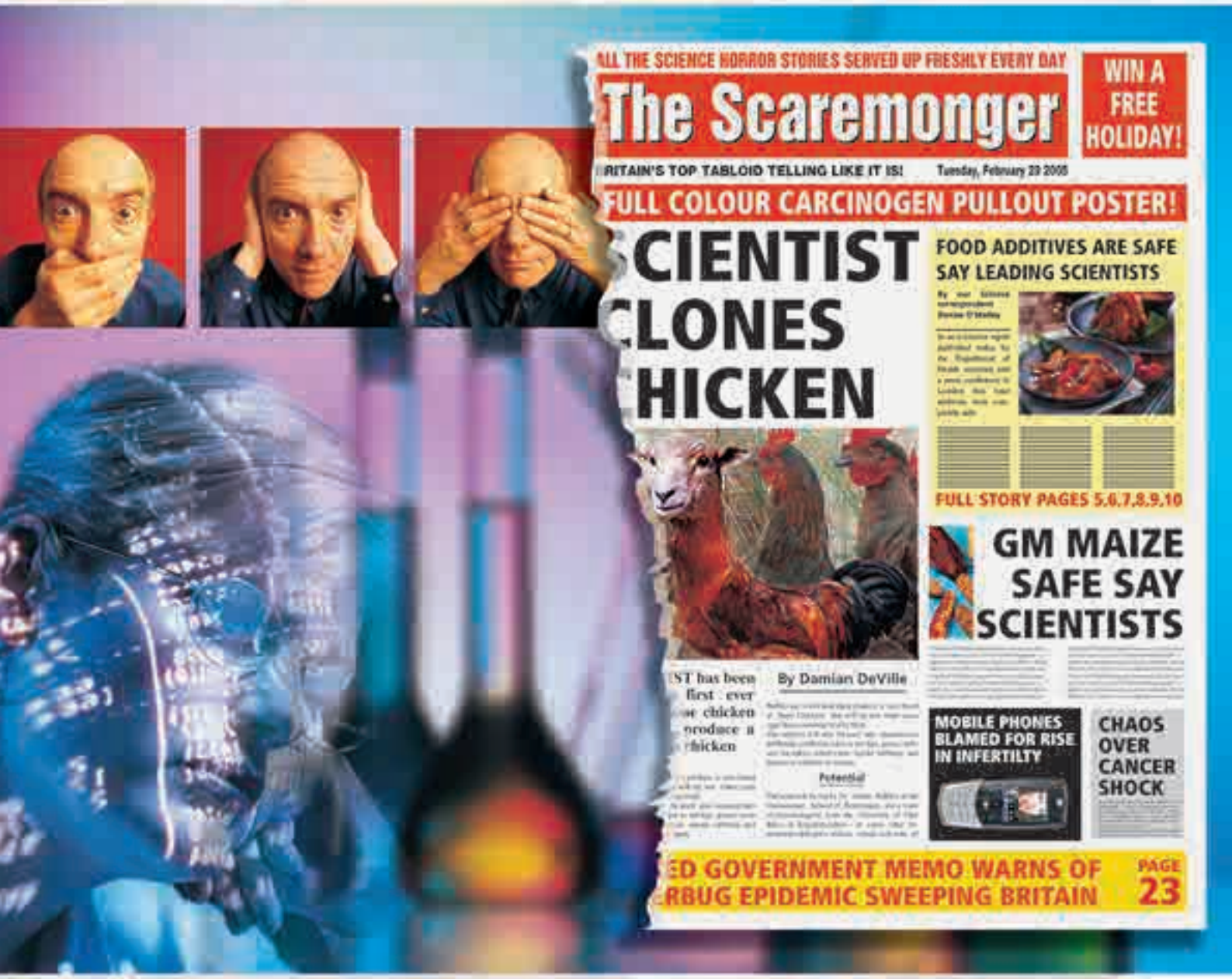
Microbiologist

The magazine of the Society for Applied Microbiology ■ March 2005 ■ Vol 6 No 1 ISSN 1479-2699



SCIENCE AND THE MEDIA: poles apart?

ALSO IN THIS ISSUE:

■ Government science policy ■ Science provision within universities

■ Summer Conference 2005 ■ Tribute to Allan Denver Russell

■ Education in Ethiopia ■ Med-Vet-Net

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The editor is always looking for enthusiastic writers who wish to contribute articles to *Microbiologist* on their chosen microbiological subject. Email: lvharper@dialstart.net

FEATURES

Microbiologist
Vol 5 No.4
December 2004

Contact the Editor:
lvharper@dialstart.net

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Friday 8 July 2005

Vol 6 No.4 Dec 2005
Friday 16 Sept 2005

Vol 7 No.1 March 2006
Friday 16 December 2005

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Please submit all articles, reports, meetings notifications, letters etc., as plain text (*.txt) or rich text files (*.rtf). Please submit all images as original photographic prints or transparencies rather than scanned images and these will be processed by us and returned to you promptly. If your images are only in digital format please make sure they are supplied at a resolution of 300dpi (dots or pixels per inch at a size of not less than 100mm (4 inches) square.

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Website: the society website 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.

www.sfam.org.uk

Editorial

WANT TO HEAR SOMETHING scary? Then pick up any newspaper and I'm sure you'll find at least one story about a microbiological issue which is more than a little worrying. That said, I expect it will only seem worrying if you take it at face value. Obviously, as microbiologists we are all in the privileged position of being able to discern the fact from the embellishments which make a story newsworthy, but what about those who are not in such a position?

How can somebody who's not in full possession of the facts, form a balanced opinion, or even make a life choice, about something that they only know about through the newspapers? Non-scientist friends of mine are often mis-informed about science stories and it's only after talking to me or one of my colleagues that they see the 'bigger picture' and are in a position to put what at first seemed a terrifying headline into some kind of context.

When science fact becomes science fiction and what's reported isn't entirely accurate, who is to blame for this? Is it the fault of the media for printing a story without finding out the facts first, or the scientists performing the experiment for refusing to talk to the media? Our feature article writer for this issue explains the way in which her organisation – the Science Media Centre (SMC) – is helping to bridge the gap between scientists and the media, in the hope that news stories that are published reach the audience with an expert input. I have been to a couple of meetings run by the SMC and would strongly advise the more media-shy of you to go along so that they can help to dispel some of the myths surrounding science and the media. Turn to page 26 to find out how you can get involved.

Also featuring in this issue are some excellent articles by our Presidents fund recipients. One of the topics for this issue is that of bacterial resistance to biocides – a very topical issue I'm sure you'll agree. Other articles discuss L-form bacteria and biodegradation of EDCs in sewage treatment systems.

Finally, I'm very sad to say that this issue sees the final contribution from Jenny Search discussing her stay in Ethiopia. In this issue she reflects on her time abroad, what it's taught her and (though I'm sure she's too modest to admit it) all that she's taught her students. I'm sure you can tell from the photos, she has had a very positive effect

and I'm certain that she'll be sorely missed. If anyone reading this – and I don't blame you for skipping the editorial, I usually do – is about to embark on a similar trip and thinks that the readers of *Microbiologist* would benefit from reading about your experiences then please contact me at: lvharper@dialstart.net with your ideas, or a proposal for a similar regular feature – see Jenny, you really are sorely missed!

Anyway that's enough from me, I hope you enjoy this issue of *Microbiologist* and as you're tucking into your chocolate eggs and other Easter Fare remember 'it's good to talk'.

Goodbye Anouche

I'm sure many of you know Anouche Newman, the Editorial Assistant for *Microbiologist*. Well at the end of the year we said a sad 'Goodbye' as she left her time with us to complete her studies on distant shores – Sydney Australia of all places! On behalf of everyone who worked with her, I'd like to say a big 'Thank you' for her excellent work with SfAM. She will talk about her time with us in the June issue of *Microbiologist* – watch this space!

society for applied sfam microbiology

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Struggling with Stats

FROM: Chris Hodgson
SUBJECT: Enlightening Statistics

The recent article – 'The use of Analysis of Variance (ANOVA) in Applied Microbiology' was a joy to read, as a scientist who struggles with statistics I found it very enlightening, thank you. I do have a question: which computer package would you recommend for such analysis?

Dr Anthony Hilton replies:

Thank you for your kind words, I'm glad you found the article useful. For the ANOVAs I have undertaken recently I have used a piece of software called Statistica. It does take a bit of time to learn how to input the data but it is incredibly powerful and should be capable of doing a vast majority of statistical tests relevant to microbiology.

Check out:

StatSoft, Inc. (2001). STATISTICA (data analysis software system),version 6. www.statsoft.com.

Don't monkey with Darwin

From: John Postgate
Subject: True Syphilitic?

I enjoy the new *Microbiologist* magazine. However, in the December issue (p.28) I was very surprised to see Charles Darwin named among Dr Worthington's list of "Famous documented syphilitics." Although not an expert on his life, I have reviewed two major biographies of Darwin and read several informed articles on him, including medical speculations on the chronic illness which dogged his middle and old age. As most people know, the consensus is that his symptoms match those of Chagas's Disease, very probably acquired from a bite by the insect *Triatima infestans* when travelling inland in South America, ashore from the Beagle. Psycho-somatic disorders have also been proposed, but never have I seen any hint of syphilis - nor any other STD. In view of Darwin's historical importance in Biology, may we have a reference supporting Worthington's assertion—or a retraction?

Speaking ill of the Dead

From: Juan Ramirez
Subject: True Syphilitic?

Mozart was not a syphilitic. It is high time this calumny of one of the world's greatest composers was exposed for the utter nonsense it is. This ridiculous theory stems mainly from the writings of US physicians in the 19th Century, specifically J. Earle Moore (1892-1957), the author of the phrase you have grossly misquoted: "two minutes with Venus, two years with mercury." There is no historical basis for the contention that Mozart was treating himself for syphilis with mercury, nor any credible medical evidence supporting a diagnosis of syphilis. No accounts of his demise mention the typical, prominent features of mercury poisoning: memory loss, excessive salivation, and erethism (from the Greek, meaning "irritation"), which denotes emotional lability, irritability, forgetfulness, timidity, and delirium. Inspection of his handwriting shows no evidence of intention tremor, probably the most common manifestation of chronic mercury poisoning in the 18th century. It is a slur upon the reputation of one of the world's finest composers to continue to repeat this ridiculous calumny, especially when the man himself is quite obviously unable to refute it.

Congratulations to **Emily Darwin** who was one of the MANY correct competition entrants. The correctly filled word search is shown below. Emily will be the recipient of a £30 book token, as could you be, if you enter this issues amusing competition.

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s b h l y o z n e b r b g e n e t i c s o
n a l n r o e n n o i t a t n e m r e f c
a b c s a n y a a i b e r s t s a t n c i
e b i e t v a b t r d c o r e c e e t e y
r o s e n i a s u o e n a t u c b u s m b
l v r g e r n c c i i c a t y t e a o o r
i i g a m u e e c m y r e m r s g n c s a
c n c h i l e s a c d h o e i e o u y n b
h e u p l e v s l y g n t s m x l m t u i
c c t o a n e i h n i c e a a t a i b f a
e c s i v c n o i t a n i t u l g g a l f
a i a r c e b m c b e r o r h e n c r a v
s b d e i r e a o g e i e c n s u e m g l
n o i t a l y r o h p s o h p o f p e e e
i r a c f e e i t a d s o r p t i o n l n
l e e a e t b h c f s f o l i c t a r l e
u a r b n e p q n y e t o s i u n l o u g
b n o e e i u f b s e v i l s r a g b m h
o a b a d i c e i a i r l m c f e a d i a
l v i b r i o c s r a i r b o r n e o b c
g a c e t o n e u g n e d s e t i m o f e
e e d e i o e s s o g e b o l a c e f n a
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On the right are two versions of a photograph taken at the **President's Dinner** in Mayfair last November. See if you can spot the **ten differences** between the two photographs, then ring them on one of the pictures and send this page (or a photocopy) to the Society office by **Friday 15th April** and you'll be in with a chance of winning a £30 book token!

ENTER!

A £30 book token is waiting for the person whose entry we receive first! The closing date for entries is **Friday 15th April 2005**. The answers will appear in the June 2005 issue of ***Microbiologist***.

Name: _____

_____

Address: _____

_____

_____

_____

_____

Simply photocopy this page and send it to:
'Microbiologist Spot the difference competition'
Society for Applied Microbiology,
The Blore Tower, The Harpur Centre,
Bedford MK40 1TQ, UK.

Remember, you could win a £30 Book Token!

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.

India

Dr Ranju Singh

Japan

Mr M Shimura; Dr D Shyu

Jordan

Dr N D Al-Hmoud

Macedonia

Professor V Kakurinov

Mexico

Dr L E Fuentez Ramirez

Nigeria

A A Amakeze; Miss A A Lawal; Mr O Nweze; Dr B O Omafuvbe

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USA

Ms N L Antoville; Mr D Bowdle; Dr A-L Reysenbach; Dr J Subbiah; Mr E Zucatti

Dr Peter Silley explains the importance of Applied Microbiology having a lobbying voice within the political sphere

Much has been made of the formation of the Bioscience Federation (BSF) as the representative voice of the bioscience community in the UK. SfAM has and continues to play a strong role within the Federation and hopefully my contribution in this edition of *Microbiologist* will go some way to explaining the importance of having a lobbying voice within the political sphere. I guess that one of the most important issues facing all scientists at the present time is that of science provision within our universities. Irrespective of whether we work in the public or private sectors it is crucial that our universities are properly funded, such that we maintain and hopefully expand our research base, at the same time as producing quality science graduates.

This contribution does not solely reflect my thoughts but those of the BSF, as part of their response to the Commons Science and Technology Committee Inquiry into science provision within our universities. SfAM contributed to this response and indeed we responded directly as our Committee believes applied microbiology needs to be considered as strategic subject at University level.

The point was made that income from both research and teaching is vital for most institutions, and the challenge is to manage the balance between these according to the standing of departments. Research in universities has been funded at very much below the full economic costs for at least the last 20 years. This non-viable position has been falsely sustained both by stinting on infrastructure and by cross-subsidy from teaching income in research-intensive institutions. The steep gradation in quality related funding between RAE 4 and 5 ratings following the 2001 RAE exercise has impacted particularly on the financial viability of departments ranked below 5, and has been cited as a factor in recent well-publicised decisions to close physical sciences departments. Universities are increasingly pursuing strategies to maximise quality related income, and focusing resources on groups capable of achieving 5 or 5* grades. Science departments scoring below 5 are vulnerable to closure for strategic reasons because of the extra expense for laboratories, technicians and equipment required for teaching as well as for research. While the biosciences have not yet been affected to the same extent as the physical sciences, it should be noted that threats to the viability of disciplines such as physics and chemistry are threats to the underpinning support of the current excellence of UK bioscience research.

The desirability of increasing the concentration of research in a small number of university departments, and the consequences of such a trend is an issue that is uppermost in the minds of the funders. In some expensive areas of biology that require large facilities, or specialised expertise, it is accepted that concentration of resources is an inevitable consequence of a finite budget if high quality outputs are to be maintained. But it is not clear that decisions concerning such research concentration are best achieved through the RAE rather than direct long-term funding for specific projects. The Biosciences Federation has argued consistently that the grade weightings applied after RAE 2001 have led to too much research concentration; it is already greater than in most comparable countries. There is no convincing evidence that research is more productive in large units, while in many disciplines it is clear that small groups can do research of international excellence. Since top-rated departments tend to focus on selected areas of research, further concentration could eliminate whole areas of research and expertise from English universities and reduce the strength in breadth that characterises the UK in international surveys. It is to be hoped that the grade profile approach in RAE 2008 does indeed prove to be efficient in identifying and supporting pockets of research excellence in otherwise less

research-intensive institutions.

Other likely consequences of a trend towards more research concentration include:

- making it more difficult for new areas of research to emerge;
- hindering new research teams outside the main centres from developing and improving their performance;
- reducing the capability to tackle regional research problems;
- restricting the availability of research-informed teaching;
- creating problems for less research-intensive universities in recruiting and retaining staff;
- loss of talented researchers abroad

In a survey of Heads of Biosciences Departments that the BSF undertook in the autumn of 2004, 87% of respondents considered that the current unit of resource for teaching biosciences does not meet the costs of course provision. The consequences noted most frequently were an inability to provide an appropriate level of practical training, field work or project work; an unacceptably high student:staff ratio adversely affecting the student experience; and an inability to renew and maintain high-cost lab equipment. Biosciences courses have to be subsidised by various means, which makes them an attractive target for closure in order to reduce institutional costs. Evidence has been emerging that the difficulty in providing adequate practical training in undergraduate courses is causing problems for the pharmaceutical industry. In his role as Chair of the Association of the British Pharmaceutical Industry Academic Liaison Group, Dr Malcolm Skingle (GlaxoSmithKline) told the Federation: "International pharmaceutical companies have located in the UK in order to interact with the excellent academic research base. In recent years pharmaceutical companies have been alarmed to note that biosciences graduates frequently lack practical skills that would formerly have been taken for granted, and this has encouraged companies to recruit more staff from abroad". This is not a problem that is unique to the pharmaceutical sector as many other employers would agree.

The question as to whether teaching can be separated from research has been raised in a number of consultations over the years. I certainly believe that exposure to research is needed to provide enthusiastic teaching. As the BSF report emphasised, there is in the absence of research a risk of teaching becoming stale, outdated, and uninteresting. Among less research-intensive universities there is scope for imaginative solutions as to how to expose final year undergraduates to research-informed teaching, including developing creative links with neighbouring research-intensive universities, institutes or industries, whilst focusing themselves on resources and innovations in teaching. Consideration also needs to be given to alternative models of higher education. Two-year Foundation degrees in specialised, teaching-only institutions could be encouraged for many students, with transfer to research-intensive institutions for an Honours year only for those both seriously considering, and capable of pursuing, a research career.

With respect to the importance of maintaining a regional capacity in university science teaching and research, SfAM believes that it is crucial to link academic science and industry.

Government policy is to encourage the development of SMEs and the existing science based industries. Industry and SMEs need a local research institution to provide them with the help, knowledge and advice they need. That University will benefit as will the local community and the country.

In conclusion SFAM believes that a policy based on a blend of market led forces, coupled with a strategy to protect and encourage subjects which are of strategic importance for the UK, is needed. This policy needs to recognise that students studying the, so called hard and strategic science subjects, such as chemistry, physics, applied microbiology and biochemistry often have careers in other disciplines. For example, these subjects are essential for medicine, dentistry, pharmacy and veterinary degrees. I am sure that you will all agree that applied microbiology must be considered as a core subject of strategic importance, we need to make a case now before it is too late.

Peter Silley

2004 sfam Ordinary General Meeting

Ordinary General Meeting of the Society for Applied Microbiology. Wednesday 12th January 18.00. The DeVere Dunston Hall Hotel, Norwich

Apologies for absence

Peter Silley, Keith Jones, Diane Newell, Valerie Edwards-Jones, Muriel Rhodes-Roberts, R.G.Board.

Present

Leon Gorris, David McCleary, Valentine Ogonna Nweze, Amakeze Azukiba Ambrose, Bridget O. Omafuvbe, Anthony Moore, Linda Thomas, Ronald Lambert, Martin Adams, Lucy Harper, Alan Godfree, Alan Kitchell, Malcolm Dowson, Susannah Walsh, Graham Pettifer, Laura Muchie, Robert Madden, Basil Jarvis, Maurice O. Moss, Aynsley Halligan, Barbara Lund.

Membership

We currently have 5 classes of membership – Full members, Honorary Members, Student including Associated Student Members, Retired Members and Corporate Members.
We propose to have a new class of membership called **Associate Membership** which will be open to those with an interest in applied microbiology without it being a prime aspect of their job. For example, schoolteachers, existing associate student members and those members taking a career break, on maternity leave, or working temporarily in other areas.
The benefits of **Associate Membership** will include:
Quarterly copies of the *Microbiologist;*
Reduced registration rates at SfAM meetings; The opportunity to apply for a grant from the Presidents fund subject to completing one full years membership.
The proposed fee for 2004/2005 is: £15 by cheque or £12.50 by direct debit instruction.
Associate membership will replace the Associate Student and these members will automatically become Associate members.

This will involve a change in the wording of the constitution to accommodate this new class of membership. The constitution will also be amended to reflect the Retired and Honorary classes of membership.

Proposed additional wording of the Constitution:

3(c) Associate Members: Admission to Associate membership is at the discretion of the Committee, so long as such admission is not unreasonably withheld, and is subject to receipt of the appropriate subscription annually.

3(d) Honorary Members and Retired Members: Admission to these classes of membership is at the discretion of the Committee.

Proposed by Martin Adams
Seconded by Alan Godfree

Custodian Trustees

At the AGM on 6th July 2005, Committee will be proposing that Professor Basil Jarvis and Dr Peter Silley be proposed as custodian trustees of the Society for approval by members.

SfAM WEBSITE www.sfam.org.uk

Have you visited the SfAM website lately? As well as keeping you up-to-date with SfAM news and activities, it offers full SfAM members many other services.
If you are a Full Member or Full Student Member, log on, using your SfAM username and password, to:

- advertise microbiology job opportunities (free!)
- post your CV (free!)
- advertise your microbiological skills or consultancy (a small annual fee is required)
- take part in the Discussion Forum

Have you forgotten your username and password? Go to the website and click on 'Services' - 'Member Log on' and then follow the instructions on that page to have your username and a new password emailed to you.

Don't miss out on our wide range of grants, including our newest grant, the SfAM Fellowship. Details and application forms can be found at:

www.sfam.org.uk/members/prizes.php

Coming soon – online booking for the Summer Conference in Brighton (Spore-forming bacteria – emerging and re-emerging issues).

In Memoriam: Professor A D Russell

A Tribute to **Allan Denver Russell** (1936 - 2004)

I AM WRITING ON BEHALF OF the Welsh School of Pharmacy to express our great sadness at the loss of A. Denver Russell, FRPharmS. Denver devoted virtually his entire career to the School, being responsible over a forty-year period for the development of teaching and research in Pharmaceutical Microbiology. During this time, some forty-five of his research students obtained PhDs, he produced over 450 publications on microbial inactivation, and was author or editor of sixteen books including the standard undergraduate text *'Pharmaceutical Microbiology'* with W.B. Hugo.

Denver was a leading world authority on biocide usage and its possible association with antibiotic resistance. His expertise was recognised in appointments to national and international advisory committees, membership of editorial boards, and external examining roles. His Fellowship of the RPSGB (1981) was awarded for distinction in the science of pharmacy, and his published achievements resulted in Fellowships of the Royal College of Pathologists in 1982 and of the American Academy of Microbiology in 1999. This latter was a rare accolade for a UK scientist.

Denver was extremely hardworking and dedicated to his subject, maintaining a research position at the School long after his official retirement. He was always delighted to pass on his enthusiasm to others and was inspirational to his junior microbiology colleagues. He was a great ambassador for pharmaceutical microbiology and good science and will be greatly missed by his friends and colleagues, not just in the Welsh School of Pharmacy, but worldwide. We extend our deepest sympathies to his wife Margaret, son David and family.

The career of Allan Denver Russell

Allan Denver Russell obtained his Pharmacy degree from the University of Wales in 1957, registering in 1958. After obtaining his Doctor of Philosophy degree in pharmaceutical microbiology from Nottingham University working under Dr W.B. Hugo he returned to Cardiff School of Pharmacy as an assistant lecturer. Successive promotions brought the award of Personal Chair in 1991. Professor Russell was awarded a DSc from the University of Wales in 1975 and a Fellowship of the Royal College of Pathologists in 1982. In 1999 he was elected Fellow of the *American Academy of Microbiology.* Professor Russell retired from his full time post in the School of Pharmacy in 2001, but remained a part-time research Professor in the School.

Denver has always been closely associated with the *Society for Applied Microbiology* since 1971 when he first joined. He was co-opted onto Committee in January 1980, elected to Committee in 1982 and served until 1984. In 1984, he served on the Sub-Committee that recommended nomination to award the W H Pierce Memorial Prize. Denver represented the Society on BSI Technical Committee *'Biological Test Methods'* and served as spokesman for the Society on the Federation of European Microbiology Societies (FEMS) International Affairs Committee. Denver was always passionate about his writing and apart from his numerous publications, he contributed to the Society's Technical Series Number 16, *'Disinfectants - Their Use and Evaluation of Effectiveness'* and Number 27; *'Mechanisms of Action of Chemical Biocides'* with B N Dancer and E G M Power. He also served as a Senior Receiving Editor for *Letters in Applied Microbiology.*

Denver was always enthusiastic to pass on his knowledge to others and to talk about his work. During his long and dedicated career, he trained many of us who are now associated with the Society. He organised the Special Topic Session for the Society on "Virucidal Activity of Disinfectants" at the Winter Meeting in Bradford in January 1981 and was associated with the planning of the scientific programme of many meetings, most recently the SfAM Summer conference *'Antibiotic and biocide resistance in bacteria: Perception and realities for prevention and treatment of infection'*, organised in Swansea in 2001.

Denver was a tireless contributor to scientific conferences, as busy in his retirement years as he was before. Through his presence on the international stage he did much to raise the profile of applied microbiology and particularly antimicrobial action. Despite being held in such regard, Denver remained a modest, and truly gentle, man. He will be deeply missed.

Stephen P Denyer and Jean-Yves Maillard

Call for nominations to Committee

Dr Valerie Edwards-Jones became the New Honorary Treasurer in January 2004. This caused an incidental vacancy and Committee invited Dr Geoff Hanlon, who stood for election last year, to fill the vacancy until the new elections in July 2005. In addition, two other members of Committee are due to retire in July 2005 after their three years of service: Dr Julie Eastgate and Dr Ian Feavers; thus, there will be three vacancies to fill in July 2005. Nominations are invited from all full members of the Society for these vacancies. Nominations must be made in writing and received at the Society Office by 17th May 2005. Should nominations exceed vacancies, election will be by a system of postal voting arranged by Committee.

Your Society needs YOU!

SfAM is the voice for Applied Microbiology and often gets requests by journalists for background briefings or information. Are you interested in being part of a small group which will brief the media about applied microbiology? If so please contact **Nigel Poole** in Public Affairs at the Society Office. Phone 01344 750248 or email him at: **Sekona@btopenworld.com**

Sponsor a new Member of the Society and win a £50 Book Token!

Could you be the next winner of the 'SfAM Sponsor of the Year' Award?

If you feel you could be our next winner for 2005, and would like some promotional material to help you recruit new members please contact Julie Wright, Membership Co-ordinator on 01234 326661 or email julie@sfam.org.uk.

Marathon Man!

Keith Jones, Convenor of the Society's Environmental Group, is running the London Marathon in April on behalf of WaterAid. Anyone wishing to sponsor him can contact him by e mail at: k.jones@lancaster.ac.uk

Alternatively, you can contribute directly to his WaterAid sponsorship web site: http://www.wateraid.org/M053313

Call for nominations for W H Pierce Prize Award

Do you know a young microbiologist (under 40 years of age) who has made a substantial contribution to microbiology? If so, why not nominate them for this prestigious and substantial award which is worth £2,000. The award was instituted in 1984 by Oxoid to commemorate the life and works of the late W H (Bill) pierce, former chief bacteriologist at Oxoid Ltd and a long-time member of the Society. The prize is presented annually at the summer conference. Full Members wishing to make a nomination for the 2005 prize should write in confidence to the Hon General Secretary, Dr Anthony Hilton, at the Society Office in Bedford, including a full cv of the person nominated and a letter of support. Please note there are no official forms for this award.

Closing date for nominations is 5th June 2005.

Please note that application is through nomination by Full Members of SfAM only.

2004 W H Pierce Prize Winner

MY CAREER IN MICROBIOLOGY began as a trainee medical laboratory scientific officer (MLSO) at Preston Public Health Laboratory in 1991. I had graduated from Manchester University that summer with a degree in biology but I still wasn't sure what I wanted to do next. However, fate (if there is such a thing) intervened and an advert for the trainee MLSO post caught my eye and about three weeks later I found myself at the Preston lab beginning my training in diagnostic microbiology.

I soon realised that I enjoyed the work and I was destined to be a microbiologist. During the two year training for state registration I rotated into many of the sections of the laboratory and gained a wide range of experience. This included clinical bacteriology, virology, mycology plus food, water and environmental microbiology. I particularly remember how much I enjoyed working in food and water microbiology, experience which would prove very useful for my later research work. The training also included ten weeks at the media production lab which was housed at another local institution responsible for caring for the mentally ill. During my time at the 'asylum' I had the chance to get my hands dirty making media for a whole range of different tests and organisms. In these days of pre-prepared media many microbiologists have little chance to learn about how media is prepared although it is the foundation of diagnostic clinical microbiology. Following the relatively scary experience of passing the oral examination I became state registered as an MLSO. For the next two years I worked in various sections of the lab gaining further experience and understanding of clinical microbiology and participating in 'out of hours' and 'on-call' work. On-call is very much the 'sharp end' of clinical microbiology where you can find yourself staring down a microscope in the 'wee hours' of the morning at urgent samples from very ill patients. On-call work is a good reminder of the importance of clinical microbiology in the diagnosis of human disease, and I have great admiration for my colleagues who still have to answer 'the call' in the dark hours of the night.

Andrew Sails (right) receiving his prize from Mike Smith of Oxoid

At this point further education beckoned and I registered part-time for the Masters degree in Biomedical Science at Manchester Metropolitan University. In the final year of the course I had the chance to perform my first 'proper' research project in the *Campylobacter* Reference Laboratory at Preston with Dr David Wareing. David has an encyclopaedic knowledge of *Campylobacter* and during my time in his laboratory he shared this knowledge unreservedly. Those of you who know David will also be aware of his great enthusiasm for microbiology and this enthusiasm definitely rubbed off on me. For the project we chose to characterise the bacteriophages of the Preston *Campylobacter* phage typing scheme and I soon found myself growing large volumes of the individual phages which we characterised by EM, restriction enzyme analysis and PFGE. During this time I was also fortunate to begin working with Professor Andrew Fox and Professor Eric Bolton of the Manchester and Preston PHL laboratories respectively. I am particularly proud of this project because it formed the basis of my very first 'first author' paper in the *Journal of Medical Microbiology*. In 1995 I submitted the thesis and finished the MSc and I decided that a permanent switch to research rather than diagnostics was inevitable.

A successful grant application to the Ministry of Agriculture, Food and Fisheries prepared by Eric, Andrew and David gave me with the opportunity to stay in research for a further three years and provided the research work for my PhD. The study involved investigating PCR-based methods to detect *campylobacter* in foods and related environments. We developed a range of PCR assays including PCR-ELISAs, real-

time quantitative assays and reverse transcriptase assays to detect and characterise campylobacters. We then applied the assays to the detection of the organism in foods and environmental waters.

I particularly enjoyed this aspect of the work because I would go out and collect the samples myself — either meat samples from the local butchers or water samples from local rivers, lakes and streams. On one of these forays for samples in the middle of winter I found myself on Lytham seafront with the sea breeze blowing sheets of heavy rain into my face. As I waded into the shallows near the beach I stood in a patch of what must have been quick sand and watched as one leg began sinking at a rather unnerving rate into the sand below. It was quickly over the top of the wellie and I found myself wondering if this had been such a good idea. A quick look up and down the beach confirmed that I was alone and the fact that no one at the lab even knew where I was collecting samples that day 'upped the ante' somewhat. Things were not looking very good and I found myself imagining the headlines in the local paper, *'Young microbiologist lost at sea.'*

It was time for evasive action particularly because the other leg had also started disappearing at an equally alarming rate. The only course of action appeared to be to jump literally out of the wellies and head for higher ground. Thankfully this plan proved successful and I found myself on higher ground albeit minus the boots. When I got back to the lab later that morning I was so embarrassed that I never told a soul, so if any of my former colleagues are reading this, all of those trips out collecting samples weren't quite as uneventful as I led you to believe!

As my PhD studies began nearing completion I started considering my options for Postdoctoral study. I particularly favoured doing a postdoc over in the USA and so I contacted the Foodborne and Diarrheal Diseases Branch at the Centers for Disease Control and Prevention (CDC), in Atlanta, USA to enquire about possible opportunities. Following a very positive response from them I met up with my future postdoc supervisor Dr Patti Fields (Head of the *Salmonella*, *Campylobacter* and *Helicobacter* laboratories, CDC) at the International *Campylobacter* meeting in Baltimore. Here we discussed our mutual research interests and drafted out a proposal for a research program for a postdoctoral fellowship at the CDC. The PhD work progressed well and by June 2000 I had a PhD thesis ready for submission plus a number of papers either submitted or close to submission.

Things got a little tricky at this point because the CDC wanted me to start the work in September but in the two months previously, my partner and I planned to sell our house, get married and I had to sit my PhD viva. These things taken individually are considered to be pretty stressful but to do them all at the same time probably seems insane. Thankfully the wedding in August and the viva in early September went fine with the PhD thesis requiring only minor corrections and so the big move to the US was all scheduled for later that month. Unfortunately just as the Dutch Proverb says 'In good times, beware', things suddenly went a little bit wrong.

Just four days before we were due to fly out to Atlanta, our house sale fell through. We were absolutely mortified because we planned to use the money from the house sale to set us up in Atlanta. The next day was spent flying between the estate agent, the solicitor, and the bank sorting out renting the house instead of selling. When we finally boarded the flight to Atlanta two days later the magnitude of the events of the preceding months finally sank in and my wife and I spent the first three hours of the flight staring straight ahead and wondering what on earth we had done. Rest assured, we had made the right decision and within a few weeks we were settled into our new home in one of Atlanta's suburbs. Life in Atlanta was very different from Preston but we quickly grew to like it and we now both have a great affection for the city and its people. They say the English are friendly but I am afraid the 'good folks of Georgia' are friendlier still.

As we both adjusted to life in the 'Deep South' I settled into the post at the CDC where I conducted research into the development of DNA sequence-based subtyping of *Campylobacter* and other foodborne pathogenic bacteria. We chose to use a multi locus sequence typing (MLST) approach and initial studies investigated if the clonal groupings identified by MLST reflected those recognised by multi locus enzyme electrophoresis (MEE). Further studies investigated alternative gene targets to provide additional discrimination, a requirement if the MLST approach is to be useful for prospective public health surveillance. During the 30 months I was at the CDC I had the opportunity to present my work at conferences and meetings all over the world.

My lab-based training was also supplemented by a range of courses organised by the CDC which included subjects such as software analysis of sequence and fingerprinting data and phylogenetic analysis. During this period I also had the opportunity to attend the *American Society for Microbiology* Summer Institute for Preparation for Careers in Microbiology in 2002 through the kind sponsorship of SfAM and the President's Fund. I found this immensely useful and would advocate it to other final year PhD students and postdoctoral scientists (further details at http://www.asmgap.org).

During the third year at the CDC I started searching for a permanent post back in the UK. In November that year a post became available and I eventually rejoined the PHLS at the Newcastle Laboratory in March 2003 as their Principal Clinical Scientist and Head of Research and Development. Here at the Newcastle lab I am responsible for the development and implementation of molecular-based diagnostic assays for the detection and epidemiological fingerprinting of pathogens in clinical samples. In particular, my work has concentrated on the epidemiological fingerprinting of *M. tuberculosis* using VNTR-based methods. I am enjoying the new challenges the role has given me and particularly being back at the 'sharp end' of microbiology in a diagnostic clinical laboratory.

Since leaving Atlanta we have been back to visit colleagues and friends several times and have very fond memories of our time there. In closing I would like to say that I was extremely honoured to receive the 2004 Oxoid W. H. Pierce Memorial Prize and feel very flattered that the awards panel considered my contribution to microbiology worthy of such a prestigious award. It was a great pleasure to be able to attend the summer meeting to receive the award and to give the memorial lecture. I would also like to thank the Directors of Oxoid for kindly sponsoring the prize.

Andrew Sails

PhD Fellowships in Denmark

TRAINAU (Training Risk Assessment In Non-human Antimicrobial Usage) is offering Seven PhD Fellowships in Denmark. **TRAINAU** provides multidisciplinary early-stage research training on identification, characterisation and assessment of public health risks associated with non-human use of antimicrobials.

TRAINAU is sponsored by the EC **Marie Curie** Early Stage Research Training programme. The Early Stage Training site consists of six inter-related research groups located at two universities, The Royal Veterinary and Agricultural University (KVL) and The Danish University of Pharmaceutical Science (DFU) and two national reference laboratories Statens Serum Institut and Danish Institute for Food and Veterinary Research.

Candidates from Member and Associated States of the European Community and from Third Countries can apply for these **Marie Curie Host Fellowships**. Danish citizens living in Denmark cannot apply.

Please visit www.trainau.dk for further information.

The closing date for applications is May 1st 2005.

Dynal Biotech Microbiology Products:

Dynabeads® anti-Salmonella
Dynabeads® anti-*E.coli* 0157
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Dynabeads® anti-Cryptosporidium kit
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Tel: 44 151 346 1234
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Email: ukcustserv@dynalbiotech.com

Website: www.dynalbiotech.com

MED•VET•NET

Teresa Belcher reports on the Challenges facing Med-Vet-Net

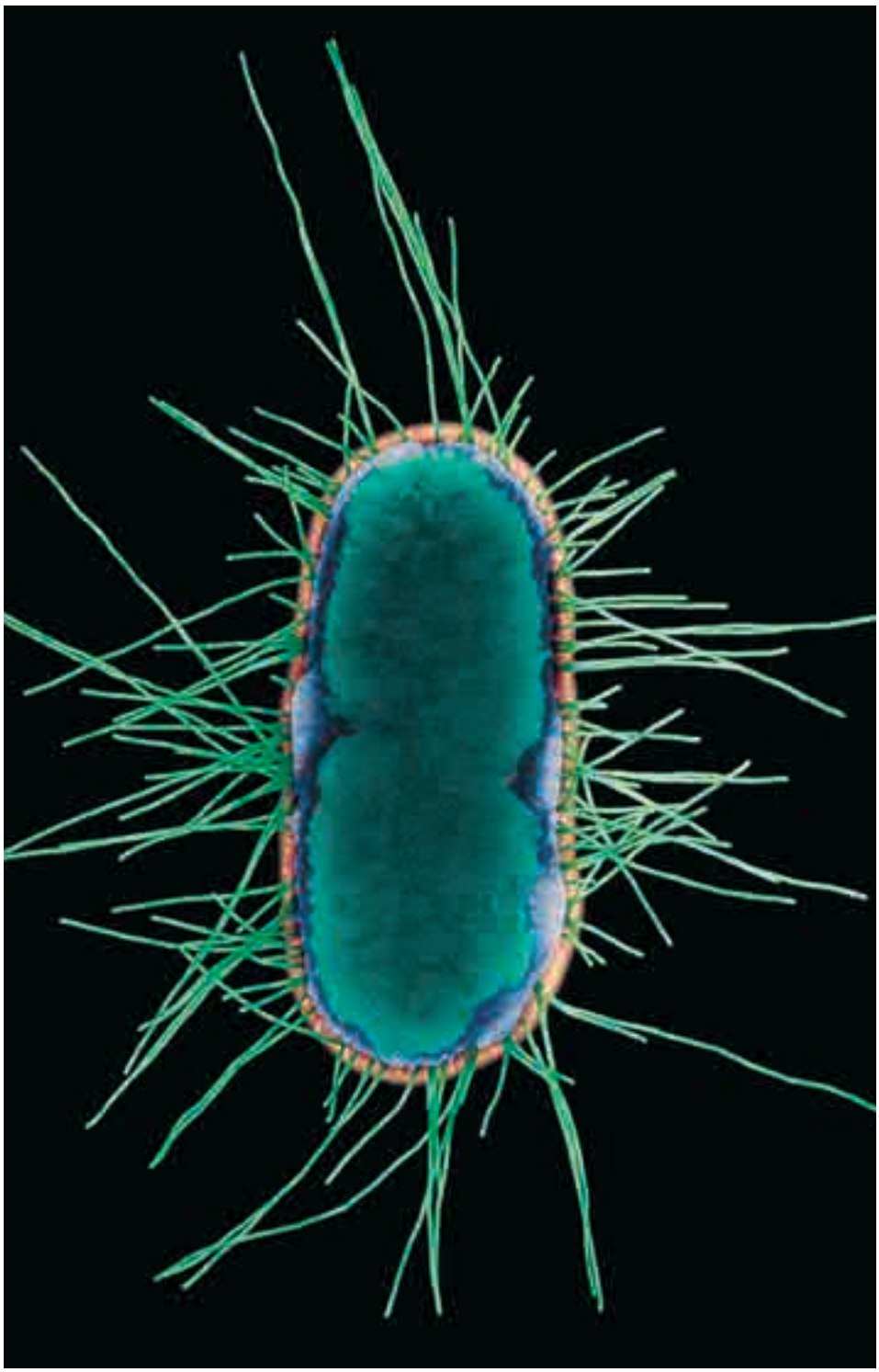
MED-VET-NET IS A EUROPEAN Network of Excellence that aims to improve research on the prevention and control of zoonoses by integrating veterinary, medical and food science research. Comprising of 16 European partners and over 300 scientists, **Med-Vet-Net** will enable these scientists to share and enhance their knowledge and skills, and develop collaborative research projects. **Med-Vet-Net** officially commenced on 1 September 2004, and is funded to the value of €14.4 million for 5 years.

Infectious diseases remain a major public health concern worldwide, causing over 14 million deaths per annum. Of the 1,415 species of infectious agents known to be pathogenic to humans, about 61% are able to be transmitted from animals to humans. These 'zoonotic' diseases are particularly important as potential sources of emerging or re-emerging diseases accounting for around 75% of them. Thus, the role of animals, including wildlife, as reservoirs of potential and existing public health problems, transmitted via food or other routes should not be underestimated.

Raised public awareness of infectious diseases

The timeliness of, and need for, an integrated European network to coordinate research on zoonoses has been dramatically illustrated by the "mad cow crisis" and more recently the outbreak of severe acute respiratory syndrome (SARS). Fuelled by media attention, coverage of such issues has raised public awareness of food safety. Television news programmes now frequently contain items on the contamination of foodstuffs with pathogens including *Salmonella* in eggs, *Campylobacter* in poultry meat or *Cryptosporidium* in water.

Even more recently, there has been considerable media coverage on the possibility of a flu pandemic arising from south-east Asia where bird flu has already killed 32 of its 45 human victims. If the



flu virus from a bird infects someone who already has a human flu virus, then it is possible for the two to combine and produce a lethal and extremely contagious new strain. This new strain would then have the potential to be transmitted from human to human potentially resulting in a worldwide crisis like the pandemic of 1918 and 1919. Almost one hundred years ago, this deadly and fast-spreading flu killed an estimated 20 million people worldwide.

Prioritising disease research

The research challenges that **Med-Vet-Net** face are many and complex. In order to control zoonotic diseases across Europe, it is necessary to detect and identify the human disease, understand the transmission routes and the critical control points, and introduce effective intervention. However, as existing disease agents are constantly changing and new disease agents emerging, continuous research is needed to ensure the risks are recognised and that appropriate controls are put in place.

The first task of the Network is to prioritorise the diseases for investigation. In November 2003, the European Parliament and Council defined Lists A and B of the Directive 2003/99/EC which specifies those zoonotic agents and diseases considered relevant to the EC. List A, are those zoonoses which must be included in monitoring – Brucellosis, Camplyobacteriosis, Echinococcosis, Listeriosis, Salmonellosis, Trichinellosis, Tuberculosis due to *Mycobacterium bovis* and Verotoxigenic *Escherichia coli.* List B defines viral, bacterial and parasitic zoonoses and zoonotic agents that are to be monitored according to the epidemiological situation, including Hepatitis A, Influenza virus and rabies *(E. coli)*.

Different priorities throughout Europe

In Europe, the relative importance of zoonotic diseases can vary across countries. For example, salmonella and rabies are high priorities for all. However, the agent causing the serious parasitic disease Trichinellosis, is considered relatively unimportant in the UK, which is declared trichinella-free, but highly important in France and Eastern Europe where it can be transmitted through the consumption of meat.

Priorities can also vary with demography. For example, infectious

agents like *E coli* O157 generate significant public interest because of the implications for children and the elderly, but in fact this agent contributes relatively little to all cases of foodborne infectious diseases.

As all partners of **Med-Vet-Net** have variable levels of breadth and expertise in these pathogens, combining their resources will raise the overall ability to respond to requirements for research.

Public health versus veterinary perspective

Historically, there has been a clear separation and lack of interaction between public health and veterinary laboratories, and research and understanding into how diseases can move from animals to humans. Med-Vet-Net aims to significantly improve the communication channels between the two. Microbes that cause disease in humans may not necessarily cause a veterinary problem and therefore may be difficult to detect, and consequently control, in the original animal host. This is particularly true for new and emerging diseases, with the viral agent causing SARS as a good example. Even though the virus was isolated and identified with incredible speed, the animal source and route of transmission remain debatable two years later. Without this knowledge, future outbreaks of SARS cannot be effectively prevented.

Humans' and animals' differing reactions to infection are also relevant to the development of control strategies for existing zoonoses. For example, the bacterial agent *Campylobacter jejuni* is the most common cause of human food-poisoning worldwide, and is thought to be largely transmitted through contaminated poultry meat. Although most chickens, turkeys and other poultry carry large numbers of this organism in their gastro-intestinal tract, they have no symptoms and therefore cannot be readily identified. This means that farmers and veterinarians do not recognise the problem, so there is little incentive to deal with it.

An integrated approach

Med-Vet-Net will consider both human and veterinary aspects of zoonotic diseases. Participating specialists include medics, veterinarians, epidemiologists, risk analysts, statisticians, immunologists, microbiologists, food scientists and molecular geneticists. This interdisciplinary approach will allow research from specialised disciplines focusing on different disease agents to be shared across regional, national and international borders.

Further Information

■ For more information, visit our website at http://www.medvetnet.org/ or contact me at the SfAM offices in Bedford on: **+44 (0)1234 271020.**

Next issue: A look at how Med-Vet-Net is solving these challenges.

Teresa Belcher
Med-Vet-Net Communications Director

Education in Ethiopia

In the seventh and final article in her series, **Dr Jenny Search** reports on her continuing two-year voluntary service overseas placement at Debub University in Ethiopia

I AM LEAVING. I have taught my last lecture, my last lab, set and marked my last exam and marked my last lab reports. While I've been here

I've taught over 700 students from first year to fourth year. The class sizes have ranged from 28 to over 200 students. I have taught labs to 90 students at a time in rushed 90 minute slots and have had relaxed 3 hour practical sessions with final year biology students. The last few weeks have been quite emotional, attending farewell parties and wondering when I will next see these people again.

It's definitely a time for reflection as I think about all I have learned during my time here. The media portrays a very unbalanced view of Ethiopia. Like most people in Europe, I associated Ethiopia with famines and thought it would look like a desert. The first thing that struck me when I arrived was how lush and green some parts of the country are, especially in the south where I was living. The diversity across the country is also remarkable. There are eighty-three languages and two hundred dialects spoken in Ethiopia. The country is very mountainous, the highest point is higher than 4400 m, even where I was in Awassa in the Rift Valley, at 1700 m we were higher than the highest point in the UK!

Ethiopia is one of the poorest countries in the world with 85% of the population reliant on subsistence farming. There are many problems facing education in the country, especially in rural areas (See Table 1) and Ethiopia, like much of Sub-Saharan Africa, is severely affected by HIV/AIDS.

The total number of people living with HIV/AIDS in Sub-Saharan Africa is 28.1 million, accounting for more than 70% of the 40 million people living with HIV/AIDS worldwide (1). In 2000 it was estimated that 3 million adults and children in Ethiopia were living with HIV/AIDS (See Table 2 for some statistics). At a household level, HIV is having a real impact on wealth. Illnesses related to HIV/AIDS exacerbate this by reducing time spent working (including teaching) and increasing the number of hospital beds occupied by patients with AIDS-related illnesses.

VSO is trying to tackle some of these problems by mainstreaming HIV and AIDS into every placement. This means that I was expected to include some activities that addressed some of the problems of the epidemic. The idea of mainstreaming is that these activities should be part

Far left: *Debub University Main Campus - The main method of transport to the campus is bicycle*

Left: *The leaving party arranged for me by the final year students of the applied biology department. I will never forget them*

Right: *Me and Colleagues - me wearing traditional Ethiopian dress*

Table 1. Problems Facing Schools in Ethiopia

Problem	Comments
Low enrolment rates	due to negative attitude to education; nomadic migration of families; distance from nearest school
High drop out rates	Children are needed for domestic tasks; early marriage; abduction of girls for marriage; inadequate sanitation; teacher/pupil relations
Lack of adequately trained teachers	
High turnover of teachers in rural areas	Teachers prefer to work in urban areas
Lack of female teachers	
Lack of infrastructure	Inadequate buildings; insufficient furniture; inadequate or no water; inadequate or no sanitation
Lack of teaching materials and textbooks	In general and in local languages

Table 2. Summary of statistics available from the UN (2000) regarding prevalence rates of HIV in Ethiopia

Year	Site	People tested	HIV Prevalence
1997	Addis Abeba	Antenatal attendees	18%
1993	10 sites outside Addis Abeba	Antenatal attendees	4%
1990	Addis Abeba	Sex workers	54%
1998	22 sites outside Addis Abeba	Sex workers	5-38%

of the normal working day rather than one-off events that may not be repeated. For example, during an immunology course we took the students to the regional health bureau to demonstrate how the ELISA test for HIV is performed. This test is routinely performed on antenatal clinic attendees at the major hospitals and clinics in the region. So not only did the students see how an ELISA was performed they gained information about HIV prevalence in the area that they live in. Next semester some of the senior student projects involve surveying students to find out about their attitudes and sexual behaviours relating to HIV and AIDS.

Despite these problems, the country is developing fast and money seems to be being pumped in from many sources. Even in the two years I have been here, new housing developments, factories, shops and hotels have sprung up all over the place.

The University was just a couple of buildings when I arrived and taught some of the first ever classes on the new campus. Now it is a sprawling campus with flowers everywhere and thousands of students. The first graduations from the Faculty of Natural

Sciences will take place this summer and I am sorry I will miss them.

As I have developed my skills and knowledge, so have my colleagues and students. We have learnt so much from each other. We have worked together in a difficult and constantly changing environment. Our offices are housed in temporary structures which heat up like ovens in the sun and leak when it rains. Regardless, the department has remained determined and used whatever resources are available. I've prepared courses including laboratory classes from what seemed like nothing when I started. This semester, the labs have been greatly assisted by a large delivery of equipment for which the department has been waiting for several years. We have lots of microbiological media which I have been incorporating into the labs in order to put them into use.

Our final year students will start their final year research projects this semester. The microbiology projects have been very popular and my colleagues will be very busy supervising students. Some of the students will investigate the incidence of food-poisoning organisms in fruit juices from local restaurants as well as bacteria carried by cockroaches and other insects. Others will investigate traditional methods of improving the quality of drinking water which will complement our research looking at the bacteriological quality of the drinking water supply. The students are enthusiastic about their projects and I am looking forward to hearing about the results.

Now I will return to the UK which seems many worlds away. Now doubt I will settle back to the commercialised lifestyle very quickly and will forget what a privilege it is to having running water and hot showers. However I will never forget Ethiopia, its varied peoples and its thirteen months of sunshine (Ethiopia uses the Julian calendar). It has not been easy living here but it has definitely been a worthwhile experience which I would recommend to anyone who is thinking about it.

References

- (1) AIDS epidemic update 2001, Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organisation (WHO), December 2001.

Further Information

- www.neal-jenny.info
- www.vso.org.uk.
- The Faculty of Natural Sciences at Debub University: http://home.no/dufns

Jenny Search
Debub University, Ethiopia

VENUE:
The Old Ship Hotel

Dating back to 1559, The Old Ship is the oldest hotel in Brighton and stands proudly on the bustling seafront of this historical city. From its magnificent white façade to contemporary modern reception area, the hotel prides itself on its excellent customer service and comfortable, relaxed surroundings.

All 152 en-suite bedrooms have been recently refurbished and are elegantly designed with tasteful furniture and relaxing surroundings.

The contemporary Redz Brasserie is just a hop from the seafront and serves up a fine selection of gourmet dishes, accompanied by an extensive choice of fine wines.

For the latest information, please visit us online at:
www.sfam.org.uk

Spore forming bacteria — emerging and re-emerging issues

Old Ship Hotel, Brighton, UK ● 4th - 7th July 2005

The conference will consider recent advances in understanding in health, industrial and environmental issues associated with spore formers (following on from the 1994 meeting). It will review understanding of the taxonomy of spore formers and consider the physiological aspects, particularly those associatiated with spore structure and resistance. The health implications will be considered with respect to common infections caused by spore formers in both animals and man, the persistence of spores in food products, and also recent developments facilitating the use of spores as vaccine vehicles, probiotics and tumour targeting vectors. The environmental applications of spores will also be reviewed.

There will be sessions on:

- **Spore formers the great survivors — a taxonomy and physiology update**
- **Spore formers in food microbiology**
- **Spore formers: human health issues**
- **Environmental applications of spore formers**

There is also an opportunity for oral and poster presentations. Please see the panel on the right or visit the Society website at www.sfam.org.uk/sumconf.html

Programme

Monday 4th July

Drinks Reception

Lewis B Perry Memorial Lecture – History of Science - Spore forming bacteria (G Gould)

Tuesday 5th July

An update on the Taxonomy and Physiology of spore formers

09.00–9.35 **Taxonomy of aerobic endospore formers**
N Logan, Strathclyde, UK

09.35–10.10 **Clostridial taxonomy/ molecular genetics**
M Bennik, IFR

10.10–10.45 **Mechanisms of the resistance of bacterial spores to radiation, heat and chemicals**
P Setlow, Connecticut, USA

10.45–11.15 **Coffee**

11.15–11.50 **Spore structure**
A Moir, Sheffield, UK

11.50–12.25 ***B. anthracis* – spore germination in macrophages**
M Mock, Institut Pasteur, France

12.25–13.00 **Genomics**
O Kuipers, Groningen, The Netherlands

13.00–14.00 **Lunch**

Spore formers and food microbiology

14.00–14.35 ***B. sporothemodurans* and other spore formers in milk**
M Heyndrickx, Ghent, Belgium

14.35–15.10 **Non-proteolytic *Clostridium botulinum* and the safety of minimally heated foods: an emerging issue?**
M Peck – IFR

15.10–15.45 **Thermal inactivation of Alicyclobacillus spores in fruit product processing**
C Silva, Portugal

15.45–16.15 **Tea**

16.15–16.50 **Offered papers**

17.00 onwards: Trade Show

Wednesday 6th July

Health/Therapeutics

09.00–09.35 **Spores as vaccine vehicles**
S Cutting, Royal Holloway, UK

Please note that the above paper titles and speakers were correct at the time of going to press but may be subject to change.

Online abstract submission

If you want to submit an oral or poster presentation for this meeting on you can do so by using our **online submission process**. Please visit sfam.org.uk/sumconf.html and scroll down the page until to you find 'CALL FOR OFFERED PAPERS'. Then simply click the 'online form' link to submit your abstract. Alternatively, you can contact the Society Office who will post an abstract submission form to you.

PLEASE NOTE that the closing date for oral abstracts is 18th April 2005.

For the latest information, please visit us online at:
www.sfam.org.uk

CPD ACCREDITATION

CPD accreditation has been applied for and will be posted on the Society website shortly

Trade Show

Anyone wishing to exhibit at the trade show please contact Marisa Ramsay at the Society Office.
Email: marisa@sfam.org.uk

For the latest information, please visit us online at:
www.sfam.org.uk

Programme

09.35–10.10 **Clostridium spores as mediators to target therapeutic proteins to tumours**
J Anne, Leuven, The Netherlands

10.10–10.45 ***B. cereus***
A Kolsto, Oslo, Norway

10.45–11.15 **Coffee**

11.15–11.50 ***C. difficile***
I Poxton, Edinburgh, UK

11.50–12.25 **Anthrax vaccines**
L Baillie – Rockville, UK

12.25–13.00 **Offered papers**

13.00–14.00 **Lunch**

Animal Health

14.00–14.35 **Probiotics**
Le Hong Duc, Royal Holloway, UK

14.35–5.10 **Do bacteria really need to be regulated?**
P Silley, MB Consult Ltd, UK

15.10–15.45 **Necrotic enteritis, the way forward**
Simjee

15.45–6.00 **Tea**

16.00–17.30 **Student Offered papers**

17.30–18.00 **W H Pierce Memorial Prize Winner**

18.00–18.30 **SfAM Annual General Meeting**

20.00 onwards: Society Dinner

Thursday 7th July

Environment /Applications

09.30–10.05 ***B. thuringensis***
N Crickmore, Brighton, UK

10.05–10.40 **Practical applications of the biotracer *Bacillus globigii***
C Hodgson, Huddersfield, UK

10.40–11.15 **Bacillus protein secretion: a game of snakes and ladders!**
C Harwood, Newcastle, UK

11.15–11.50 **Coffee**

11.50–12. 30 **Spore- forming bacilli as biocontrol agents against fungal pathogens**
B Seddon, Aberdeen, UK

12.30–13.00 **Bacillus species in the intestine of invertebrates**
H König, Mainz, Germany

13.00–14.00 **Close of Conference and Lunch**

Please note that the above paper titles and speakers were correct at the time of going to press but may be subject to change.

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BOOKING FORM and INVOICE

SFAM SUMMER CONFERENCE 2005 4 - 7 JULY 2005

Spore forming bacteria: emerging and re-emerging issues

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Whole Conference Rate: inclusive of registration fee, coffee breaks, lunches, dinners, including Society dinner and accommodation in The Old Ship Hotel for the entire conference	£450.00	£300.00	£400.00	£650.00
Day Rate: 08.30 - 17.00 hours per day, or part thereof, inc. of registration fee, coffee, lunch and tea	£95.00	£50.00	£95.00	£150.00

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☐ **I wish to attend the Society Dinner on Wednesday evening (This is included in the Whole Conference Rate but costs £50.00 for delegates who elect to pay the Day rate).** Please note that numbers are limited**:**	£
☐ **Additional overnight accommodation per night inclusive of breakfast: £120.00.** If you wish to stay extra NIGHTS please enter the additional NIGHTS you wish to stay: _____	£
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TOTAL AMOUNT REMITTED:	£

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STUDENTSHIP Application

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SFAM SUMMER CONFERENCE 2005 4 - 7 JULY 2004

☐ **I wish to apply for a SfAM Studentship grant to attend the 2005 SfAM Summer Conference**

About this award

The Society offers Studentships to enable **student members** to attend Society meetings. These grants cover registration, accommodation, meals (where appropriate) and modest travel expenses. Preference is given to students offering a paper or poster and who have not previously received this award. To be considered for a Studentship grant, please complete this form in **BLOCK CAPITALS** and return it to the Society Office **no later than 6 weeks before the date of the meeting you wish to attend.**

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Your Department:_____ **Position in Department:**_____

Grant authority:_____

Your intended career:_____

Your costs

Expected Travel Costs:_____

Other costs - please specify:_____

_____

_____

Why do you wish to attend this meeting?

Please give your reasons:_____

_____

_____

Your signature:_____ **Date:**_____

(If you need more space for your answer please continue on a separate sheet)

Will you be contributing to the meeting by offering a Poster or presenting a paper? ☐ **Offering a Poster** ☐ **Presenting a Paper**

Your Supervisor's support

This section **MUST** be completed by your Supervisior or Tutor. Applications which are not supported by your Supervisor will be automatically rejected. **Please give your reasons why the applicant should receive a studentship:**

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Supervisor's name:_____ **Tel and extension:**_____

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In signing this application I agree to reimburse the Society for any costs it may incur in awarding this grant should the applicant fail to attend the conference or fail to notify the Society of their inability to attend the conference within 14 days of the start of the meeting.

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CCFRA Food Micro International Conference 2005

Thursday 9 to Friday 10 June 2005
Campden & Chorleywood Food Research Association, Chipping Campden, Gloucestershire, UK

SfAM Members are invited to submit scientific posters for display at the conference.
Delegates will have ample time to study these posters during breaks and at the end of the afternoons. Restricted space is available and the deadline for submission of posters is 15 April 2005. Interested parties should contact Joy Gaze Tel: (0)1386 842064.

information

This conference will provide the forum for eminent food microbiologists to present research findings and offer opinions and hypotheses for debate. The combination of keynote lectures and presentations will compliment practical workshops and displays of the most up-to-date technology in microbiological assessments.

REGISTRATION: Please contact the Training Department on: **Tel: (0)1386 842104** or Email: **training@campden.co.uk**

Keynote Lectures: Day 1 - Professor Tom Humphrey, University of Bristol, UK. **Day 2** - Professor Michael Doyle, University of Georgia, USA
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> Journalists and scientists have not always had a happy relationship. There is a need for them to be more at ease with each other
> ***Professor Robert Winston***

Science and the Media: poles apart?

Rebecca Morelle, of the **Science Media Centre**, makes a plea for scientists to stand up and be counted in the eyes of the Public and to start seeing media interest in science as an opportunity, rather than a threat

I RECENTLY attended a meeting about science and the media which began with the audience of scientists being asked to outline their thoughts on the media. What was supposed to be a five minute session grew into a forty-five minute barrage of criticisms and complaints: 'They're too sensationalist; they get their facts wrong; they misrepresent views; they hype'—were just a very few of the comments made by scientists.

But reverse this question and visit a newsroom. The criticisms from the journalists towards scientists come just as thick and fast. 'They don't speak in English; they won't return calls; they expect special treatment for science; they won't give a straight answer'—the list goes on.

The relationship between science and the media could, at best, be described as fraught. But could this conflict arise from the fact that one probably couldn't have two disciplines that are more different?

A scientist will spend years researching a single area of science; spend months writing a paper and then wait for it to be peer reviewed, before it is finally published. When the news of this research lands on a journalist's desk, they will get a few hours to turn a lifetime's worth of work into a few hundred words of copy.

A scientist will think in terms of probable outcomes, risk factors and competing theories. A journalist will want absolutes, yes or no answers, and will see any debate in science as the battle between two polar opposites.

A scientist will want to stick to the science and avoid delving into the areas of politics and ethics. A journalist will bypass the technicalities and go straight to why it matters, how it will be applied, and what the potential repercussions are.

Yet, despite these differences, more and more scientists are realising the importance of engaging with the media, and the **Science Media Centre** is both a product of and catalyst for this changing relationship.

The Science Media Centre Arrives

The roots of the **Science Media Centre** can be found in the highly influential House of Lords report on Science and Society, published in 2000. It examined why levels of trust in science and scientists were decreasing. Gone were the glory days where scientists were trusted, respected and admired—an unprecedented period was being entered where their authority was being questioned, especially after the very publicly played out furores over BSE and GM food.

One of the areas looked at was the media coverage of science, and after hearing evidence from both journalists and scientists, the report concluded by calling upon someone, somewhere, to do something to improve the relationship between these two desperately different disciplines and at the same time to do what seemed like an impossible task of "adapting science to frontline news."

The **Science Media Centre** was the result. It launched in April 2002, but before opening its doors for business a three-month consultation exercise was carried out to try and find out what this very special something to improve these relationships should be. After speaking to around three hundred scientists, journalists, press officers and politicians, a consensus emerged. While scientists were doing well at talking to publications like *New Scientist*, or *Nature*, or to programmes like the now defunct *Tomorrow's World*, when science grew legs and moved onto the front pages of a newspaper—think MMR, cloning, or GM—scientists were just not coming forward to speak to the media, often leaving vacuums which were very quickly filled by other more media-savvy groups. It became clear the centre's efforts should be focusing on science at the times when it dominates the news agenda; this was where the centre could make a real difference.

The centre is best described as a press office for all of science, but when science hits the headlines, ensuring that the voices, news and opinions of the scientific community are heard at these key times. Housed in the Royal Institution, although independent from it, the centre runs with four staff, and has its own board, science advisory panel and funding (the centre is funded by a diverse group of sponsors, from media groups, to research councils, to industry, but no sponsor can give a more than five percent of our running costs to maintain our independence).

Our activities can be roughly divided into three areas: our work with journalists, our work with scientists, and our work where we try to bring the two groups together.

Working with journalists when science is in the headlines

The **Science Media Centre** aims to make it as easy as possible for the news media to cover science well, and we do this by giving them easy access to the best scientists for their particular story. Working from a database of well over 1000 scientists and over 500 science press officers, we aim to make sure the news media can reach the scientists they need within the timeframe they're working within.

This means, at our most straightforward, we are able to provide a service whereby a journalist can call us to find a scientist to talk about the latest science story, and we are able to provide the right person whether it is for the GMTV sofa, or a Paxman-style confrontation.

However, the centre strives to be much more proactive than this, and if a science story is dominating the news agenda, we will find the scientists who are relevant, available, and happy to give up their time to speak to the media, and then we will contact every single newsdesk to make sure that they know this. Encouraging scientists to engage with the media at these key times has often made a real and important impact on how a science story has been covered.

Take, for example, the announcement this summer that a research group in Newcastle had been granted a licence to clone human embryos for stem cell research. It was an important step forward for science, but would the public think of it in this way, or rather as a the slippery slope to playing God? By ensuring that the media had access to scientists who could comment on why this research was being done, where it could lead, and to address some of the ethical issues, the public were also able to access these opinions.

Or take last Januarys human cloning announcement for Panos Zavos. When Zavos came to town early one Saturday morning to announce to the press that he had successfully cloned a human, the centre located the scientists who could give up some of their weekend, and talk to the media. As more and more scientists went to the media, the message that the public were hearing, via the news, changed from *'scientist claims to have cloned human'* to *'scientists condemn cloning claim.'*

When science and the media meet

While the sort of reactive process just described is very much led by the news agenda, our activities also include helping scientists to have a hand in shaping and influencing the news media, which we do through our regular press briefings. The briefings are targeted at national science, health or environment correspondents, and cover all areas of science, but generally fit into three different categories.

Some of the briefings are best described as background briefings, where a panel of scientists will brief journalists on an area of science before it has hit the headlines, giving the media basic information about a new research area and also access to great contacts. Our 'backgrounder' nanotechnology briefing in 2003 introduced journalists to this new area a few weeks in advance of the now infamous

headlines about Prince Charles' worries about grey goo, and influenced the subsequent coverage.

Some of our briefings are better described as giving scientists a platform to speak out about a certain issue—the rational being to encourage scientists to use the media as a tool for conveying important messages. When we heard of scientists' worries about the impact that the new Human Tissue Bill could have across all areas of research, the centre organised a briefing where four scientists spoke to the media about their concerns. Until this point, the media and hence public, were completely unaware of this issue, but by embracing the media, the scientific community was able to successfully put across its point.

Our third type of briefing is where scientists can brief the press on new research, and we have run briefings ranging from the launch of the results of the hugely important, both scientifically and politically, Farm Scale Evaluations on GM crops, to this years news that scientists had discovered a new species of hominid (christened by the media *'The Hobbit'*) in Indonesia. The briefings form an important part of the centre's remit, and are popular with both scientists and journalists.

Working with scientists

We are a centre that was set up by the scientific community, and because of this it is our belief that to get the media 'to do' science better, scientists need 'to do' the media better. And this means working with the scientific community not only to encourage them to engage more, but also helping them out when they do. Last November the **Science Media Centre** held a pilot event for scientists entitled *'Introduction to the Media.'* Over two hundred scientists came to London to spend an afternoon being immersed in the culture of the news media, hearing from journalists at *The Times*, *The Sun* and the *Today* Programme on the realities of the news machine, and what scientists should want out of it and expect from it. After some very positive feedback we have now decided to turn it into an annual event. The fact that the event was so popular indicates that more and more scientists are beginning to see the importance of engaging with the news media, and this should be seen as an encouraging sign.

The centre has also been encouraging scientists to use their news interviews to get across some information about the way science works. The fact that nothing can be 100% safe, or that scientists disagree; or why they use some oddly named process called peer review, is common knowledge to a scientists, but often leaves the public confused. We have worked with scientists, press officers and journalists to create a series of pocket sized media guides for scientists, with key phrases that they can use to talk about risk: 'so tell me Prof, Bloggs, is it safe?'—or peer review; 'well, Prof Bloggs, just how can we trust this research?' We will be tackling scientific uncertainty in our next one. In addition to these guides, we have also produced a leaflet for scientists talking about the important but difficult issue of animal research in a media interview. They are free and available from our website.

It's down to the scientific community to make things better

We live in a climate where public opinion counts for a lot. It can have a direct impact on the policy decisions that are made, and these policy decisions can have a direct impact on your research. And the public are getting more and more interested in, and concerned with, developments in science. A MORI opinion poll that the centre commissioned to mark it's opening showed that over 90% of the public get their information about science, not from popular science books, or science lectures, but from the mainstream media. The publics' interest in science is even more marked when science hits the headlines; when a report linking the MMR vaccine to autism is all over the front page of *The Sun*, millions of readers are suddenly very interested indeed in this area of science.

Scientists now have to argue the case for what they are doing more than ever before. Ducking away from the media at the times when the public are most interested in science can have very serious consequences, but rolling up your sleeves and getting stuck in can make a real difference to how a news story is covered, and to the message that the public will receive. The science media centre has been working hard to champion the effort of those scientists who stand up and be counted in the eyes of the public. We believe that it is time to start seeing media interest in science as an opportunity rather than a threat.

Further Information

■ Please visit:
www.sciencemediacentre.org

Rebecca Morelle
Senior Press Officer
Science Media Centre

BIOSCIENCES FEDERATION

Science Policy: UK

Report on science and education policy December 2004

THE SCIENCE Minister announced that the extra £120 million in 2005/6 and the previously announced £200 million pounds per year from 2007/8 would enable the Research Councils to pay 80% of the full economic cost of projects after September 2005, rather than the 60-70% previously estimated.

The government aim is that this will reach 100% by the start of the next decade, taking into account capital funding streams. The Minister also announced that Research Councils would pay 100% of the costs of any equipment over £50,000 per grant, with universities contributing 20% of the costs for equipment costing less than £50,000. The government anticipates that these increases, together with the promised 6% a year increase in Funding Council block grants in England, will allow QR funds to be used more to support blue-skies research and enable universities to reach full economic costs from charities and other research funders (*DTI* press release, 6/1). Save British Science welcomed in particular the tone of the announcement, which seemed to imply that there would be no strings attached to the increased funding and that university researchers and administrators would be trusted rather more than in the past. *"This can only be good for science and engineering, if it translates into less micro-management from the centre"* (Press release, 6/1).

The Director General of the Research Councils said that the new performance management system for the Research Councils would not increase the existing burden of data collection on researchers, and that there would be no attempt to shape institutional behaviour in the way that the RAE has done. He argued that the science base has to be healthy enough to attract future generations of researchers, and to be flexible and exploitable for public good and economic objectives. *Res Ft* (8/12) considered that, ultimately, the system has been designed to facilitate strategic decision-making now required by the government. The Director General commented that it would enable the Office of Science and Technology and Research Councils to look at long term options rather than being preoccupied with allocating relatively small pockets of money in any Spending Review period. An editorial in the same issue of *Res Ft* noted that Labour's more strategic approach to research policy means that the Haldane principle of scientists deciding what science to fund is continually being eroded. *Res Ft* (8/12) also added that the decision by the Chancellor to establish a high level forum of business leaders, scientists and ministers will result in the government having two top-level committees on science, since the Council for Science and Technology already advises the Prime Minister.

An article in *Guardian Higher* (7/12), based on a survey of heads of chemistry departments, looked again at the problems facing physical science provision. All the heads of department said that the funding council unit of teaching resource is insufficient to cover the full costs of providing science courses, and nearly all were taking stock of the future. Some universities have abandoned chemistry as a separate subject, and incorporated it into user disciplines in the biological sciences. Dundee, for example, has decided to close physical and inorganic chemistry to focus instead on the more popular pharmaceutical chemistry course (*THES*, 10/12). John Holman, head of the new National Science Learning Centre, noted that the lack of popularity of chemistry is not unique to the UK – the number studying physical sciences is falling across Europe, the US and Japan. Only in China and India is there healthy competition for places. He thought the problem is to do with the general perception by society that chemistry and the way it is taught are dull and irrelevant. Holman referred to the need to *"restore some of the bangs and surprises into school lessons steamrollered by the national curriculum and too much assessment"*. He considered engaging with 11 to 13 year-olds to be essential, and encouraged more university outreach into schools.

Another article in the same issue of *Guardian Higher* blamed the decrease in funding of 4-rated research for many of the difficulties: for many departments it reduced the possibility of subsidising teaching from research income; it concentrated research in a small number of universities and hence reduced the possibility of research-informed teaching; and the pressure to achieve 5 or 5* RAE grades reduced the effort spent on teaching. The Royal Society of Chemistry and the Department for Education and Skills will be putting together a panel early in 2005 to consider the issues. *Res Ft* (8/12) noted that the letter from the then Education Minister, Charles Clarke, to HEFCE also asked for advice on supporting research collaboration between higher education institutions, as is being pioneered in Scotland, involving universities in regional strategies, and possible variations to the 3 year honours degree model. An article in *THES* (10/12) by the Chief Executive of HEFCE concluded that there is no one-size-fits-all solution when subjects hitherto regarded as core disciplines fall from fashion. He considered that more needs to be done with schools to stimulate demand, while recognising that adequate provision at a national level does not always imply sufficiency at a regional level. *" We cannot alter teaching funding to cater for the needs of those who shout loudest; if the problem is on the demand side then this must be dealt with by mand-side solutions."*

A consortium from the chemistry community has, in fact, secured almost £1 million from HEFCE's Aimhigher National Activity initiative, to deliver outreach activities to motivate school students to take undergraduate courses in chemical sciences. Chemistry: The Next Generation is running as a two-year pilot in the North West, the East Midlands, and London, bit it is intended that the scheme will be rolled out nationally (*THES*, 7/1).

A survey by the Universities Companies Association showed that total licensing income of UK universities in 2003 increased nearly 40% to £31.3 million, but there is still some way to go to match US universities, which achieved more than £680 million. At 151, the number of new UK spin-off companies remained about the same as in 2002. The 2004 figure is expected to be lower because of the unintended adverse effect of the 2003 Finance Act (*THES*, 10/12). An editorial in the same issue of *THES* considered that a year after the Lambert review of business-university interaction, little has changed to facilitate *"third-stream"* activities in universities. Lambert *"muddied the waters"* by calling for changes to the RAE to reward more applied work. Higher Education needs a funding stream for business interaction on a par with the RAE rather than the latter becoming *"an afterthought in an exercise with different objectives"*.

Government statistics for 2003 show that business spending on R&D in the UK is largely stagnant. It represented 1.2% of GDP, as it has since 1996. The number of industry scientists and engineers decreased 2% from 2002, and there was a worrying 11% drop in technician numbers (*Res Ft*, 8/12). Anne Campbell MP is to bring a Private Members Bill during the current parliament that requires government departments and agencies to spend 2.5% of their R&D budgets with small businesses. Similar legislation in the US has successfully fostered new science-based start-up companies. The 2001 Small Business Research Initiative in the UK has been less successful, partly because participation is not mandatory for government departments and few have chosen to participate. The current procurement processes are also too time-consuming and bureaucratic for the Initiative to work effectively (*Res Ft*, 8/12).

The Environment Secretary admitted that the UK is not on target to meet the government's manifesto target of cutting carbon dioxide emissions by 20% by 2010. She indicated that industry could face much tougher curbs on such emissions under a third-term Labour government (*FT*, 8/12; *Gdn*, 9/12). A review by the Office of Science and Technology concluded that the Agricultural and Environmental Biotechnology Commission has *"ultimately failed"* to increase public understanding of GM technology and to provide strategic advice to the government (*Res Ft*, 8/12).

Science Policy: International

A survey of leading international scientists on what they would like to see in 2005 included among its findings: open access to the US from abroad for students and scholars; to be able to get on with neuroscience research, which helps people with dyslexia and Parkinson's disease, without being harassed by animal extremists; a big budget Hollywood movie that makes scientists the new idols of today's youth and leads to a burst of interest in careers in science; and a spell-check for English Euro-speak, together with a new dictionary, in order to work out what the Euro-words in Framework grant applications actually mean (*Nature*, 23/30/12). *THES* asked 1300 academics in 88 countries to identify the top university in their areas of expertise. Cambridge and Oxford came first and second for science and Imperial College 10th. US universities occupied 6 other places in the top 10, and Tokyo University the other. There were no European universities outside the UK in this top echelon (*Times*, *THES*, 10/12).

An editorial in *Sci* (24/12) noted that the poor 2005 budgets for US science agencies are unlikely to be a one-off occurrence. The Bush administration budget predictions show the purchasing power of R&D investments declining over the next 5 years in all areas other than homeland security, defence and space. The decrease in NSF funding will seriously hamper efforts to improve science education at a critical time. The editorial urged scientists to reach out to the people that they serve – the public and leaders in industry – to seek support in making the case for increased government funding of science. US researchers are concerned that 9 months after the US government said it would create a powerful committee to advise it on issues related to bioterrorism, the committee has not yet been approved. It is meant to advise on the overseeing of 'dual-use' research, that could have civilian or military uses, and to write a code of conduct for scientists. Some biosecurity specialists point out that if the committee is not up and running soon, there is a real risk that the government could bypass it and take extreme steps to regulate some types of dual-use biology (*Nature*, 18/12). In a similar vein, a paper on bioterorrism issued by the Royal Society and the Wellcome Trust in the UK urged that governments should not respond by screening publications to keep risky-looking information out of terrorists' hands. Instead, they should ask scientific societies and funding institutions to take more responsibility for vetting and preventing the dissemination

of risky technical details. The paper arose from a meeting of 66 experts in October, who considered strongly that censoring basic research would not prevent terrorist attacks. Wellcome Trust Director Mark Walport summarised: *"Self-governance by the scientific community, rather than new legislation, is the way forward"* (*Sci*, 17/12).

An article on academic careers in the US considered that although dozens of universities have changed their policies to provide time out from tenure-track positions to start families, created part-time tenure opportunities, and generally spread the message about the need to make room for family choices, these are eclipsed by cultural norms that put a premium on productivity, especially at the start of an academic career. Researchers who surveyed women faculty members around the country referred to a 'fear factor' that a tenure extension could harm a career, and that women using such policies were somehow asking for special treatment (*Sci*, 17/12). The NIH Director explained in a Policy Forum article why he did not think that the new policy, that requests authors to submit a copy of their peer-reviewed papers to the NIH for subsequent placement on PubMed Central, would harm academic publishing. The investigators and their publishers would be left to make the decision as to whether to submit a copy – it was not mandatory; there would be a six-month window before open publication; and scientists and libraries were unlikely to access the scientific literature through PubMed Central rather than by subscribing to journals because they would miss so much of a particular journal's content by doing so (*Sci*, 10/12).

The European Union Competitiveness Council failed to endorse the proposal to set up a European Research Council. Italy and Poland were unhappy about particular aspects. Countries backing the plan said the outcome was a delay rather than a disaster, the disagreements were technical rather than fundamental (*Sci*, 3/12; *Res Ft*, 8/12). The UK government called in a position paper for a thorough overhaul of Framework Programmes. It recommended that FP7 should pay the full economic costs of projects, and that there should be a real attempt to reduce bureaucracy and to provide applicants with more support, guidance and feedback. There was a strong case for increasing the overall FP budget, while the funding for basic research should increase from 10-15% of the total to 15-20%. The concept of an independent European Research Council was approved (*Res Ft*, 8/12). The EC's annual report on EU competitiveness said that policies that encourage public-private collaboration, and more generous tax subsidies, are needed to lift levels of business R&D spend. The report concluded that the EU is less successful than the US at developing such collaborations (*Res Ft*, 8/12).

Higher and Secondary Education

The 2003 Trends in Maths and Science Study found Asian school students doing very well, with Singapore, Chinese Taipei and Hong Kong being in the top 4 at both grade 4 and grade 8 stages of education. More than 360,000 students participated, taking tests designed to assess both knowledge and understanding of maths and science. English pupils ranked 5th in science at grade 4, but were outside the top 10 at grade 8 (*Sci*, 24/12). A long article in *THES* (17/12) considered the effects of a fall in numbers taking science degrees on the future supply of school teachers. Science Ambassador schemes, where undergraduates teach in schools, were considered helpful in encouraging more pupils to take science at university and the Ambassadors to consider teaching as a career.

The Privy Council has awarded a Royal Charter to the Association for Science Education that will allow it to grant charter status to experienced science teachers who demonstrate a commitment to professional development. It is hoped that this will lead to greater prestige for the profession, improve recruitment and retention, and ultimately be linked to higher pay. The number of graduates starting science PGCEs fell last year to 2,484, well below the government target of 2,879. Details of the requirements for gaining charter status will be published in the Spring (TES, 7/1). At the start of the ASE annual meeting, Mike Tomlinson, former Chief Inspector of Schools, who is ASE's new President, reiterated John Holman's point about the need to put back creativity and a bit of risk-taking into school science teaching. All students, but particularly girls, are put off science by an overcrowded and boring curriculum, and because they think the subject is not relevant. A special science supplement in TES (7/1), to coincide with the ASE meeting, included items on:

- The role of the new Science Learning Centres;
- Interviews with the winners of this year's AstraZeneca/ TES primary science teacher awards;
- Interviews with the winners of the four Salters' Institute chemistry teaching awards;
- The Nuffield bursaries that offer first-year post-16 science students an opportunity to sample research in higher education institutions;
- An account of the new Salters-Nuffield Advanced Biology course;
- The need for a revival of field work.

Am I eligible - can I apply?

This new award is intended to assist Society members in developing countries and Eastern Europe to visit laboratories and give lectures and training in appropriate areas of applied microbiology, or support overseas members to visit UK laboratories to receive training in appropriate areas of microbiology, or to support technology transfer in applied microbiology for which sources of funding do not exist.

Nominations for awards will normally be considered by the Society's Awards panel in March, July and November each year.

To apply, please read the guidelines below and then submit your application by email or post to the Society Office.

GUIDELINES

1. Individual awards up to a maximum of £5000 will be considered.

2. The laboratory supporter must be a full member of the society and have held membership for at least 3 years.

3. Detailed information must be provided about the relevance of the application and the available local support.

4. Each application must be accompanied by full supporting documents.

5. A condition of the funding is that an appropriate report must be written for publication in SfAM Microbiologist magazine together with photographs where possible.

6. Applications should be sent by email or by post to the Society Office.

www.sfam.org.uk/members/prizes.php

Dr. Oguntoyinbo Folarin Anthony received an Overseas Development Award to conduct research at Nottingham University

Microbial diversity and kinetics during cassava fermentation for gari production in Nigeria

MY PROFOUND APPRECIATION goes to the Society for Applied Microbiology for the overseas development award that enabled me to conduct research at the University of Nottingham, under the supervision of Dr. Christine E. R. Dodd between 14th May -13th September 2004. The project looked at microbial diversity and kinetics during cassava fermentation for *gari* production in Nigeria. It was very interesting and I felt it a privilege to be working in such an excellent research team and faculty where state of the art facilities were available for my work.

On arrival at the school of Biosciences, the peaceful environment and the serene atmosphere of Sutton Bonington Campus was a welcoming and appealing place to live and study. I was welcomed by my host, Dr. Christine E. R. Dodd, who had been anxiously awaiting my arrival. I will always remember her kind hospitality. She gave me useful information about transportation, shopping, maps and campus information. It was great to finally meet my host whose contact information I obtained through the Society Handbook. On getting in touch with her via email, she gladly accepted my proposal and made many helpful suggestions.

I was then taken to my accommodation at the post graduate hall, Kingston House, by Dave Fowler, a very hard working, intelligent and tireless technician. Dave also made arrangement for the depositing of my fermented cassava samples to the cold room (4 ^{o}C).

I had a full weekend to acclimatize to my new environment. I found that Kingston House was like an international hostel where I met postgraduate students from different countries. It was summer and we had plenty of time and opportunity to socialize. I met students working in Applied Biomolecular Science, Applied Molecular Microbiology and Post doctoral fellows from all over the world.

The school of Agriculture of the University of Nottingham is Located at Sutton Bonington, a village between Loughbrough and Kegworth. It accommodates the Schools of Biosciences, Plant sciences and Agriculture. On Monday, I met with Dr. Dodd to discuss the project in detail. Her kind suggestions and advice were excellent and much appreciated.

The level of organization of Food Microbiology under the school of Food Sciences is excellent. I sat the Laboratory entrance test, which I passed after my third attempt, and I was then apportioned a bench in the laboratory and shown the facilities therein. It is a big laboratory with the best of facilities. My first impression about the running of the laboratory was the increased use of disposable plasticware over glassware. This has made experiments easier to handle and enables them to be carried out more quickly.

Our project was to evaluate the total community of bacteria and fungi involved during the fermentation of cassava for *gari* production. Here we used Denaturing Gradient Gel Electrophoresis (DGGE) to determine the microbial profile of both the dominant and non dominant, and to differentiate between culturable and non-culturable microorganisms involved in the fermentation. DNA sequences of the PCR fragments obtained from purified DGGE bands were determined by comparison with the closest relative of 16SrDNA sequences. This was performed by searching the GenBank DNA database using a Blast algorithim. We also used Pulse Field Gel Electrophoresis (PFGE) to examine the diversity among the dominant culturable bacteria. This was complimented by phenotypic characterization of the Lactic acid bacteria. The information generated was valuable in creating a better understanding of the taxonomy and succession of the microbial population as fermentation progresses. However, information about the physiology of the dominant bacteria was also generated, in particular that of the amylolytic lactic acid bacteria. Also, the dynamics of yeast during the fermentation process was determined. The yeast population was observed to be significant after 48 hours of fermentation and they were subsequently identified using the API system. Identification of closest relatives of the DGGE 18S rDNA sequence gave us the total picture of the yeast community during the fermentation.

Effort is ongoing to develop our manuscript for publication. I am very grateful to SfAM for the opportunity granted me to broaden my horizons in the field of microbiology. This training and exposure has given me a better understanding of my research. The overseas development award has created a great sense of belonging for me as a young scientist from a developing country. This exposure has given me ample opportunity to meet and interact with microbiologists from a different part of the world, all of whom are working on different topics such as proteomic, biophotomic and functional genomics. I am particularly grateful to Mary Obodi, Phil Richard, Avinach, Pieter Gouws, Phil Hill, Cath Rees and all my friends in the Food Microbiology Laboratory for their kind support which contributed immensely to my work and made my research a brilliant success.

Dr. Oguntoyinbo Folarin Anthony
Lecturer in the Department of Botany and Microbiology, Faculty of Science, University of Lagos, Akoka, Lagos, Nigeria.

Am I eligible - can I apply?

Grants can be made available to ANY FULL member who is able to offer a suitable undergraduate student a work placement for a period of up to 10 weeks during summer. The grant is £160 per week for the student for a maximum of 10 weeks and up to £50 per week for lab costs for a maximum of 10 weeks. To apply, visit **www.sfam.org.uk/members/prizes.php**

GUIDELINES

1. Any full member of the Society who can offer an undergraduate student, or a recent graduate (within 6 months of graduation) a work placement is eligible to apply for this grant. The placement can last up to a maximum of 10 weeks, normally during the summer vacation.

2. The Grant will normally provide support at the rate of £160 per week for the student and up to £50 per week for lab costs. The monies will usually be paid to the Department in which the student/graduate works unless a specific request is made for an alternative method of payment.

3. Applications should be made by the supervisor using the PDF form provided on the website or the paper form obtainable from the Society Office.

4. Successful applicants and their students/graduate must write a report on the placement within 4 weeks of completing their placement which will be published in *Microbiologist*. Photographs of the applicant and/or the work done during the placement are desirable. These should be supplied as (a) digital images at a size of not less than 4 inches square at a resolution of not less than 300 pixels per inch, or (b) original photographic prints which will be scanned and promptly returned.

5. Normally a member may not apply for a further grant until a period of two years has elapsed.

6.There is no closing date for this Grant and applications can be made any time during the year. Applicants must apply at least 6 weeks before the proposed start date.

www.sfam.org.uk/members/prizes.php

Enterococcus faecalis virulence and its involvement in ulcerative colitis.

Katie Louise Blackett reports on her work project

AFTER FINISHING THREE years of my four year BSc course in microbiology, I was still unsure of the career I wanted to pursue after graduating. However, the Microbiology and Gut Biology group at Dundee University Medical School, situated in Ninewells Hospital, and the Society for Applied Microbiology, gave me the opportunity to do a ten week placement in their laboratories.

The project involved research into *Enterococcus faecalis* virulence and its involvement in ulcerative colitis (UC) - one of the major forms of idiopathic inflammatory bowel disease (IBD).

UC is an acute and chronic form of IBD with unknown aetiology, which mainly affects the distal colon leading to inflammation of the epithelial lining, ulceration and haemorrhaging. This results in pain, diarrhoea and rectal bleeding. The inflammation is due to abnormal activation of in the immune system of the gut. UC inflammation can have extra mucosal manifestations in the joints (arthritis) skin, eyes, liver and bile ducts. It also significantly increases the risk of colon cancer after about 8-10 years of chronic disease, so regular screening of patients is needed. If the inflammation is unresponsive to drugs, surgical removal of the colon may be required.

Although the cause of UC is unknown, commensal bacteria such as enterococci and *E. coli*, are thought to play a role, either in disease aetiology or in the maintenance of the condition, possibly by the production of specific virulence factors under certain environmental conditions. While the specific methods of pathogenicity are unknown, a number of virulence determinants have been identified in *Ent. faecalis* because the organism is increasingly becoming one of the major causes of nosocomial infection.

The aim of my project was to investigate the prevalence of six virulence genes (aggregation substance, a collagen adhesin (ACE), enterococcus surface protein (ESP), a stress protein Gls-24, gelatinase (GelE) and serine protease (SprE)) in 46 human isolates of the bacterium, using PCR. Levels of these genes in mucosal populations of bacteria in UC rectal biopsies were then compared to healthy controls, using quantitative real-time PCR (qrtPCR). During the course of this work I gained experience in designing specific primer sets, using primer design software, purifying and cloning PCR products using a pgemt easy vector kit and *E. coli* (JM109) competent cells. I then purified and sequenced the resulting plasmids. These sequence-verified plasmids containing target DNA specific to each virulence factor, were then used to construct standard curves of known molecular copy number to quantify the levels of each virulence factor in the biopsy samples, using Sybergreen qrtPCR, which provided me with invaluable skills for my honours project.

Tests on *Ent. faecalis* isolates from human sources were done to look for the presence of the virulence factors using conventional PCR, demonstrating the overall prevalence of these factors in the organism. Isolates were grown on a specific agar supplemented with azide and growth produced a clear zone around the

colonies. Eighteen normal biopsies and sixteen UC biopsies where tested using rtPCR for the presence of the six virulence factors in mucosal populations of *Ent. faecalis*. Significant differences where found in virulence gene prevalence in UC versus normal biopsies. Three virulence factors (ESP, GelE, SprE) were found to have significantly higher prevalence in UC patients than in healthy individuals, when controlled for biopsy size and the numbers of *Ent. faecalis* present in each biopsy.

These results were very encouraging, and further studies will allow us to assess not just the prevalence of these virulence genes, but also whether these factors are expressed on the mucosa by *Ent. faecalis*, by measuring levels of specific mRNA in the samples. This will provide a clearer picture of how *Ent. faecalis* virulence contributes to the development of chronic UC.

Before I started this ten week placement the only laboratory experience I had was in university practical classes, which are very different to a research laboratory. However, SfAM sponsorship has given me the opportunity to learn some amazing skills, which I can now apply to my honours project, along with invaluable research experience.

I learned vital skills in conventional and real-time PCR, along with culturing of bacteria, DNA isolation and cloning. I have also developed my time management and project planning skills, which will be invaluable for my honours work, and hopefully, a future in research.

The positive outcome of my research made some of the more challenging days of disappointment well worth it! The whole experience has confirmed my dream of following a career in medical research, and I now feel positive that I would enjoy doing a PhD once I graduate.

I would like to thank Professor George Macfarlane for allowing me to work in his laboratories, and specifically, would like to thank my project supervisor Dr. Liz Furrie for her continued support. Also, Dr. Sandra Macfarlane and all other staff in the laboratory for their guidance, and making these ten weeks not only successful, but enjoyable, and a time I will never forget.

Katie Louise Blackett
University of Dundee

The influence of shear on bacterial diversity in freshwater biofilms.

Amy Stead reports on her work project

LAST SUMMER I HAD THE good fortune of receiving a SfAM student into work award under the supervision of Professor Peter Gilbert and Dr. Alex Rickard at the University of Manchester. During the ten weeks I investigated the microbial diversity and frequency of occurrence of coaggregation between community members of freshwater biofilms grown under extremes of shear force.

Biofilms were grown in a rotating biofilm bioreactor, fed with unfiltered potable tap water, in which the substrata comprised rotating concentric stainless steel rings. The magnitude of the shear-force generated depended on the radius of the steel ring, i.e. the smaller the radius the lower the shear force. My work entailed sampling the biofilm associated with each ring, isolation purification of the morphotypes represented and characterization of their co-aggregation potential. Identification of the dominant morphotypes followed extraction of the DNA and PCR-amplification of the 16s rRNA genes.

The PCR products were purified and sequenced so that the species could be identified by the DNA sequence coding for its 16s RNA. This allowed a comparison of general trends in composition of the biofilms depending upon the imposed shear force. The interactions of the bacteria in each biofilm were investigated by coaggregation assays. The results will be analysed in the next few months but a preliminary analysis of the data suggests that the imposed shear-force profoundly influences both community composition and diversity, as well as the proportion of coaggregating organisms. Under high shear the biofilm community was less diverse and contained many bacteria belonging to novel genera. Those biofilms formed under low shear were considerably more diverse and the community members often did not co-aggregate. This suggests that under high shear conditions the ability to colonise a surface is more dependent upon cell-cell adhesion phenomena than under low shear.

I found my SfAM work placement to be an extremely enjoyable and valuable experience, which has taught me many useful skills that will aid me greatly in my final year project and future employment. It has also led me to a greater appreciation of scientific research work and has inspired me to apply for a Ph.D. when I complete my degree.

Many thanks to the Society for Applied Microbiology for providing me with such a great opportunity, and to all of my friends and colleagues in the lab for their help and guidance.

Amy Stead
University of Manchester

Could you benefit from this Grant?

STUDENTS INTO WORK Grants can be made available to ANY FULL member who is able to offer a suitable undergraduate student a work placement for a period of up to 10 weeks during summer.

The grant is £160 per week for the student for a maximum of 10 weeks and up to £50 per week for lab costs for a maximum of 10 weeks. To apply, visit **www.sfam.org.uk/members/prizes.php**

www.sfam.org.uk/members/prizes.php

Am I eligible - can I apply?

The President's Fund provides limited grants to ALL members to assist them to attend scientific meetings or workshops related to their area of work. Awards are made at the sole discretion of the Honorary President. Please note that this Fund is open to members of all ages! Why not apply to the Fund? The maximum grant available is normally £1,000.

To apply, visit **www.sfam.org.uk/members/prizes.php**

TERMS & CONDITIONS

1. The applicant must have been a member for at least a full subscription year before the event to be attended and must be a fully paid-up member at the time of application.

2. A successful applicant cannot re-apply to the Fund for three years from the date of the award.

3. Preference will be given to applicants who are contributing to the meeting they wish to attend and/or are unable to obtain funds elsewhere.

4. Completed applications must include an abstract of any intended contribution to be made at the meeting and must be received by the Society Office not less than six weeks before the date of the event.

5. Student member applications must be supported by their supervisor and include the contact telephone number(s) and email address(es) of the supervisor or head of department who is supporting their application.

6. The maximum grant available is normally £1,000.

7. Under exceptional circumstances this maximum may be exceeded.

9. The award of this grant is at the sole discretion of the Hon President of the Society.

10. The applicant must write a short article of between 400 - 600 words within 4 weeks of the meeting, the content of which will be agreed with the Editor of sfam *Microbiologist* and will be published in the magazine. Photographs of the applicant and/or the subject of the article are desirable. These should be supplied as (a) digital files in TIFF or JPEG format at a size of not less than 4 inches square at a resolution of not less than 300 pixels per inch, or (b) original photographic prints which will be scanned and promptly returned to the applicant.

Applied Microbiology in Ukraine

FIRSTLY I WOULD LIKE TO thank SfAM for the award of a grant that enabled me to visit the Zabolotny Institute of Microbiology and Virology, and the National University of Food Technology (Kiev), in order to promote and explore research collaboration possibilities between Greece and Ukraine in Applied Microbiology and Food Science/Technology.

The structure of the Institute of Microbiology and Virology, part of the National Academy of Science of Ukraine, deals with fundamental and applied research in Microbiology and Molecular Biology. Several Departments cooperate including: Antibiotics, Physiology of Industrial Micro organisms, General and Soil Microbiology, Biochemistry, and Molecular Biology. The above Departments deal with the following areas:

a) Ecological, physico-biochemical, taxonomic and genetic studies of microorganisms and viruses with the purpose of determining their properties for use in new biotechnologies, methods of diagnostics and treatment of human, animal and plant diseases

b) Investigations into the molecular bases of biological activity of microorganisms and viruses, with the aim of developing regulation methods and creating highly active producers of biologically active substances, including the methods of cell and genetic engineering.

Throughout this two-day visit, I was able to discuss with the Head (Professor Podgorsky) and the President of Ukrainian Society of Microbiologists (Professor Matselyukh) the current state of affairs regarding research at the Zablolotny Institute of Microbiology and Virology. Professor Matselyukh, to whom I am grateful for his invitation, guided me around the Departments and I had an interesting discussion with Professor Nadezhda Kovalenko (Winner of the State Premium of Ukraine) who is currently involved in probiotics and lactic acid bacteria research. It must be noted that the Academy boasts a huge collection of bacterial strains isolated and characterized from in house research work. Further information on strains can be obtained from Professor Podgorsky, Head of the Zabolotny Institute.

Overall, there are opportunities for European scientists who want to establish research collaboration with scientists from the Institute and/or from other Ukrainian Universities in Applied Microbiology and Biological Sciences.

I am grateful to Mrs Dmitrieva Alyenova, Secretary of International Relations of the Institute for making my stay enjoyable during my two-day visit in Kiev.

During my second day, I visited the Ukrainian State University of Food Technology, located in the centre of Kiev. I was then briefed by the Vice Rector Professor Lyubomir Homichak, to whom I am grateful, about the State University of Food Technology. The University dates back to 1930, when it was known as Kiev Institute of Sugar Refinery Production. In 1993 it was renamed the Ukrainian State University of Food Technology. Approximately 1000 students are currently enrolled following both under- and postgraduate studies offered by the various Departments.

The State University is currently engaged in collaboration with European Universities through INCO-Copernicus and E.U. programs.

Further Information

Those seeking collaboration with the Institute or other Ukrainian Universities in scientific disciplines of Microbiology, Biotechnology and Molecular Biology, are encouraged to obtain further information:

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Assistant Professor of Food Microbiology,
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The development of bacterial tolerance to biocides.

The potential pitfalls of indiscriminate biocide use are discussed by **Susannah Walsh**

BIOCIDES ARE COMMONLY used throughout our environment, from the antibacterial hand wash and toilet bleach in our homes, surface disinfectants in the food industry, to the use of high level disinfectants in hospitals. Undoubtedly most of the applications for these diverse products are justified on the grounds of improved hygiene and prevention of infection. However, in recent years concerns have been raised about whether indiscriminate use of biocides could result in microbial tolerance/resistance not only to the product in use, but also to other biocides and possibly to antibiotics.

The idea that all biocides act as general protoplasmic poisons or at the other extreme, have a single enzyme target site is now considered unlikely, but similarities have been found between the mode of action of some biocides and antibiotics (Russell 2002). A well known example of this is the targeting of a specific fatty acid biosynthetic enzyme enoyl-[acyl-carrier protein] reductase *(Fab I)* by the bisphenol triclosan in *Escherichia coli* (McMurry *et al.*, 1998a). The homolog of *Fab I* in *Mycobacterium Tuberculosis (InhA)* is also the gene for one of the proposed targets of isoniazid and cross-resistance between isoniazid and triclosan tolerant laboratory isolates has been demonstrated using *Mycobacterium smegmatis* (McMurray *et al.*, 1999).

The mechanisms of resistance or tolerance to biocides have also been examined, and again similarities have been found with antibiotics. For example, efflux systems have been shown to pump a range of antibiotics (ampicillin, tetracyclines and fluoroquinolines) and many other substrates including biocides (e.g. pine oil, organic solvents, quaternary ammonium compounds, triclosan and chlorhexidine) out of bacteria (McMurry *et al.*,1998b; Poole 2001; Levy 2001).

Researchers have shown that it is possible to increase the tolerance of bacteria to a range of biocides under laboratory conditions and that these bacteria may then possess altered antibiotic susceptibility profiles (Levy 2001). Many of the increases in MIC reported are still below the in-use concentration of the biocide in question and hence the term tolerant rather than resistant might be more appropriate. However, despite these small increases in biocide MIC, larger changes in antibiotic susceptibility have been reported with some of the biocide tolerant laboratory isolates (Walsh *et al.*, 2003). This raises possibility that biocides which leave a residual concentration or are used below the in-use concentration could play a role in the selection for antibiotic insusceptibility.

In May 2004, SfAM jointly sponsored two sessions at the ASM general meeting addressing the practical policies and issues surrounding biocide and antibiotic resistance in bacteria and what we have learnt so far. There appeared to be a general consensus that biocides should only be used when appropriate, but some speakers raised the important issue that laboratory studies need to be correlated with the reality in practice or in the field. Several studies have suggested that there is a relationship between the use of biocides and antibiotic resistance, but others have shown no link or evidence that resistance is developing (Russell 2004).

So should we all worry that cross resistance will occur or is already occurring? Biocide tolerance is not a new phenomenon, but worries about biocides effects on antibiotic susceptibility are more recent. Perhaps the best we can do for now is to try and make sure that biocides are only used for purposes where they have been shown to be effective and necessary. Although biocides can be extremely helpful in preventing infection in appropriate applications, the current obsession with germs has led to a craze for antibacterial products. Perhaps in the light of the remaining unanswered questions a little more thought about the use of biocides would not be out of place.

I would like to thank SfAM for awarding me a President's Fund grant in order to attend and present a poster at the ASM general meeting 2004 in New Orleans.

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Susannah Walsh

Biodegradation of Endocrine Disrupting Chemicals within sewage treatment systems. **K Tyldesley** reports

THE PRIMARY AIM OF SEWAGE treatment systems is to substantially reduce the levels of organic and inorganic material in raw sewage, facilitating safe discharge into surface waters. However, with increases in industry and the manufacture of novel compounds used in industrial processes, new challenges have arisen for sewage treatment systems. Sewage treatment works are now required to process a huge variety of chemicals which are potential environmental pollutants.

Many chemicals currently in use are relatively new to the environment and are thus recalcitrant to biodegradation when released into the natural environment, where they can potentially accumulate within organisms, causing a variety of environmental issues, with the possibility of detrimental health effects on wildlife and the public.

Research is required in order to establish optimum conditions for pollutant degradation within sewage treatment works, to ensure that biodegradation occurs before the effluent is released into surface waters. In addition, perhaps more importantly, closer collaboration between microbiologists, engineers and other professions is required to ensure that when new sewage treatment works are built, optimum biodegradation of pollutants can occur, and that relevant monitoring and regulatory procedures are established.

One group of environmental pollutants which require further research into their biodegradation within sewage treatment works are endocrine disrupting chemicals (EDCs). These are man made or natural chemicals, which have the ability to interact with the endocrine system to alter reproduction, development and/or growth in an individual and/or its progeny. Observations of reproductive abnormalities in wildlife have been attributed to EDCs. Imposex (where females develop part of the male reproductive system) in molluscs exposed to tributyl tin, and reduced phallus size in male alligators exposed to oestrogens, have been observed in the wild. Reproductive abnormalities in humans have also been linked to EDCs. Although not yet proven, these include decreasing sperm counts in men and increases in incidences of reproductive cancers.

Attention was first drawn to the issue of EDCs, and their effects on fish, with the observation of hermaphrodite fish within the lagoons of sewage treatment works. This lead to the hypothesis that sewage effluent may contain a substance, or substances, that are oestrogenic to fish (Purdom *et al.*, 1994). In order to test this hypothesis, Purdom and colleagues exposed caged fish to the sewage effluent. Increased synthesis of the female yolk precursor vitellogenin in these exposed fish demonstrated that the effluent from the sewage treatment works was indeed oestrogenic to fish.

Other studies in the UK and worldwide have confirmed the oestrogenic activity of sewage treatment works effluents, and have shown that this oestrogenic activity can persist for considerable distances downstream as, in some cases, very little dilution of the effluent occurs (Harries *et al.*, 1997).

There are many chemicals which can contribute to the oestrogenic activity of sewage treatment work effluents. These include natural steroid oestrogens (e.g. 17β-oestradiol and oestrone), synthetic oestrogens (e.g. 17α-ethinyl oestradiol) and various xeno-oestrogens (e.g. nonylphenol and octylphenol). The proportions of steroids and xeno-oestrogens present in effluents from sewage treatment works will vary greatly, dependant on the proportions of domestic and industrial wastewater received by each works. The type of industrial wastewater received will also greatly affect the overall oestrogenic activity of the effluent, in addition to the composition of xeno-oestrogens present. Other factors affecting the oestrogenic activity of the effluent include the types of treatment processes in the works, retention times and environmental factors such as temperature and rainfall.

Steroid oestrogens (both natural and synthetic) are highly potent and are present in wastewater in significant quantities, and have been demonstrated to be responsible for the majority of oestrogenic activity in effluents (Lee & Liu, 2002). However, being natural compounds (or, in the case of synthetic oestrogens, being very similar to natural compounds in their chemical structure) they are generally degraded relatively rapidly both within sewage treatment systems and in the aquatic environment. Many of the xeno-oestrogens, whilst being less potent oestrogens, have more complex chemical structures and can be far more resistant to biodegradation, and thus can persist in the aquatic environment for significant periods of time.

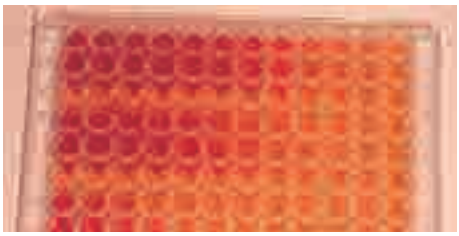
The xeno-oestrogens nonylphenol (NP) and octylphenol (OP) are biodegradation products of alkylphenol polyethoxylates (APE), which are one of two major groups of surfactants in current use. Each year, 600,000 tonnes of APE are produced worldwide. Commercial formulations usually contain mixtures of APE with high proportions of nonyl and octyl alkyl groups.

The environmental problems resulting from the use and discharge of alkylphenolic compounds are mainly associated with the biodegradation products. Alkylphenol derivatives are more resistant to biodegradation than the parent compounds, and are often found in high concentrations in sewage treatment work effluents.

NP is known to be approximately ten times more toxic than its ethoxylate precursor, and is known to display both oestrogenic and anti-androgenic activity. OP is a more potent oestrogen mimic than NP, but is generally present in sewage treatment works effluents at lower concentrations than NP. Alkylphenol derivatives have low water solubility and adsorb to suspended solids and sediments. This hydrophobic nature means that they are likely to bioaccumulate within organisms and thus likely to pose longer-term problems for wildlife (Blackburn *et al.*, 1999).

As part of my research, I have been investigating the effects of different sewage treatment processes on the removal of oestrogenic activity from wastewater. The oestrogenic activity (measured as ng/l 17β-oestradiol equivalents) of wastewater samples was analysed using a genetically modified yeast screen, containing the human oestrogen receptor (hER α). Upon binding an active ligand, β-galactosidase

is secreted into the assay medium, where it reacts with a chromogenic indicator. The corresponding colour change (yellow to red) is measured at an absorbance of 540nm. Figure 1 (below) shows a plate from the yeast oestrogen screen.



The top rows show the 17β-oestradiol standard. The middle rows show the oestrogenic response of a raw sewage water sample. The bottom rows show the oestrogenic response of a treated effluent water sample. My data has shown that activated sludge treatment significantly reduces the oestrogenic activity of wastewater. I will be focussing my research into the biodegradation of NP by activated sludge bacteria. I am isolating and characterising the bacteria capable of degrading NP by performing enrichment cultures using NP as the sole carbon source. I am also investigating the effect of NP on the community structure of activated sludge bacteria, using culture-independent approaches such as DGGE analysis of ribosomal genes.

I would like to express my gratitude to SfAM for the President's Fund Grant which allowed me to attend the 10th International Symposium on Microbial Ecology in Cancun, Mexico.

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K Tyldesley

L-form Bacteria and Plant Symbiosis.

Eunice Allan reports

IT SEEMS AMAZING THAT over a hundred years ago, microbiologists accepted that the classical bacterial morphologies of rod, coccus, spirillum etc. actually represented only a specific phase of growth and that in reality most bacteria actually pass through stages with markedly different morphologies.

Observations of non-classical pleomorphic forms were seen in natural situations, such as pathogenicity, where organisms presented varying shapes spontaneously. The challenge however was to isolate these atypical types which failed to grow using classical isolation techniques. The advances came through the pioneering work of Emmy Kleineberger-Nobel and Louise Dienes (see Madoff, 1986). In 1935 Kleinberger-Nobel isolated a strain of *Streptobacillus moniliformis* which was associated with small pleomorphic forms. She termed this pleomorphic form as "L1" and those she isolated from other bacteria were duly called "L forms" to commemorate the Lister Institute where she worked. Debate continued as to whether these so-called L-form bacteria were symbionts and in time, Dienes showed that the pleomorphic forms were variants of the same organism.

After their isolation in 1935, there was increasing interest in L-form bacteria and much effort was spent inducing pleomorphic forms, with advances being made using the many different cell wall inhibiting antibiotics that were discovered around that time. Cultivation relied on complex media supplemented with osmotic stabilisers and inducing agents i.e. inhibitors of cell wall synthesis such as penicillin, glycine and lysozyme. With this increasing interest came an increasingly confusing terminology for the widely different growth forms which still, to this day, can initiate much debate.

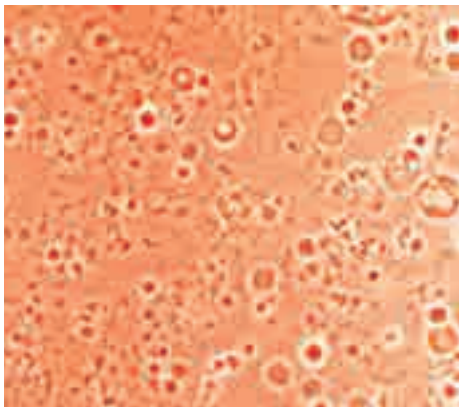
Today, the term L-form/L-phase is generally accepted to include those bacteria, except mycoplasmas, that have either permanently or temporarily lost the ability to synthesize their cell walls. The former is used to denote bacteria which have been induced artificially while the term L-phase denotes those that occur in natural situations. The loss of the rigid cell wall results in the cells becoming extremely sensitive to osmotic pressure and support is typically provided with sucrose or salt.

A particular interesting phenomenon is the fact that some L-form lines (termed stable) loose the ability to revert to the parental type and consequently no longer require inducing agents in their growth medium. Simple questions remain as to what differentiates an L-form from its parental form? Why are some organisms inducible and others not? Why do some attain stability and others not? Such studies would, with modern techniques, be fairly straightforward to answer, but unfortunately research funding does not often target areas that are not mainstream.

Current L-form research at Aberdeen University has been inspired by the late Professor Alan Paton who, with both moral and financial support from the Venture Research Unit of BP International Ltd., showed that L-form bacteria could form long-term associations with plants. In his Presidential Address to the Society in 1987 he presented a list of research areas encompassing questions on fundamental biology of L-form bacteria to their role in evolution; could chloroplasts have originated from the association of photosynthetic L-form bacteria with plants?

In order to progress research on the plant L-form symbiosis, research has involved increasing our understanding of L-form bacteria themselves. Infact here is now much know-how within the laboratory on induction and growth of L-form bacteria. We still tend to rely on complex media but now we find that many L-form bacteria can be grown on both solidified and liquid media with quite respectable growth rates. It appears too that most L-form bacteria have a complex developmental cycle.

For our *Bacillus subtilis* cell line (Allan *et al.*, 1993) this is evidenced by a typical exponential growth phase which is followed by a phase where the cell size increases through vacuole formation and expansion by a process which resembles fluid-phase endocytosis. At this stage, the cells also produce granules which, by our observations, are storage granules but which others have suggested are reproductive units and hence are responsible for continuing the L-form life cycle.



A major focus of research has been on the use of L-form bacteria as plant protection agents. This has stemmed from Patons initial studies and in particular from the work of Amijee *et al.*, 1992 which showed that L-forms derived from *Pseudomonas syringae* pv. *phaseolicola* could form long-term associations with French bean plants with no obvious adverse effects on growth and development.

The most interesting aspect of this research was the fact that, when these plants were challenged by the cell walled pathogen, the L-form associated plants were protected against disease. Experiments have since continued and the protective phenomenon is seen against both fungal and bacterial diseases when plants are associated with L-forms derived from either pathogens or non-pathogens.

More recently, it has been shown that the plants induce chitinases in response to the L-form infection in a system akin to induced resistance (Daulagala and Allan, 2000). Although how this actually occurs, remains to be elucidated.

A major advantage of using L-form bacteria is that they are targeted to the plant. This arises from their location within the plant cells themselves and in addition, it may be that their pleomorphic morphology will allow access to small spaces such as the extracellular spaces within plant tissue. This should improve the persistence of the biological control agent which is well documented as a major reason for inconsistency in current biocontrol strategies.

In addition to improving persistence, L-form bacteria can also be selected for their ability to produce metabolites that are detrimental to the pathogen and hence offer protection by two different modes of action which may improve biocontrol efficacy.

Today, L-form bacteria remain understudied and intriguing. Fundamental scientific questions - especially in the areas of their nature, their life cycle and their interactions with the host plant remain, but advances have been made and hopefully will continue.

Finally, I would like to express my thanks and appreciation to the Society for Applied Microbiology for awarding me a President's Fund Grant which allowed me to further my research.

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Eunice Allan

Probiotic properties of lactic acid bacterial strains in the traditional Maasai fermented milk in Kenya.

Julius Mathara reports

THE MICROBIOLOGY OF traditional fermented milk of the Maasai people of Kenya was investigated against the background of potential functional properties of major bacterial groups. The domination of *Lactobacillus. plantarum* and *Lb. fermentum* among the typical lactic acid bacteria (LAB) associated with traditional Maasai fermented milk could be shown. Other strains occurring in relatively high numbers were identified as representatives of *Lactococcus lactis*, *Enterococcus faecium*, *Leuc. mesenteroides*, *Lb. paracasei*, *Lb. rhamnosus*, and also strains belonging to the *Lb. acidophilus* group(Mathara *et al.*, 2004).

Selected *Lactobacillus* strains in this study have shown desirable characteristics as potential probiotic bacteria. Resistance to acid and bile will give the strain a higher tolerance and growth advantage in the gut where these two conditions are typically encountered. This was demonstrated by the high percentage of survival in a simulated stomach duodenum passage. The *Lactobacillus* strains demonstrated ability to adhere to human cell line HT 29MTX and to the extracellular protein

matrices (ECM). The results of the current study therefore suggest potential adhesion and colonisation to the human gut. Binding to both fibronectin and fibrinogen was expressed. ECM binding LAB may protect the host against invasion of pathogens at sites such as wounds or cell sloughing, where the ECM proteins are exposed to the intestinal lumen. On the other hand, bacterial adherence to collagens can lead to long term colonisation. The frequent binding of fibronectin by *Lb. plantarum* strains may be reflected by fibronectin acting as a bridging molecule between the bacterial cell and the epithelial cell surface. Due to high exposure and incidences of diarrhoea in most African countries, research work using selected strains from this study can be done to establish the extent to which they can suppress or inactivate pathogenic micro-organisms.

LAB producing antilisterial and/or, anticlostridium bacteriocins were isolated and characterised. The bacteriocin producing strains may give protection against possible microbial contamination from the environment during the extended periods of fermentation and storage of the milk products. Such strains can be envisaged as so-called 'protective cultures' to improve the safety of these popular milk products.

Before reaching the intestinal tract, probiotic bacteria must first survive transit through the stomach. In this study, most of the lactobacilli tested in acidic and bile environments performed as well as, or even better than, many of the probiotic bacterial strains described in the literature. The study suggests that these strains isolated from traditional fermented Maasai milk may reach the intestinal environment in a functional state. In the current study, *Lb. fermentum* strains tested showed, in fact, very good survival when exposed to low pH solutions. Better survival was shown by some strains of the *Lb. paracasei* group and *Lb acidophilus* group (Mathara, 2004). It is generally considered necessary to evaluate the ability of potentially probiotic bacteria to resist the effects of bile acids not only as a selection criterion, but also because lactobacilli have been shown to exhibit a strain variation in their tolerance to bile salts. Bile tolerance is considered to be an important characteristic of *Lb. acidophilus* strains. Among the probiotic strains tested in a recent study, strains of *Lb. acidophilus* group and *Lb. fermentum* demonstrated the highest bile salts tolerance, followed by strains of the other potentially probiotic lactobacilli (Mathara, 2004).

Bacteria used as probiotics or in starter cultures may serve as hosts of antibiotic resistance genes, which can be transferred to pathogenic bacteria. One of the safety measures taken in probiotic studies is the verification that a bacterial strain does not contain transferable resistance genes. From the dominant *Lactobacillus* strains, high frequencies of resistance were detected for kanamycin, trimethoprim and gentamicin. Fewer strains (14%) were resistant to tetracycline, whereas 100% were sensitive to chloramphenicol and erythromycin. This observation differs greatly from the antibiotic susceptibility of lactobacilli isolated from commercial probiotic milk products in Europe (Temmerman *et al.*, 2003). The current study shows occurrence of strains that are less resistant to the commonly used antibiotics.

The hydrophobic nature of the outermost surface of micro-organisms has been implicated in the attachment of bacteria to host tissue, a property that could confer a competitive advantage, important for bacterial maintenance in the human gastrointestinal tract. In this study, the highest values of hydrophobicity were found for the *Lb. acidophilus* and *Lb. fermentum* strains, while relatively lower values were obtained for the strains of *Lb. paracasei*, *Lb. rhamnosus* and *Lb. plantarum*. Hydrophobicity values for LAB isolated in this study were similar or higher than those obtained for some commercial probiotic strains of *Lb. casei* and *Lb. rhamnosus*. There was some correlation between hydrophobicity and bacterial adhesion of the strains tested in this work. The significance of such high hydrophobicity values on functionality of these strains needs to be investigated. Evidence of the cholesterol reduction on consumption of fermented milk by the Maasai was first documented in 1974 (Mann and Spoerry, 1974). However, since then, no follow up on the possible contribution of the LAB involved in the spontaneous fermentation of milk with regard to cholesterol assimilation was conducted. In this study, isolated LAB strains with ability to reduce cholesterol have been identified and characterised. A number of LAB strains were found to express bile salt hydrolase activity, a physiological function linked to cholesterol assimilation.

In this study, the protective effects of selected LAB strains was examined by investigating their antigenotoxic activity using the Comet assay. Results indicate protection effect against MNNG-induced DNA damage in vitro with some strains of the *Lb. acidophilus* group. From this study selected strains obtained are recommended as good candidates for functional culture development (Holzapfel, W.H. 2002).

I would like to thank the SfAM for awarding me a President's Fund grant to attend the SfAM 2004 summer conference in Cork, Ireland. Apart from presenting part of the research findings highlighted above, I acquired valuable information, on challenges and opportunities in probiotic and functional food research. Special thanks to Prof. Dr. Wilhelm Holzapfel of Federal Research Centre for Nutrition and Food, Germany, Dr. Phillip Museve Kutima, of Jomo Kenyatta University of Agriculture and Technology and Prof. Samuel K. Mbugua, University of Nairobi, my mentors in these research.

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Julius Mathara

Interaction of *Neisseria meningitidis* with cerobrovascular and respiratory cells. **Andrew Rogers** reports

NEISSERIA MENINGITIDIS (meningococcus) was first isolated after an outbreak in Vienna in 1887, where the pathology of the disease carried the now familiar characteristics of: mild fever, through to severe fulminant bacteraemia, characterised by purpuric rash, organ failure and eventual death.

To date, there are 13 classified serogroups of *N. meningitidis*. Serogroups A, B and C make up 90% of global meningococcal disease isolates, with serogroup A causing periodic epidemics in the 'meningitis belt' of sub-Saharan Africa, and serogroups B and C being responsible for more sporadic outbreaks in Westernised countries (Caugant 1998). However, over the course of the last 50 years, *N. meningitidis* has caused major long-term epidemics in European countries (Norway, 1974-1990s; Spain, 1976-1979; Great Britain 1970s) as well as the United States (1969-1975 and 1977-1985) and Canada (1985-1992). Currently, there is an epidemic in New Zealand (1991-current), which is caused mainly by a specific strain of meningococcal serogroup B (Martin & McDowell 2004).

Humans are the only natural reservoir for N. meningitidis and transfer between other humans is usually through aerosols or intimate contact. This is why university students, after new-born infants and toddlers, are at greatest risk of contracting meningococcal disease. Natural asymptomatic carriage occurs in the nasopharyngeal area and has an estimated baseline rate of between 5-11%. Meningococci are well adapted to nasopharyngeal colonisation (Read *et al.*, 1995) through the presence of surface-expressed proteins, such as pili, Opc and the Opa proteins. In virulent strains, these proteins (adhesins) are essential for meningococcal adhesion and subsequent invasion of epithelial and endothelial cells (Nassif *et al.*, 1994; Virji *et al.*, 1993). This therefore represents a major route of entry into the host's systemic circulation and thereby mediating bacterial sepsis.

Previous studies have used endothelial cells that were derived from human umbilical veins (HUVECs), and epithelial cell lines that were derived from larynx carcinomas (HEp-2). Investigations carried out by the Molecular Bacteriology and Immunology Group into meningococcal adherence and invasion, using a serogroup B strain (MC58), have used physiologically significant cell lines. These cell lines are a bronchial cell line (BEA-2B) and a cell line derived from the human brain microvascular endothelial cell layer (HBMEs), which forms part of the blood brain barrier (BBB).

The extent of cellular adhesion and invasion was investigated using fluorescent microscopy and confocal microscopy. However, firstly to determine the optimal time of bacterial adherence and invasion a standard CFU association and invasion assay was performed. In summary, the human cells were infected with 2e7 MC58 and incubated for up to 10 hours, with timepoints taken every two hours.

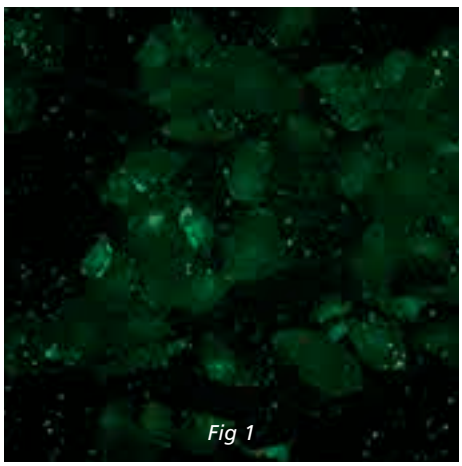
Fig 1

The human cells from each timepoint, were then lysed and serially diluted on to chocolated horse blood agar to determine bacterial association (adherence and invasion) through CFU counts. To determine invasion alone, at each timepoint, the human cells were further incubated with 100µg/ml gentamicin for 1 hour, killing extracellular bacteria. The human cells were then treated identically to that stated above. It was shown that optimal association occurred after 4 hours incubation, and optimal invasion occurred after 8 hours.

Though CFU counts form an essential part of determining the extent of bacterial adhesion and invasion, it is paramount to use other techniques such as fluorescent microscopy, to image bacterial adhesion, as well as confocal microscopy to image invasive meningococci, to fully demonstrate the interacting of the meningococcus with the host cell. Figure 1 shows meningococci, labelled with a fluorescent antibody (bright green), clearly adhering to the surface of the human cells (HBMEs), after four hours incubation. This too was seen with the BEA-2B cell line. Furthermore, the confocal image (Figure 2), this time showing the BEA-2B cell line, shows that after eight hours incubation with MC58, meningococci have clearly invaded into the cells and are approximately 6-8µm inside the cell. This occurred, though to a lesser extent, with the HBME cell line.

The implications of this, physiologically, is that once virulent strains of *N. meningitidis* have colonised

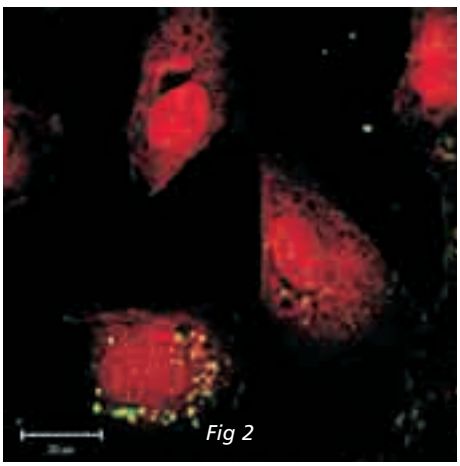
Fig 2

the nasopharynx, they are clearly able to invade into these cells, pass through the host cell, and exit through the basal surface, eventually into the host's systemic circulation. Once in the circulation, the bacteria is able to then adhere to the cells of the BBB and again invade and pass through the cell. Even though this may be in reduced numbers, in comparison to the original invasion, only a small number of viable bacteria need to be present to multiply in the CSF of the brain cavity, where an immunological response is not as vigorous as in the systemic system and bacterial meningitis will follow.

It is with much appreciation that I

thank SfAM for the generous President's Fund Grant that allowed me to attend, as well as present my above work, in a poster format, at the 14th International Pathogenic Neisseria Conference in Milwaukee, USA.

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Andrew Rogers

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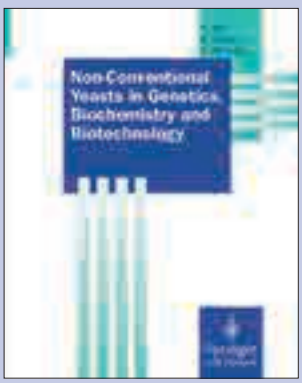

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Environmental Microbiology: Methods and Protocols

J F T Spencer & A L R de Spencer (Eds). Humana Press Totowa, New Jersey. 2004. ISBN: 1-58829-116-2. 423 pp.
Reviewed by J Gwynfryn Jones

This volume is the sixteenth in the series entitled Methods in Biotechnology. A wide range of subjects are covered, with sections on Communities and Biofilms, Fermented Milks, Nucleic Acids —Recovery and Determination and, finally four chapters under the heading Reviews.

The authorship is dominated by South American contributions with 19 of the 34 non-review chapters coming from Argentina (all but two from Tucuman). This might indicate that the volume is the result of a symposium but, as the editors do not say so in their preface, this is probably a totally incorrect supposition on my part. The range of the subject matter covered is matched by a considerable variety in the length of the contributions.

These vary from four pages on the *"Determination of Oligosaccharides in Fermented Soymilk Products by High-Performance Liquid Chromatography"* to much meatier contributions such as the chapter on *"Techniques for Manipulating the Bacterial Endophyte Bacillus mojavensis"*.

The general impression gained on examining this book is that there has been a lack of editorial control. Some chapters clearly do not belong in a volume entitled *"Environmental Microbiology"* and others fall well outside the title of their section. For example, what is a chapter entitled *"Method for Determining Lindane Concentration in Water and Solid Samples"* doing in the section devoted to the recovery and determination of nucleic acids?

The English in some chapters leaves room for improvement; whilst it does not prevent the reader from understanding what is meant, it does lead to slower reading in some sections. It is the responsibility of the editors to help contributors whose first language is not that of the publication. Although the chapters are not uniform in format, most

provide enough information about the protocols used to permit the reader to repeat the methods described. In any event each chapter has a supporting list of references. Some chapters cover similar ground, as in the case of two entitled *"Isolation and Molecular Characterization of Seawater Bacteria"* and *"Molecular Characterization of Microbial Communities from Marine Environments"*.

These chapters have two authors in common; the first uses nutrient rich media to isolate bacteria (even though the enormous drawbacks are acknowledged) and the second is essentially about bacteria not microbes, as protists are first removed by prefiltration. Once again, some editorial guidance was required. The editors refer to the chapters on groundwater microbiology (a notoriously difficult subject) in their preface.

The chapter on *"Development of Vital Fluorescent Staining Method for Monitoring Bacterial Transport in Subsurface Ground Water"* gives detail of the staining method but fails to cover the environmentally more challenging task of designing a programme for adequate sampling and recovery of the marked bacteria,. The contribution on *"Molecular Identification of Microbial Populations in Petroleum-Contaminated Groundwater"* appears to confine itself to primers that distinguish at the Bacteria/Archaea/Eukarya level.

Given its title, I would prefer to see a much better focussed volume and I am forced to the conclusion that there are more useful publications on the market. This is not to say that there are no chapters of interest, merely that, in this rapidly growing field, other volumes provide the reader with more up to date information and a significantly higher proportion of post-2000 references.

Experimental Design for the Life Sciences

George D. Ruxton and Nick Colegrave.
Oxford University Press.
ISBN 019925232 7
Reviewed by Andrew Sails

This textbook is specifically aimed at teaching experimental design to undergraduate students in the life sciences, however it will also appeal to anyone working in life science research in general. The book is organised as a step-by-step guide which leads the student through the process of experimental design but can also be used as a reference for specific concepts.

When I was an undergraduate, experimental design usually consisted of rather stodgy lectures about statistics with almost endless mathematical equations. Thankfully this book does not include extensive discussions on statistics or pages of equations and instead it breaks experimental design down in to key concepts or steps. The authors are particularly effective at explaining the more difficult concepts using easy to follow examples.

Chapter 1 begins by reminding the reader why we need to care about experimental design. The costs in both time and money, and ethical issues of poor experimental design are outlined to emphasise why good design is important. Each chapter finishes with a short summary of bullet points to reiterate the key concepts addressed.

Chapter 2: *"Starting with a well defined hypothesis"* leads the reader through the process of formulating clearly focussed hypotheses and making predictions from them which can be investigated experimentally. At the end of the chapter we are reminded that there is no such thing as *"the perfect experiment"* but a little care can produce a good one instead of a bad one.

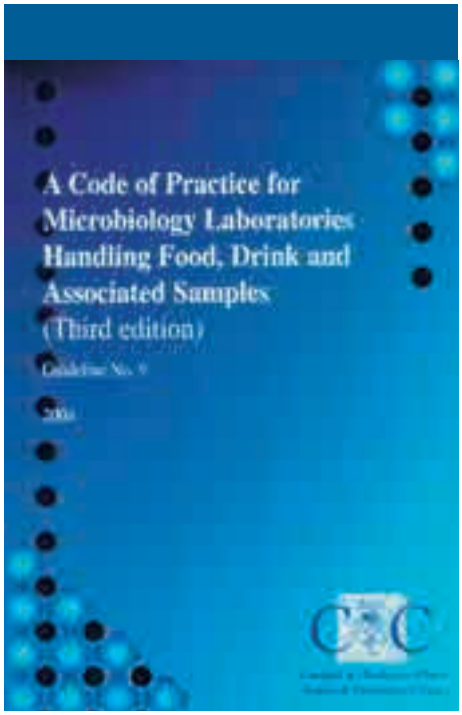
Chapter 3: *"Between-individual variation, replication and sampling"* describes the concepts of dependent and independent variables and experimental replication. Well thought out examples contained in boxes placed within the main body of text, are used to illustrate these concepts and many others in later chapters. Chapter 4: *"Different experimental designs"* aims to introduce the idea of experimental controls, and the need for care when designing the most effective sort for a particular experiment. Chapter 5 discusses taking measurements and then Chapter 6 provides the reader with some final thoughts on experimental design. This is then followed by a very useful bibliography which directs the reader to other exemplary texts on the concepts raised in the book.

The authors have even taken the trouble to provide a short summary of the contents of each text helping the reader to identify which book would be most useful for further reading.

This book should be on the reading list of all life science courses and would be a very useful textbook for teaching courses on experimental design. The teachers of such courses would also be able to take advantage of the companion web site where all the figures of the book can be downloaded for free, most useful when planning lectures.

In summary, the book has much to offer the undergraduate life sciences student but also should appeal to postgraduate and even postdoctoral level students. For the more experienced biologist, this text should also prove useful and may stimulate them to think about the way they design their experiments.

After reading this book I found myself re-examining some of my more recent experiments to determine if perhaps they could have been designed more effectively. Who said *"you can't teach an old dog new tricks?"* Ruxton and Colegrave should be congratulated for producing such a useful and well written book.



Food microbiology laboratories

A new edition of a well-established guide from CCFRA will help food microbiologists to run their laboratories safely and efficiently and help ensure that they generate results that are valid and meaningful. A code of practice for microbiology laboratories handling food, drink and associated samples has been extensively revised and updated to build on the success of the earlier editions and benefit from user-feedback. Its focus, however, remains strongly practical.

After introductory sections on the principles of laboratory safety and security and laboratory management, it provides guidance on the main points to consider when using specific pieces of laboratory equipment. It then provides extensive guidance on media preparation, a range of basic microbiological procedures, and the calculation and recording of results. Supplementary sections include lists of useful references and websites and several appendices which contain information on equipment quality monitoring checks, microscopy techniques including staining, and sample laboratory

Microbiological analysis of foods can involve any of a range of techniques.

Obtaining valid and meaningful results, however, requires that the principles of good laboratory practice (GLP) are applied to the many steps and laboratory procedures through which the samples pass *en route* to the analysis. This practical laboratory guide provides a firm basis on which to establish and maintain such good practice.

Further information can be obtained from Mrs. Sue Hocking, CCFRA,
Tel: +44(0)1386 842225
Email pubs@campden.co.uk

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The Society publishes two monthly journals: ***Journal of Applied Microbiology*** and ***Letters in Applied Microbiology.*** We also produce our own quarterly in-house colour magazine: ***Microbiologist***, which contains features, reports topical news stories and full details of our meetings. The Society is also a partner with Blackwell Publishing in the bi-monthly journal ***Environmental Microbiology.***

Online journals

Synergy is an online service provided by Blackwell Publishing that gives Full and Student Members **FREE** access to the online versions of the Society's three journals: ***Journal of Applied Microbiology***, ***Letters in Applied Microbiology*** and ***Environmental Microbiology***. Members can register for this service at http://www.blackwell-science.com. Members can also submit papers directly to our journals via an online submission service.

For more information about Synergy or online manuscript submission, please visit the website.

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

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