for his kind support which facilitated the S*f*AM Overseas Development Award and to meet some wonderful people. I am particularly grateful to Dr Pat Cane, Dr Andrew Buckton, Dr Deenan Pillay, Dr Jean Mbisa, Dr Chris Parry, Dr Andros Gavriel, Dr Adriana Alvarez and Dr Jennifer Toswill who offered me their hospitality and shared knowledge during my stay at the HPA.

Dr Green spent a few days at the end of my trip showing me how a culture collection functions and how strains of microorganisms are preserved. This was very useful information which I could relay to colleagues at Javeriana University, who manage our small clinical collection which is used for research and teaching purposes. The Javeriana collection was recently in receipt of an S*f*AM Endangered Culture Collection Grant and this information will supplement that award and allow us to build on the previous expert advice and equipment provided.



Olga Raquel Villamizar Beltran
Javeriana University
Bogota, Colombia

SfAM Laboratory Fellowship Award

Investigating the role of freshwater epilithic biofilms in harbouring persistent *Escherichia coli* O157 in an agricultural environment

Between 2002 and 2003, a mixed farm (animals and crops) in Southeast England was surveyed for the presence of *E. coli* O157. Pooled animal faeces (chickens, goats, cattle, pigs) and stones in four streambeds running through the farm were collected, and *E. coli* O157 was isolated from all animal populations and from the freshwater epilithic biofilms (stones in the river bed) (Cooper *et al.*, 2007a, Cooper, 2007).

Four years later, samples were obtained from the same locations in order to determine whether the previously identified *E. coli* O157 clones had persisted at the sites, or if population turnover had replaced those recovered in 2002-3 with different ones.

In 2007, we presented phenotypic data suggesting that clones of *E. coli* O157 recovered from pooled animal faeces resided within the biofilms on the stones in the streams on the farm and also in the sediments recovered from the River Ouse (Cooper, 2007). This work established several key facts:

1. *E. coli* O157 clones associated with domestic farm animals survive in epilithic freshwater biofilms.
2. There is no single animal-specific strain for any one animal, but there is evidence to suggest a dynamic exchange of bacteria between different animal populations (e.g. goats and chickens), and between animals and the biofilms, presumably through run-off.
3. The isolates recovered from both animals and biofilms possess up to four of the aforementioned virulence factors, suggesting a potential threat to human health.

While unique so far, this work was based purely on phenotypic typing as more advanced DNA-based typing was not available to us previously.

Dr Eshwar Mahenthiralingam of Cardiff University is an expert at identifying and discriminating between bacterial clones. A recent collaboration between Dr Mahenthiralingam and I led to the successful publication on the long-term persistence of *Legionella pneumophila* in a municipal shower using Random Amplified Polymorphic DNA (RAPD) (Cooper *et al.*, 2008). Due to the successful nature of this publication and relative ease of the techniques applied, we decided to apply for a SfAM Laboratory Fellowship to obtain funding to apply these skills to answer basic questions on the molecular epidemiology of *E. coli* O157 that could shed further light on the phenotypic characteristics we had already observed.

RAPD analysis provides a high degree of discriminatory power allowing us to determine whether a single clone of a bacterial species persisted over a period of time or it had been replaced by another clone of the same species. This is important, because it allows us to understand population shifts amongst segregated animal populations linked only by their human feeders and by run-off.

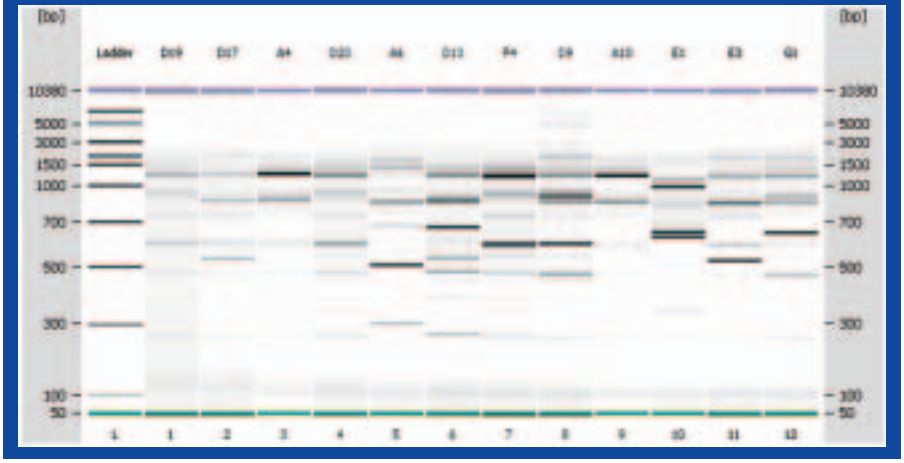
Unlike traditional PCR analysis, RAPD does not require any specific knowledge of the DNA sequence of the target organism. Identical 10-mer primers will or will not amplify a segment of DNA, depending on positions that are complementary to the primers' sequence. For example, no fragment is produced if primers annealed too far apart or 3' ends of the primers are not facing each other. Therefore, if a mutation has occurred in the template DNA at the site that was previously complementary to the primer, a PCR product will not be produced, resulting in a different pattern of amplified DNA segments on the gel. DNA 7500 LabChip Kit (Agilent®) provides size and concentration information for DNA fragments ranging in size from 100 to 7,500 base pairs.

Briefly, bacterial isolates were cultivated at 37°C for 18 ± 2 hours on Tryptone Soya Agar (Oxoid). DNA was extracted using Qiagen DNeasy Blood & Tissue kit™, which uses a series of buffers and centrifugation steps to isolate and purify the DNA. Next, RAPD-PCR was performed using a thermocycler for approximately 4.5 hours (significantly longer than normal PCR). The DNA and PCR products can both be stored at 4 or -20°C for up to one month without significant degradation.

The procedure can be summarized as follows:

- Preparation of the Gel-Dye Mix.
  - Allow DNA dye concentrate and DNA gel matrix to equilibrate to room temperature for 30min.
- Loading the Gel-Dye Mix.
  - Pipette 9µl of gel-dye mix into the marked well.
- Loading the Markers.
  - Pipette 5µl of marker into all 12 samples and ladder wells.
- Loading the Ladder and the

Figure 1. *A typical "gel" showing a computer-generated image of the banding pattern, as it would be if it had been run on a standard agarose gel*



Samples.

- Pipette 1μl of DNA ladder into the marked well.
- In each of the 12 sample wells pipette 1μl of sample (used wells) or 1μl of de-ionized water (unused wells).

- Run the chip in the Agilent 2100 Bioanalyzer within 5min.

The Bioanalyzer produces a computerized image of the DNA banding as if the PCR products had been run on an actual agarose gel (Figure 1). However, as the Bioanalyzer produces digital rather than gel-based information, it is easily transferrable to mathematical cluster analysis which would not have been possible using conventional electrophoresis.

This technique is rapid, easy to perform, and provides a high discriminatory facility for epidemiological investigations such as this. Thanks to this S*f*AM Laboratory Fellowship, we have been able to perform this technique. We are currently waiting to obtain clinical isolates from local hospitals in order to ascertain whether the clones of *E. coli* O157, isolated from the animal and biofilm sources, are related to those associated with incidents of human disease. It is envisaged that this work will form the basis of an epidemiological survey into the environmental niches which *E. coli* O157 occupies, and to determine the interchange between reservoirs of the bacterium and outbreaks of human disease between 2002 and 2006.

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Ian R. Cooper
University of Brighton
Eshwar Mahenthiralingam
University of Cardiff

Hardship Research Grant

Biofilms: Stress tolerance response of bacteria under adverse growth conditions

At the end of the 19th century and the beginning of the 20th century microbiology came forward with the recognition of the role of microbes in diseases and the existence of the immune system. The current era is associated with the availability of the complete bacterial genomes and the recognition that, outside the laboratory flask, bacteria can grow by attaching themselves to surfaces and being embedded in a self produced extracellular matrix forming what is referred to as a biofilm.

Research on biofilms has come a long way since the initial characterization by van Leeuwenhoek. Using his simple microscopes on tooth surfaces over three centuries ago in his seminal studies of dental plaque (which he called 'scurf') he is credited with the discovery of microbial biofilms. Biofilms are ubiquitous, and exist wherever surfaces contact naturally occurring fluids. These biofilms pose serious problems for human health and are of major concern in medical, environmental and industrial settings (including living tissues, indwelling medical devices, industrial or potable water system piping and natural aquatic systems).

Complex differentiation and collective behaviour have been demonstrated for a number of different organisms and lots of reports about collective behaviour show the ability of microorganisms to exploit intercellular interactions and communication to facilitate their adaptation to changing parameters. The development of a biofilm requires multicellular behaviour, which means biofilm formation requires coordination, interaction and communication between multiple bacterial species. Biofilms represent biological systems with a high level of organization where bacteria form structured coordinated functional communities.

It is still difficult to understand common mechanisms of biofilm formation, because biofilms in the environment and industrial settings are heterogeneous. They are composed of complex microbial communities and involve various metabolic activities. Conversion of bacterial cells from planktonic to biofilm form involves a highly complex regulatory process which affects the expression of diverse groups of genes, and establishes the method for regulation of the biofilms. Therefore, it is essential to investigate biofilm formation process at the molecular level by using single species biofilms with controlled conditions.

Biofilm life cycle; a short summary

Formation of three-dimensional structures inherent within biofilms is a dynamic process and involves a coordinated series of molecular events that includes mechanisms for adhesion, aggregation and community expansion. Five main steps in the biofilm life cycle have been recognized. The stages are described as follows:

1. **Reversible attachment**
   During this process microbial cells become reversibly associated with a surface and exhibit species-specific behaviour.
2. **Irreversible attachment**
   This mode employs molecularly mediated binding between specific microbial adhesions and the surface. This permits the rapid transition between planktonic and sessile forms depending on environmental factors.
3. **Aggregation and maturation (two stages)**
   During these stages, the surface bound organisms begin to replicate which increases the overall density and complexity of the biofilms. In this stage, biofilm bacteria have radically different levels of genetic and protein expression compared to their planktonic counterparts.
4. **Detachment**
   When biofilms reach their critical mass, as determined by numerous conditions such as the availability and perfusion limit of nutrients and wastes, the peripheral layer of growth begins to re-differentiate into planktonic organisms.

Mechanisms of biofilm resistance

There is no single answer to the question of why and how bacteria growing in a biofilm develop increased resistance to antimicrobial agents. The following statements will describe some of the possible mechanisms that can account for the resistance of bacteria within biofilms to antimicrobial compounds. Biofilms exist in a variety of infections and form on the surface of indwelling medical implants. It has been estimated that 65% of infections are biofilm associated. Reduced susceptibility of the biofilm bacteria to antimicrobial agents is a crucial problem for the treatment of chronic infections, because biofilm bacteria can be up to 1,000 fold more resistant to antibiotic treatment than planktonic bacteria, but the mechanism by which the biofilm bacteria attain this resistance is still a matter of speculation.

The key component of biofilms is the surrounding extrapolymeric substance and bacteria experience a certain degree of shelter and homeostasis when residing within a biofilm. Most bacteria are able to produce polysaccharides, either as wall polysaccharides (capsules) or as extracellular excretions into the surrounding environment (EPS). The EPS matrix has the potential to physically prevent access of certain antimicrobial agents into the biofilms. When a bacterial cell culture becomes starved of a particular nutrient it slows its growth. Transition from exponential to slow or no growth is generally accompanied by an increase in resistance to antimicrobial agents. Because cells growing in biofilms are expected to experience some form of nutrient limitation it has been suggested that this physiological change can account for the resistance of biofilms to antimicrobial agents.

The microorganisms generate physiological changes that act to protect the cell from various environmental stresses. Thus, the cells are protected from the detrimental effects of heat shock, cold shock, changes in pH and many chemical agents. Nevertheless, the physiological changes begin when cells attach to a surface, by expressing a biofilm phenotype that can confer resistance to environmental stress conditions. This resistant phenotype might be induced by nutrient limitation, certain types of stress, high cell density, efflux of the treatment agent or a combination of these phenomena.

Research on microbial biofilms is proceeding on many fronts, with special emphasis on elucidation of the genes which are specifically expressed under biofilm mode in all stress-induced environments. The stress response of bacteria is complex and their adaptation to stress environments needs to be addressed in more detail. More research is required on the combined and individual roles of biofilm specific genes. The key to success is to understand what makes biofilm bacteria so different from planktonic bacteria. Biofilm formation is a mode of action by which the bacteria can protect themselves against environmental stress. This involves different forces which motivate bacteria to change from a planktonic phase to a biofilm phase which in turn is beneficial to the bacteria.

acknowledgements

I gratefully acknowledge support from the National Bio Resource Project (NIG, Japan): *E.coli* for providing bacterial strains for use during this project and the Society for Applied Microbiology for a research grant to complete this project.

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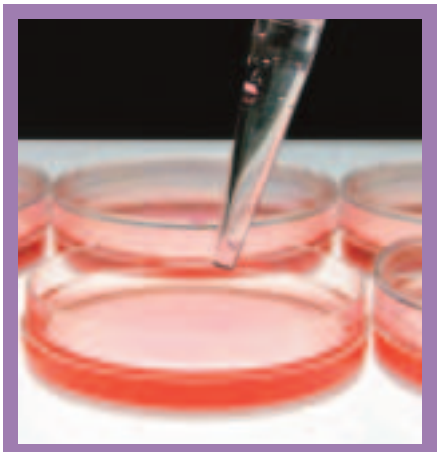

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Regional Meeting Grant

Where is the Microbiology of Medicines and Cosmetics going in Latin America?

The Second Latin American Congress on Microbiology of Medicines and Cosmetics, (CLAMME II) took place in Buenos Aires, Argentina from 1 June to 4 June 2009. This event was organized by the Argentine Society for Microbiology (Asociación Argentina de Microbiología), Foods, Medicine and Cosmetics branch (División Alimentos, Medicamentos y Cosméticos).

The general objective of CLAMME II was the diffusion of knowledge and interchange and update of information in specific areas of interest for academic reserch, industry and regulatory agencies. The specific objectives were to:

1. Contribute to the training of young professionals in the areas of biotechnology, vaccines, medicines, cosmetics and subjects related to medical technology.
2. Create a forum to broaden the knowledge of the professionals who work in the field of microbiology of medicines and cosmetics.
3. Stimulate technological interchange in the Latin American region.
4. Provide access to the most modern technologies related to safety assurance and quality of medicines, cosmetics and medical products.
5. Generate a forum to discuss the prevention of Public Health risks.
6. Help spread technological advances throughout the Latin American region.
7. Provide contact with world-renowned experts.
8. Increase research and development in all areas of qualitative and quantitative microbiological analysis.
9. Improve the health of the population of the region and the environment.

Guest speakers included experts from Argentina and other countries:

Dirce Akamine (Brazil); Eliana Siu Delgado (Peru); Luis Jiménez (USA); Liz Kerrigan (USA); Ivonne Nathalia Laverde (Colombia); Sébastien Manuel (France); Juan Carlos Medina Bravo (Mexico); Josineire Melo Costa Sallum (Brazil); Wolfgang Schmidt (Germany); Radhakrishna Tirumalai (USA); Scott Sutton (USA) and Laura Zunino (Uruguay).

Among the different topics covered in the thirty conferences and seven round tables offered were:

1. Parametric release.
2. Water activity and its relationship to microbial contamination.
3. Prevention and control of biofilms.
4. Microbiological control in the preparation of intravenous medicines.
5. Design of pharmaceutical facilities.
6. The difficulties of globalization in the microbiological control of medicines.
7. Rapid microbiological methods.
8. Sterilization in medical technology.
9. Microbiological cosmetic contamination.
10. Vaccines.
11. Good Manufacturing Practices.

The underlying theme of the congress, as reflected in the lectures mentioned above, was the future of the microbiology of medicines and cosmetics, especially as related to the use of rapid microbiological methods in the industry of medicines and cosmetics. As Drs Luis Jimenez and Scott Sutton pointed out, the current situation in the medicine and cosmetic industry is quite different from the food industry where rapid methods have been used for the enumeration of microorganisms and to detect the presence of microorganisms for some time now. They agreed that not only is the selection of the rapid microbiological method important but equally important is the validation of the method selected. The US Pharmacopoeia (Chapter 1223 "Validation of Alternative Microbiology Methods") and the European Pharmacopoeia (Chapter 5.1.6. "Alternative for Methods Control of Microbiological Quality") provide the guidelines to carry out the validation.

Three workshops were also offered at the congress:

1. *Burkholderia cepacia*: a problem in the industry.
2. Education on the microbiology of medicines.
3. Waste management in the pharmaceutical and cosmetic industry.

Within the framework of the congress and with the co-organization of the AOAC International's Latin American Section four courses were organized:

1. Uncertainty from the perspective of a microbiologist.
2. Selection, verification and validation of microbiological methods.
3. Validation of rapid microbiological methods.
4. Design and qualification of an environmental monitoring programme.

Congress attendees came from: Argentina, Bolivia, Brazil, Colombia, Chile, Ecuador, France, Mexico, Paraguay, Peru, Uruguay, USA and Venezuela.

CLAMME II was a great opportunity for researchers in the field of the Microbiology of Medicines and Cosmetics to present the results of their work and to discuss their lastest findings and the current trends in Latin American countries and the rest of the world.

Professor Maria Ines Cereijo's prize was given to the poster: "Biotechnology in the manufacturing of medicines" presented by Juárez Tomás M.S. and Nader Macías from the Reference Centre for Lactobacillus (CERELA) in San Miguel de Tucumán in the province of Tucumán, Argentina. I would like to thank the Society for Applied Microbiology for their financial support of this event.

María Cristina Fernández
President CLAMME 2009

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Investigation of the effects of different antimicrobial dressings using semi-solid and porcine models

I studied for my Bachelors Degree in Technical and Applied Biology at the Hochschule, Bremen, Germany and completed my honours year in Biochemical Science at the University of Salford, England. Thanks to the *Sf*AM I was able to undertake an internship supervised by Professor Valerie Edwards-Jones at the Manchester Metropolitan University (MMU). My 12 week project aimed to study the effects of different antimicrobial dressings using a semi-solid model.

A typical human body contains 1 x 10^{13} body cells and harbours 10 times more bacterial cells. The micro-organisms which are more or less permanent do not produce disease under normal conditions and are called the body's normal flora or normal microbiota (Tortora *et al.*, 2009). All chronic wounds are colonized by bacteria, with low levels of bacteria being beneficial to the wound healing process. A bacterial load of 10^6 or higher of colony forming units per gram of tissue leads to extended wound healing (Woo & Sibbald, 2009). Microbial pathogenicity is due to a wide range of different bacterial properties — for example, structural features such as capsules (e.g. *Pseudomonas aeruginosa*), which protect bacteria against the host immune system and pili (e.g. *E. coli*) that allow attachment to the host. The Gram-positive *Staphylococcus aureus* features polysaccharide cell wall components, which facilitate adherence to extracellular matrix components in target tissue. Enzyme production and metabolic products including exotoxins, lead to host damage and infection.

There is increasing evidence that bacteria in chronic wounds form biofilms. This allows these communities to progress towards antibiotic resistance and use a chemical signal through quorum sensing to coordinate gene expression. This increases virulence and complicates wound healing. Therefore, a better understanding of the physiology and the interactions within polymicrobial biofilms may lead to more effective methods of wound care (Cooper, 2005).

The treatment and healing of chronic wounds take a long period of time. Therefore it is important to provide a treatment that upgrades the patient's quality of life, including comfort, low costs of professional healthcare and wound dressings, ease of handling and, of course, a fast healing progression.

A wide range of dressings with different features are on the market, including foam dressings, cellulose dressings, dressings that contain antiseptics and many more. Efficacy testing of antimicrobial dressings is difficult to assess because of the varying nature of the dressing itself. It is important to develop a model which is reproducible and reliable.

The aim of this project was to develop a semi-solid wound model to study the effects of three different wound dressings currently on the market. These were Allevyn Ag™ (Smith and Nephew), Aquacel Ag™ (ConvaTec) and AMD foam™ (Covidien) dressings (containing the antiseptic polyhexamethylene biguanide (PHMB)). Both Allevyn Ag and Aquacel Ag incorporate silver in some form into the dressing.

S. aureus (NCIMB 8625) and *Ps. aeruginosa* (ATCC 9027) were used as representative wound organisms. Scanning electron microscopy was used as a possible new technique for identifying organisms on the dressings and to evaluate new possibilities in disease and biofilm diagnosis.

The semi-solid wound model was constructed in a number of different ways and tested with varying concentrations of bacterial cells prior to treatment with dressings. The model was

Figure 1. *A non- inoculated Aquacel Ag dressing (2k x magnification)*

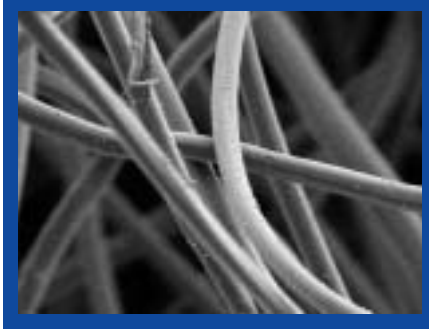

Figure 2. *A non- inoculated Aquacel Ag dressing (10k x magnification)*

partially successful but would need further modification, beyond the scope of the project.

The porcine model showed great promise, especially at room temperature. This needs further development. The results demonstrated antimicrobial activity of the dressings but the data was difficult to control and interpret due to the difference in absorbency capacity of the dressings.

Several dressings which were inoculated with *S. aureus* and *Ps. aeruginosa* were used for field emission scanning electron microscopy. In order to kill the bacteria, the incubated dressings were placed into formalin for 24 hours prior to processing. The electron micrographs indicated that silver had an antimicrobial effect. Gram-negative bacteria were not found which indicated that they were killed either by the dressing itself or due to the electron beam.

Finally, thanks to the entire MMU Microbiology lab, especially Professor Valerie Edwards-Jones, Anne Leahy-Gilmartin, Monika Stuczen, Dr Vladimir Vishnyakov and of course the S*f*AM for this great opportunity. I would fully recommend this scheme to students who wish to gain work experience.

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Jessica Landau

Cloning and over-expressing the *gln3* gene of *Methylocella silvestris*

Between the final two years of my degree at the University of Warwick I was lucky enough to be offered a research project within J.C. Murrell's microbiology research group. The group is geared towards researching methylotrophic activity and methane oxidation in bacteria.

The aim of my research was to clone the gene *gln3* (*msil2635*), found in *Methylocella silvestris*, into an expression host in order to over-express the aforementioned gene to gain an abundance of its pure product, thought to be gamma-glutamylmethylamide synthetase (GMAS). If the production of pure, functional GMAS is achieved, the next step would be to assay the enzyme to determine whether it has the functional ability to convert glutamic acid and methylamine, at the expense of ATP, into gamma-glutamylmethylamide (GMA) (Yamamoto *et al.*, 2008) If this reaction is found to occur then it would strongly indicate *gln3* as a gene which produces GMAS.

Part of what attracted me to this project was the fact that GMA has been found to have a profound inverse effect on spontaneous hypertension in rats, and thus has putative therapeutic benefits for mammals in general (Yokogoshi & Kobayashi, 1998). The molecule GMA is found in the soluble extract of *Camellia sinensis* (green tea), a drink consumed by populations worldwide. The above study noted that the hypotensive effects of GMA were more acute than theanine (gamma-glutamylethylamide), another compound found in tea and one closely related to GMA. It is, therefore, possible that GMA is one of the key health promoting compounds found in green tea alongside the more established and recognized Epigallocatechin gallate (EGCG).

The first task of my project was to design primers to extract *gln3* from the genomic DNA of *M. silvestris* and into a cloning plasmid, namely pET28a. The primers were designed to contain restriction sites to allow ligation into the plasmid, which has analogous restriction sites in its polylinker. The resultant plasmid, [pET28a-gln3], was then transformed into *E.coli* JM109, a cloning host.

Colony PCR was carried out to identify transformants and the PCR products were run via 1% agarose gel electrophoresis in order to visualize colonies with the correct band size (~1.2Kb), i.e. the band size which corresponds to the [pET28a-gln3] plasmid. The two successful colonies were then sequenced and the sequences obtained were aligned to the gene sequence from the genome using NCBI's BLAST program.

The plasmid with the original sequence (without any point mutations, etc.) was then transformed into the expression host *E. coli* BLR(DE3)pLysS. This bacterium contains a T7 bacteriophage promotor enabling strong RNA polymerase activity upon *lacZ* promotor induction via the lactose analogue, IPTG.

The IPTG induction itself was carried out in a 37°C shaker for 4 hours post-IPTG addition. SDS-PAGE analysis subsequently revealed there was very little product expressed. There was, however, a large amount of visible insoluble protein (inclusion bodies), which is potentially the result of protein misfolding within the expression host. To remedy this, a lower IPTG concentration and 25°C incubation was used; however, despite little insoluble protein being produced, there was still only a nominal amount of protein expressed. Further work is needed to optimize the amount and quality of GMAS protein being expressed. Potential solutions would be to test other expression hosts or to add various cofactors to the expression host growth medium in an attempt to increase protein yield.

To conclude; the summer project was extremely useful as it has introduced me to a plethora of new laboratory skills and an insight into the practical side of biotechnology and microbiology. In addition it has offered a window into the world of an academic researcher and the range of work undertaken by them. I would like to thank my supervisor Yin Chen for his support and patience as well as Colin Murrell and all the helpful members of his research group and S*f*AM for this grant.

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Richard Chattaway

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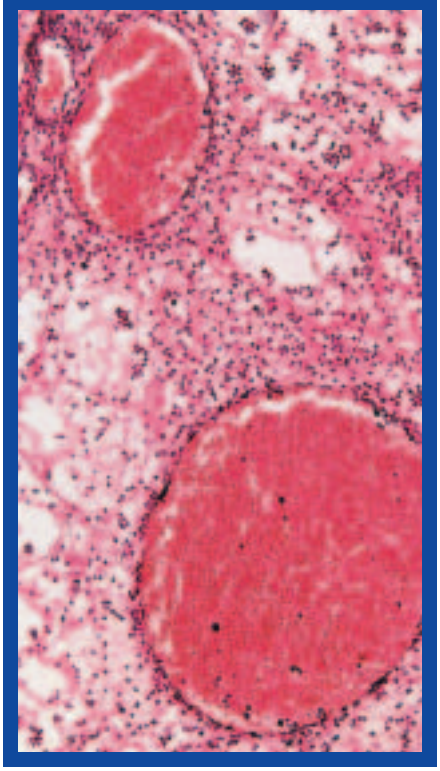
Review of proteomics as a tool in meningococcal vaccine development

Neisseria meningitidis **is a** causative agent of meningitis and septicaemia. It is frequently carried asymptomatically as a commensal in the nasopharynx, only rarely causing disease. As virulence does not confer an evolutionary advantage on the organism it is sometimes described as an "accidental" pathogen. Meningococcal disease develops quickly and can result in the death of a previously healthy individual within hours. As optimal intensive care and disease treatment only offer a small reduction in mortality and survivors can suffer serious morbidity, the prevention of disease through vaccination is preferable.

There are five main disease causing groups of *N. meningitidis* classified according to their capsular polysaccharide. The capsular polysaccharide of the groups A, C and W-135 form the basis of available licensed vaccines. However, due to similarities to host antigens the serogroup B polysaccharide is considered unsuitable as a vaccine candidate. In an attempt to produce a fully comprehensive meningococcal vaccine, protein antigens of the organism have been investigated for their vaccine potential. The most successful protein-based vaccine to date is the outer membrane vesicle (OMV) vaccine. These vaccines have been used to disrupt outbreaks of group B meningococcal disease in Norway, Cuba and New Zealand. The success of these campaigns means that OMVs are likely to form the basis of future vaccine developments.

The OMVs bleb spontaneously from the surface of the meningococcus and are made up of phospholipids, lipooligosaccharides, periplasmic and outer membrane proteins. However, vaccines are manufactured by the extraction of OMVs with detergent, a method that reduces the endotoxin content resulting in a less reactogenic product. OMV vaccines present the host immune system with a complex mixture of outer membrane protein (OMP) antigens, many of which remain poorly characterized in terms of their contribution to protective immunity. In addition, many of these antigens are highly variable, a number are phase variable or their expression is regulated in response to environmental stimuli. Product consistency is, therefore, an essential consideration for the manufacturers of OMV vaccines.

Neisseria meningitidis



The proteomes of a number of OMVs have been deciphered and various proteomic techniques used to examine batch consistency of vaccines and interactions of membrane proteins. Four studies have used one-dimensional SDS PAGE and mass spectrometry to determine the protein profiles of both *N. lactamica* and *N. meningitidis* derived OMVs.

A further six studies have introduced an isoelectric focusing step and separated the proteins of OMVs by two-dimensional electrophoresis followed by mass spectrometry. Together, these studies revealed the vast number of proteins present within an OMV, with over 100 proteins identified in some studies (Wheeler *et al.*, 2007). A number of uncharacterized OMPs were identified. As these have not been described previously they are likely to be in the membrane in low concentrations. There is evidence that proteins found at low concentrations, referred to as minor antigens, could act synergistically to bind the required levels of antibodies required for the bactericidal killing of the meningococcus (Weynants *et al.*, 2007). In addition, 47 hypothetical proteins were identified from the studies providing evidence at the protein level that these predicted coding sequences do encode proteins. Many of these proteins share homology with other bacterial OMPs and could also be minor antigens and therefore play a role in the protective immune response evoked by the vaccine.

A surprising finding from the OMV proteomes was the number of inner membrane or cytoplasmic proteins present in OMV vaccines. A study carried out by Ferrari *et al.* using a mutant with a blebbing phenotype compared detergent-extracted OMVs with natural OMVs (Ferrari *et al.*, 2006). The natural OMVs had far fewer cytoplasmic proteins suggesting the use of detergents in the manufacturing process may be lysing cells, resulting in high levels of cytoplasmic proteins in the vesicle preparations. The impact of these cytoplasmic proteins on the vaccine remains unclear but the manufacturers should optimize the concentrations of detergent used or, conceivably in the future, use a genetically modified strain to produce a vaccine from an organism with a blebbing phenotype. Batch consistency of pre-clinical and clinical batches of OMV vaccines was examined using comparative proteomics and over 70 proteins were found to differ between the pre-clinical batches. This technology is currently being used to compare the proteomes of vesicles derived from the same strain grown in different culture media and the level of expression of a number of proteins have been found to differ. The impact these changes have on protective immunity of the vaccine remains unclear but these studies highlight the need to keep growth conditions of the organism consistent when developing an OMV vaccine.

The proteomic methods described above disrupt the membrane and denature the OMPs. They do not, therefore, give any information about the proteins in their natural state. OMPs are not usually isolated from one another; they interact to form multi-subunit complexes. Carlos Ferrerios' group at the University of Santiago de Compostela has developed methods of running native polyacrylamide gels to investigate the composition of OMP complexes. Using a 2D method of diagonal electrophoresis which separates proteins according to their size, the first dimension in their native conformation and the second under denaturing conditions, they were able to identify complexes containing multiple proteins (Sanchez *et al.*, 2005). The sizes and numbers of proteins involved in such complexes are still unknown but these pioneering developments may provide more information on the structural composition of OMVs.

Proteomic technology offers useful tools for the development of protein-based meningococcal vaccines and quality control tests to ensure their consistency. In conjunction with the ever increasing body of genomic data, it has also contributed to a more detailed understanding of the organism. Proteomic science is more than simply a matter of defining an organism by a long list of proteins; the biological counterpart of stamp collecting. It provides a powerful means of addressing important biological issues. Recent studies of the genomics and population genetics of the meningococcus have gone a long way towards elucidating the genetic relationships between isolates. Through the application of proteomic technology, it is possible to compare the phenotypes of closely related isolates and characterize the phenotypic differences that distinguish the "accidental pathogen" from the normally commensal isolate, thus providing an insight into the evolution of an accidental pathogen. In addition, the virulence determinants identified serve as targets for future vaccine and drug development.

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Caroline Vipond

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Advances in microbial & mammalian cell phenotyping; linking phenotype to genotype

14 and 15 of November 2011. The University of Surrey, Guildford, UK

We are pleased to announce a two day International Biolog Phenotypic Microarray conference to be held at the University of Surrey, Guildford.

The conference will focus on recent advancements in the application of the microbial and mammalian Biolog phenotypic array (PM) to study cell metabolism in relation to genotype. Conference sessions will include presentations on the application of Biolog PM to human, animal and plant pathogens with a particular emphasis on new and emerging pathogens and zoonoses. Other areas to be covered will include antimicrobial resistance and the effects of resistance on microbial cell fitness, mammalian cell phenotyping, and understanding the burden of infection on mammalian cell metabolism.

Confirmed speakers include; Professor Katherine Smart, University of Nottingham, Professor Martin Woodward and Dr Paul Wheeler, AHVLA, Dr John Wain and Dr Claire Jenkins, HPA, Professor Roberto La Ragione, University of Surrey and AHVLA, Dr Gail Preston, University of Oxford, plus many more.

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Mast Launches new AmpC detection set

Mast is pleased to announce the launch of a NEW AmpC Detection Set, the latest innovative product in its hugely successful multi-resistance detection portfolio.

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Lab M's all new information-rich microbiology website includes on-line purchasing facility

Microbiology specialist Lab M has unveiled a brand new website that brings together a wide range of supplies for the microbiology laboratory and offers convenient online purchasing. It details the full range of Lab M's microbiological culture media and supplements, together with a growing number of complementary products for the microbiology laboratory.

A new easy to use online shopping basket gives laboratory scientists everywhere the option to shop as and when they need supplies, putting them in control of routine ordering and complementing the services of Lab M's local distributors. Technical and product information and supporting documentation is available to download from this single source: www.labm.com.

A range of search options means that visitors to the new website can rapidly find the products they are interested in. Certificates of analysis, material safety data sheets, quality certification and accreditation and product guides are there too, together with all the latest news from Lab M.

Importantly, there is a distributor locator to help find local Lab M suppliers. And of course, for anyone wanting guidance on choosing or using Lab M products, the customer support team is there to provide its usual expert service. They can now be contacted directly via the new website, as well as by telephone.

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Unique 3-Port Workstation launched

Introducing the A45 Workstation — the world's first 3-port anaerobic workstation, which will be launched by Don Whitley Scientific at this year's Biomedical Science Congress.

The three gloveports provide easier access, marshalling and organization of plates within the chamber. From a relatively small footprint, this workstation maximizes incubation capacity with a very low temperature gradient throughout. The A45 will accommodate between 700 and 900 x 90mm Petri dishes depending on whether plate carriers are used and what accessories have been incorporated.

The latest in the DWS range, the A45 Workstation has a built-in rapid airlock, colour touchscreen control and instant access ports that eliminate the need for sleeves or gloves. This access system uses eight times less gas when entering the workstation when compared with conventional ports.

Options to tailor the workstation to a customer's specific requirements include:

- Removable front
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- Single plate entry system
- Internal power socket

With the A45 Workstation, sample manipulation within a secure environment is now as easy as working at the laboratory bench.

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Faecal specimens on a swab?

Medical Wire's new Sigma Cary Blair is a liquid medium transport swab suitable for taking faecal specimens directly from a patient, or transferred from a stool specimen. Having the specimen mixed in liquid medium allows it to be handled by automated processors, but can also reduce turnaround times for conventional methods.

The swab set comes with a screw cap vial with liquid Cary Blair medium. The swab is a moulded stick with clearly marked breakpoint and soft foam tip. It can be used to take the specimen directly from the rectal canal, or dipped in the patient's stool specimen. The swab is then snapped into the

vial, and when closed the swab is "captured" by the cap, and will be removed with the cap when opened manually or mechanically. Cary Blair medium is specifically designed for the recovery of enteric bacteria, such as *Salmonella* and *Shigella*, with an alkaline pH to inhibit overgrowth. The liquid format allows easy and direct inoculation of plates or broths.

Sigma Cary Blair is suitable for clinical use, and for staff screening programmes in the food industry.

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NCIMB support for researchers

Do you struggle to maintain and keep track of novel isolates from research programmes when PhD students or Post Doctoral researchers move on? Or are you looking for ways to improve efficiency and reduce costs? Do you need backup to secure your novel isolates before publishing or patenting? NCIMB has the answers. We provide a variety of freeze drying services where we can preserve your isolates (e.g. environmental isolates from research programmes) in ampoules or bottles so you don't have the worry of maintaining stocks.

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The first direct detection kit for pathogenic *Listeria*

Technical Service Consultants new SwabSURE ListeriaP is an innovative, Campden BRI validated, ISO 18593 compliant, easy to use colour-change testing system for presumptive detection of pathogenic Listeria from food contact and environmental surfaces. ListeriaP permits easy differentiation between pathogenic *Listeria monocytogenes* and *Listeria ivanovii* from other background microorganisms including *Bacillus* spp., *Enterococcus* spp., *Micrococcus* spp., *Klebsiella* spp., and other *Listeria* species like *Listeria innocua*., simplifying the testing process involved in meeting safety and regulatory requirements such as HACCP.

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To order your Swab kit for the detection of pathogenic *Listeria* quote order number SS-L01. For further details, validation results or to request a free sample pack of 5 tests please contact us.

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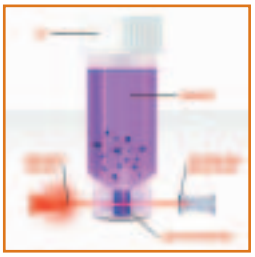
Neogen develops Soleris® assay to rapidly detect heterotrophic bacteria

Neogen has expanded its comprehensive line of food safety and quality testing products to include a rapid assay to detect the growth of heterotrophic bacterial microorganisms (e.g., *Pseudomonas* spp.) in a wide variety of sample types.

Neogen's new Soleris® NF-TVC (total viable count) can produce accurate results in as little as 24 hours — which represents a 24-hour improvement over traditional testing methods that can require up to 48 hours.

Unlike testing alternatives, Neogen's new assay can be used to test large sample sizes. The presence of heterotrophic bacteria, such as *Pseudomonas*, is a critical factor in the shelf life of fluid dairy products, aseptic UHT products, bottled water, and many other food and personal care products. The new Soleris® assay delivers speed and the increased sensitivity over alternative methods that comes with using up to a full 5 ml sample with the Soleris® system. Soleris® is the only rapid microbiological system that is capable of consistently delivering reliable results on difficult product matrixes, while at the same time being an effective, economical choice for common safety and quality testing.



The new assay is a new option for use with Neogen's Soleris® technology, which is now used by hundreds of the world's largest food and nutraceutical manufacturers to detect indicator microbes in a fraction of the time needed for traditional methods.

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Microbank™, the original long term bacterial and Fungal storage and retrieval system, manufactured by Pro-Lab Diagnostics, recently celebrated an 18th Birthday. To coincide with this event a full updated version of the Microbank™ Worldwide Performance Portfolio is now available. This valuable reference tool contains essential long term storage data from many international reference centers for an extensive range of bacterial and fungal cultures including many fastidious species. Copies can be obtained in hard copy or electronic format. Samples of Microbank™ are also available on request.

...and expands facilities

Pro-Lab Diagnostics has recently expanded its European and United States facilities. Both expansions will accommodate increased product range manufacture and distribution, increased customer service support, and product research development. Full onsite customer training facilities have also been included in the European facility for hands on training and customer support with the expanding Prolisa™ range of EIA systems. The Prolisa range now includes *C.difficile* GDH EIA, EHEC EIA, *Cryptosporidium* EIA and *Giardia* EIA. More kits will be added to the range very soon.

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Thermo Fisher Scientific focuses on Dengue and Q Fever in latest issue of Oxoid Culture journal

The latest edition of Culture (Volume 32, No 1) is now available. The issue focuses on two important febrile diseases: dengue, one of the world's deadliest mosquito-borne viral diseases, infecting approximately 50 million people in the tropical and subtropical regions each year, and Q fever, zoonotic illness caused by *Coxiella burnetii* that is normally rare, but recently caused a large outbreak in the Netherlands.

Dr. Byron Martina from the Department of Virology at the Erasmus University Medical Center in Rotterdam, the Netherlands, provides an overview on the clinical course, pathogenesis and treatment of dengue. Incidences of dengue infection, which is transmitted by species of mosquito belonging to the *Aedes* genus, have increased dramatically in recent years.

In a review of Q fever in the Netherlands, authors R.J. Brooke and W. van der Hoek from the Netherlands National Institute for Public Health and the Environment at Bilthoven, and P.M. Schneeberger from the Department of Medical Microbiology and Infection Control at Jeroen Bosch Hospital in Hertogenbosch, the Netherlands, describe a recent large outbreak of Q fever in the Netherlands from 2007 to 2009.

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information

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