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Cover image Rugby scrum. *Bob Thomas / Getty Images*

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Sir Howard Dalton Prize and Fellowship

Sir Howard Dalton, who was SGM President 1997–2000 and who sadly died unexpectedly in 2008, made a bequest of £2,000 to the Society. After careful deliberations, Council decided that it would like use the money to support attendance at an SGM meeting by a microbiology student from The Gambia, where Sir Howard and his wife Lady Kira were involved in educational activities. Lady Kira was delighted to accede to this suggestion and the scheme will be put in place. Council also decided to rename the *Young Microbiologist of the Year Competition*, which fosters science communication in early career microbiologists, in honour of Sir Howard.

Fred Griffith Prize Lecture

Professor Jeff Errington will deliver his prize lecture entitled *From spores to antibiotics via the cell cycle*, on Tuesday, 8 September at the Society's meeting at Edinburgh Conference Centre, Heriot-Watt University. The Fred Griffith Prize is awarded in recognition of long and distinguished service in any area of microbiology.

Jeff did a BSc in Genetics and Zoology at Newcastle University (1977) and then a PhD in microbial genetics at what is now the University of Greenwich. In 1981 he made a career-defining move to Oxford to work with Prof Joel Mandelstam on spore formation in *Bacillus subtilis*. Captivated by the power of *B. subtilis* as an experimental organism, he has continued to work on fundamental aspects of its cell and molecular biology ever since. In 2006 he moved his lab to Newcastle to take over as Director of the Institute for Cell and Molecular Biosciences and realize a dream of building a research centre focused on fundamental studies of model bacteria – the Centre for Bacterial Cell Biology – which will be housed in a brand new building in 2010. Jeff has published nearly 150 full research papers, many in high ranking journals including *Cell*, *Science* and *Nature*. His contributions have been honoured by election to Fellowship of the Royal Society, the Academy of Medical Sciences, the American Academy of Microbiology and EMBO. Jeff embraces the idea that basic science can provide opportunities for drug discovery and founded Prolysis Ltd, which now has several novel antibiotics in the development pipeline.

Free access to H1N1 influenza virus papers

Because of current public health interest in swine influenza, SGM has made all papers on H1N1 influenza viruses published in *JGV* and *JMM* freely available online. Under normal circumstances, papers published in these journals are under access controls for 12 months after publication. See **http://vir.sgmjournals.org/misc/news_060509**

Swine 'flu talk at autumn conference

Wendy Barclay, Professor of Influenza Virology at Imperial College London, will be giving delegates at the SGM conference in Edinburgh all the latest news and research findings on swine 'flu. As *Microbiology Today* went to press, the World Health Organization declared the current outbreak an official pandemic. Wendy has been in much demand by the media to provide information about the virus and the infection it causes, appearing on television as well as being interviewed on radio and by the press. Her talk takes place at noon on Wednesday 9 September.

Wendy has also agreed to participate in an event for the general public during the Heriot-Watt meeting, under the banner '*Flu and You: catch it, bin it, kill it*. She will give a talk that covers seasonal 'flu as well as swine 'flu and provide information on 'flu vaccines. The talk will be followed by an interactive demonstration on hand hygiene by SGM staff using their exciting glowing gel to show how viruses are transmitted by touch. The event will take place after the end of scientific sessions on Tuesday 8 September.

SGM Council

May meeting highlights

Honorary membership

Council decided unanimously to support the President's nomination of **Dr Julian Davies**, Professor Emeritus of Microbiology and Immunology, University of British Columbia, Vancouver, Canada, for Honorary Membership. His scientific work focuses on all aspects of microbial ecology and he is a keen supporter of SGM; in the past few months alone having written not only an article for *Microbiology Today*, but also been a keynote speaker at the Harrogate conference.

SGM Prizes

Council members were requested to send nominations for the 2010 SGM Prize Medal to the General Secretary in May, in readiness for the discussion at the July 2009 Council meeting when a decision will be made.

SGM meetings

Council heard that the Spring 2009 meeting in Harrogate was a great success with good attendance at the scientific sessions and particularly the prize lectures. This was the first conference under the new system, which was considered to have worked well. The arrangements will be reviewed by the new Scientific Meetings Officer, **Chris J. Hewitt**, in 2010.

European Society for Virology (ESV)

The President attended the First General Assembly of the new ESV which took place in Rome on 24 April 2009. He reported that the ESV sees itself as the equivalent in Europe of the American Society for Virology (ASV). It will be responsible for organizing the triennial European Congress of Virology. The next (4th) congress will take place in Cernobbia, Lago di Como, Italy, in April 2010. Council agreed that SGM should support the new society and become a corporate member. Robin Weiss was elected the Chair of the European Virology Award (EVA) Committee.

Within the next year an Advisory Council of 12 members will be formed.

SGM finances

Council accepted the 2008 Annual Accounts and authorized the Treasurer to sign the Letter of Representation to the auditors. They also noted that the commercial sales tiered pricing project was underway. The general economic recession has not left SGM untouched. However, at present its finances are stable.

Education activities

The Education Officer **Sue Assinder** reported that in 2009 SGM staff will continue to participate in the joint *Science Careers* stand with other bioscience organizations at the Higher Education Conventions aimed at 6th-formers making university choices. She showed Council two new publications. *Microbiologists make a difference*, a stylish and interesting guide to careers in microbiology for the 16 year-old, describes 9 job profiles by young microbiologists and contains advice on training routes and career opportunities in microbiology. *The good, the bad and the ugly – microbes*, a colourful 68-page book for key stage 3 and 4 pupils which includes a CD on microbiology, has been sent to all school members of the SGM (now over 500!), and a marketing campaign aimed at all UK and Ireland secondary schools is underway.

Dual use of micro-organisms

In the light of the Parliamentary Office of Science and Technology (POST) canvassing opinion on this issue from some of the SGM Editors-in-Chief for one of their 'POST Notes', Council had a general discussion. In conclusion, it saw no cogent reason to change the Policy on Scientific Publication, Security and Censorship that they had agreed on 2 May 2003 (see **www.sgm.ac.uk/pubs/policy.cfm**).

***Ulrich Desselberger**, General Secretary*

New member of Council

Dr Karen Robinson, Associate Professor, Centre for Biomolecular Sciences, University of Nottingham, has been elected unopposed to serve on Council for a period of 4 years from 8 September 2009. A profile of Dr Robinson will appear in a future issue of *Microbiology Today*.

AGM 2009

The AGM of the Society will be held on **Tuesday, 8 September 2009** at the Society Meeting at Edinburgh Conference Centre, Heriot-Watt University. Agenda papers, including reports from Officers and Group Conveners and the Accounts of the Society for 2008 are circulated with this issue of *Microbiology Today*.

New Officers

The transition process to the newly restructured Council begins with the AGM and the following will take over as officers of the Society from 8 September 2009.

President – Professor Hilary Lappin-Scott

I have been a member of SGM since 1984 and have been an Elected Officer, Group Convener, Council Member and Meetings Officer at various times since then. I am currently President of the International Society for Microbial Ecology and a member of the International Board of the American Society for Microbiology. My day job, until recently, was Professor of Environmental Microbiology at the University of Exeter. I am now Pro-Vice Chancellor (Research and Enterprise) at Bangor University.

These roles have provided insights into how learned societies are responding to the exciting developments in microbiology and meeting the professional needs of their members. The SGM has to meet various challenges: microbiologists have to take into account the economic impact factors of their research as never before; there is concern that 'blue skies' research may thus be put under pressure; young researchers need encouragement for the future development of microbiology and learned societies have to survive in very difficult economic circumstances.

I am positive that the SGM is well placed to respond to these pressures and develop new initiatives to promote the art and science of microbiology. I am honoured to be elected President and look forward to working with Council and professional staff to meet these challenges.

General Secretary – Dr David Blackbourn

My PhD was in Microbial Genetics with Colin Harwood at the University of Newcastle-upon-Tyne. I then turned to virology as a postdoc in the US, working first on SIV before joining Jay Levy's HIV lab in San Francisco. Here, my interest in viruses and cancer flourished, in part through the study of Kaposi's sarcoma (KS), the most common malignancy of untreated AIDS patients. I established my own group at the Institute of Virology, Glasgow in 1999 and moved to my present position as Reader in the School of Cancer Sciences, University of Birmingham in 2005. My group's interests include viral immune modulation and pathogenesis, which we study through KSHV, the causal agent of KS.

I have served on the SGM Virus Group, have been an Elected Member of Council serving on the Treasurer's Committee since 2007, and Editor of SGM's *Journal of General Virology* since 2008.

I look forward to working with Council, the new President, Hilary Lappin-Scott, and the team at Marlborough House in my capacity as General Secretary. One of the challenges during my tenure will include helping to ensure that equally diligent and talented people succeed key members of the Marlborough House staff who have ensured the seamless running of SGM and its conferences for many years.

Publications Officer – Professor Howard Jenkinson

Howard Jenkinson is Professor of Oral Microbiology at the University of Bristol and is pleased to be taking up the new position of Publications Officer. He graduated from Warwick University in Microbiology and Virology, completed his PhD in Applied Biochemistry at the University of Nottingham, and worked as a postdoc in Oxford on the biochemistry and genetics of *Bacillus subtilis* sporulation. He then spent nearly 14 years at the University of Otago, Dunedin, New Zealand, before returning to the UK in 1997. Howard's research interests lie primarily in studies of the molecular basis of *Streptococcus* colonization and virulence. He also works on adherence and colonization factors of *Candida albicans* and *Treponema* spp. Howard was SGM Meetings Officer 2000–2004. He sees this new job as an opportunity to help strengthen the position of SGM publications in the market, especially the electronic arena, and to develop a future strategy that will increase our competitiveness and elevate our profile in publications.

Education & Public Affairs Officer – Professor Joanna Verran

Jo is Professor of Microbiology in the School of Biology, Chemistry and Health Science at Manchester Metropolitan University. Her research has focused on interactions between micro-organisms and inert surfaces, with current interests diverging across dentures and hygienic food contact surfaces! She has formed a strong interdisciplinary collaboration with surface engineers and polymer technologists, and the research was submitted within the Metallurgy and Materials UoA. She is Director of the Graduate School in the Faculty of Science and Engineering, and also maintains a significant undergraduate teaching commitment, incorporating several novel learning activities into the curriculum, which she disseminates at conferences, through her website, and via publications. She has been involved in outreach activities with schools, teachers, the general public and the media.

Jo has been a member of the Education/Education & Training Group Committees for some time, being Chair for the past 5 years – plus one for good behaviour to help the transition from Group to Division! She has worked closely with Marlborough House helping to promote and develop microbiology education, particularly for undergraduates. Education links with other microbiology societies are being developed through FEMS, and relationships with ASM via their Board of Education and Training, and ASMCUE (Conference on Undergraduate Education) are healthy. She looks forward to developing many of these initiatives further on Council.

Scientific Meetings Officer – Professor Chris J. Hewitt

Chris graduated with a first class honours degree in Biology from Royal Holloway College, University of London in 1990. He then went on to the Department of Chemical Engineering at Birmingham to study for his PhD in Industrial Microbiology where he worked on the synthesis of α-amylase by *Bacillus amyloliquefaciens*. Chris stayed there for a further 13 years, as Lecturer then Senior Lecturer, developing his research work at the life science/engineering interface, and studying the interaction of the organism with the process engineering environment using such non-invasive techniques as flow cytometry, image analysis and NIR spectroscopy. These techniques were used to improve understanding of how cells behave within such diverse areas as microbial fermentation, bioremediation and biotransformation for informed process development and subsequent scale-up. In October 2006, Chris moved to Loughborough University to take up a new chair in Pharmaceutical Engineering and is now busy establishing Loughborough's Centre for Biological Engineering, of which he is co-founder. Whilst his research is centred around regenerative medicine bioprocessing, he is still an active microbiologist and hopes through the role of Scientific Meetings Officer to deliver exciting, 'cutting edge' programmes that meet the expectations of all members.

Deputy Scientific Meetings Officer – Evelyn Doyle

Evelyn is a Senior Lecturer in the School of Biology and Environmental Science in University College Dublin. She began her career with a BSc in Microbiology in the National University of Ireland, Galway and then came to UCD as a PhD student working on high-maltose-producing amylases under the supervision of Professors Liam Fogarty and Renee Kelly. After 4 years working as an industry-funded postdoc on the application of microbial carbohydrases , Evelyn joined the staff of the Department of Industrial Microbiology in UCD in 1990. She was Head of Department from 2002 to 2005.

The main focus of Evelyn's research is microbial degradation of xenobiotics and bioremediation, with particular interest in linking specific microbial populations to biodegradation in natural ecosystems.

Evelyn has been a member of the SGM since 1983 and served on the Irish Branch committee from 1990 to 1994 and again in 1997 to 2000. During her time on the committee she was involved in organizing a number of symposia. She was Chair of the Irish Division on the SGM from 2006 to 2009 and is looking forward to the challenge of Deputy Scientific Meetings Officer.

New Division Chairs

Following the restructuring of SGM meetings organization that started in 2007, the first chairs of the five divisions have reached the end of their terms of office. The chairs-elect who have been helping to introduce the new system will now take over the helm of their respective divisions.

Education and Training Division

Dr Sue Assinder

Sue Assinder began her career with a degree in Biological Sciences at Lancaster University. The highlight of this was her final year project in which she made her first contact with fungal genetics, an area in which she continued for her PhD research. After postdoctoral positions at Dalhousie University and the University of St Andrews, she joined the School of Biological Sciences at Bangor University in 1986 as a postdoctoral fellow and remained there for 21 years, the final 3 years as Head of School. In 2006, she was appointed as Director of the newly formed Academic Development Unit in the School of Education, where she had responsibility for delivering professional development in teaching and learning for academic staff, and skills training for early career researchers.

In 2008, she moved to the Liverpool School of Tropical Medicine as the first Director of Education and now runs a complex teaching effort that delivers postgraduate programmes not only in Liverpool but also in many countries around the world, particularly Africa and the Middle-East.

Outside of conventional teaching, Sue has for many years pursued an interest in promoting public engagement with science, producing resources for schools and participating in numerous science festivals and other public events. She has just completed a 6-year term as SGM Education Officer and chairs the Education Committee of the Biosciences Federation. Sue is delighted to be continuing her association with the SGM as Chair of the Education and Training Division and aims to deliver an exciting and diverse programme that will be attractive both to members whose professional roles focus on teaching and also to those whose primary interests are in research.

Sue is married with three grown-up children, who bring her much pleasure and have even proved to have their uses on occasion as guinea pigs for her educational activities.

Eukaryotic Microbiology Division

Professor Neil Gow FRSE FIBiol FAAM

I am a former British Mycological Society President, current Vice-President of ISHAM, former Editor of *Microbiology* and current Editor-in-Chief of *Fungal Genetics and Biology*.

My own research is focused on the growth, morphogenesis and pathogenesis of the human fungal pathogen *Candida albicans* and other medically important fungal species. In recent years my group has focused mainly on the genetics of glycosylation and the fungus–host interaction, and on chitin synthesis and hyphal orientation responses.

Eukaryotic biology has always been supported by the SGM, and with the new division structure, we will put even more resources into this. My hope is that the Eukaryotic Division will be able (with your help) to capture the most exciting and topical developments in the field and will provide a home for those of you who are invested in fungi, protozoans, algae and other protists.

We have been guaranteed the resources to make a difference and I hope that you will be active in sending your ideas to the team of people who will be helping to make the SGM even more eukaryotic in the future.

Irish Division

Dr John McGrath

I am a Senior Lecturer in the School of Biological Sciences at the Queen's University Belfast.

I did my BSc in Molecular Biology at Queen's before completing my PhD within the Queen's University Science and Technology Research (QUESTOR) Centre. This focused on the biodegradation of a group of environmental pollutants known as the organophosphonates, under the supervision of John Quinn, with whom I continue to enjoy a close working relationship.

My current research involves investigating microbial phosphorus cycling in the marine, freshwater and terrestrial environments. This has important implications for environmental protection, resource management and climate change.

I have been a member of the Society for General Microbiology since 1992 and have served on the Irish Branch committee (twice) and the Environmental Microbiology Committee.

Prokaryotic Microbiology Division

Dr Ian Henderson

I graduated in Industrial Microbiology from University College Dublin. After a brief period working for Wellcome I pursued my PhD studies at Trinity College Dublin. I performed my postdoctoral studies at the Center for Vaccine Development, University of Maryland before becoming a lecturer at Queens University Belfast. Currently, I am a Senior Lecturer at the University of Birmingham where my group studies outer membrane biogenesis, protein secretion and genomics.

I am looking forward to the next 2 years as Chair of the Prokaryotic Division as we strive to build upon the success of the new meetings organization. I hope with my colleagues within the Prokaryotic Division to deliver a dynamic, robust and community-driven series of symposia.

Furthermore, I will strive to adopt best practice from strategies previously utilized by the Virology Division such that we deliver opportunities for younger members of the Society to present their work, thereby gaining exposure for themselves and their research.

Virus Division

Professor Mark Harris

Mark graduated with a first class honours degree in Biological Sciences from Plymouth Polytechnic in 1983 and then undertook his PhD at the Institute of Virology in Glasgow, working with Ron Hay on adenovirus DNA replication. After a postdoc at the NERC Institute of Virology in Oxford working on baculoviruses with Bob Possee, he moved back to Glasgow to the Department of Veterinary Pathology, switched from DNA to RNA viruses, and began working on the Nef protein of HIV-1 in the lab of Jim Neil.

After 5 years as a postdoc he obtained an MRC Senior AIDS Research Fellowship and subsequently moved to Leeds in 1997, taking up a Lectureship post in what was then the Department of Microbiology. Whilst retaining an interest in HIV, Mark's lab has moved over almost entirely to the study of hepatitis C virus. His research is focused both the molecular mechanisms of virus replication as well as virus–host protein interactions.

He has always been a strong supporter of the Society and is currently a member of SGM Council and an Editor of the *Journal of General Virology*. As incoming Chair of the Virus Division, Mark welcomes the opportunity to make a further contribution by helping to organize programmes of meetings.

People

Congratulations to:

Professor Martin Buck, Imperial College London on his election to Fellowship of the Royal Society.

Dr Julian Parkhill, Head of Sequencing and Pathogen Genomics, Wellcome Trust Sanger Institute on being elected to the Academy of Medical Sciences.

Queen's Birthday Honours 2009

The following members have been made awards:

Professor David Charles Baulcombe, Professor of Botany and Royal Society Research Professor, University of Cambridge, is to receive a knighthood for services to Plant Science.

Professor Diane Newell, lately Senior Scientific Consultant, Veterinary Laboratories Agency is to receive an Order of the British Empire for services to Science.

Staff News

Congratulations to **Faye Stokes**, Public Affairs Administrator, on the birth of a baby girl Elizabeth in May.

Welcome to **Victoria Hurr**, who took up a post as Staff Editor on the Society's journals in at the end of June. Victoria did her PhD in Crop Genetics at the John Innes Centre, Norwich, and has just returned to the UK after 7 years working as a postdoc in the Agronomy Department at the University of Florida, USA where she has been carrying out projects on transgenic plants.

Sense About Science campaign

A recent court case brought by the British Chiropractic Association against the science writer Simon Singh has been highlighted by Sense About Science (SAS). SAS believes that the English laws of libel are a threat to scientists and writers worldwide and wants them to be taken out of scientific debates. They assert that disputes about evidence should take place in peer-reviewed journals, public forums and the mainstream media, not the courts. SGM President Robin Weiss and Chief Executive Ron Fraser have both signed the statement at **www.senseaboutscience.org/freedebate**, along with many other high ranking scientists, journalists and celebrities. The journal *Nature* is supporting the campaign and published a one page advertisement for it, listing the names of the original signatories in the 25 June issue. Further signatories are welcome via the above url. Over 10,000 names have been received to date.

Microbiology in the News

www.sgm.ac.uk/news/news.cfm

Every day, staff in the SGM External Relations Office check out the UK broadsheet newspapers and other news services online, such as the BBC, for stories relating to microbiology. These are collated and summaries of interesting items put on the Newsdesk of the SGM website. Links to the original reports are included for those who want to read the full story. *Microbiology in the News* not only provides a quick way of checking what's currently hitting the headlines, but it is also a useful resource for students. The archive goes back to 2002, so it is possible to track back particular topics. Why not bookmark it?

CaSE

The Campaign for Science & Engineering (CaSE) is the leading advocate for science and engineering in the UK. The strength of their policy advocacy is due to their political networks, independent analysis, broad membership, and responsiveness. SGM has been a corporate member of CaSE for many years and a keen supporter of its activities. CaSE meets regularly with Lord Drayson, the Minister for Science and Innovation, and was active in re-establishing the Science and Technology Committee, disbanded 2 years ago. This was particularly important since a new Department for Business Innovation and Skills was created in the recent Government re-shuffle, merging the old Departments for Innovation, Universities and Skills and for Business Enterprise and Regulatory Reform. With a general election looming, CaSE will play an important role in disseminating details of the science policy of the different political parties.

CaSE Director Nick Dusic and Membership Officer David Hawksett recently visited SGM to talk to Chief Executive Ron Fraser and External Relations staff about current initiatives. Individuals can sign up free to receive the monthly e-bulletin, giving news of CaSE activities at **www.savebritishscience.org.uk**

Classifying microbes – new poster

A new and huge poster showing examples of the main groups of micro-organisms in glorious colour is now available from the External Relations Office.

It has been produced and designed by Dariel Burdass, Education Manager. Why not brighten up your lab or office walls? Copies are free by emailing **education@sgm.ac.uk** Although a copy of the poster has been sent to every UK and Ireland secondary school, any teachers that you are know are also welcome to their own copy. Help us spread the word about the amazing world of microbes!

Grants

Upcoming deadlines

25 September 2009 is the deadline for receipt of applications to the International Development Fund, Watanabe Book Fund, Elective and Trainee Support grants and President's Fund for Research Visits

Postgraduate Student Meeting Grants

Applications for a grant to attend SGM's Heriot-Watt meeting (7–10 September) must be received by **4 September 2009**.

Other schemes in brief

Scientific Meetings Travel Grants

The scheme supports early career microbiologists wishing to present work at a scientific meeting, either in the UK or abroad. See rules on the website for eligibility criteria.

Seminar Speakers Fund

The Fund supports talks on microbiological topics in departmental seminar programmes.

Applications will be dealt with on a first come, first served basis during the calendar year.

Education Development Fund/ PUS Awards

Grants are available to members for projects intended to lead to an improvement in the teaching of any aspect of microbiology relevant to education in the UK. Funding is also available for small projects to promote the public engagement with microbiology, such as workshops, talks, demonstrations, leaflets, and activities at science festivals.

Applications will be considered on a first come, first served basis during the calendar year.

Microbiology in Schools Fund

Teachers working in SGM member schools are invited to apply for grants of up to £1,000 to support microbiology teaching initiatives and events. All topics in microbiology will be considered but projects linked to climate change, health and food are particularly encouraged.

Applications are considered throughout the year but should be made no less than 3 months before the planned activity.

Retired Member Conference Grants

Retired members may apply for a grant to attend one SGM meeting each year. The award covers en-suite accommodation and the Society dinner.

Applications for grants to attend the SGM meeting at Heriot-Watt University are now invited.

Closing date:
4 September 2009.

Technician Meeting Grants

These grants support attendance by eligible technicians at one SGM meeting each year.

Applications for grants to attend the SGM meeting at Heriot-Watt University are now invited.

Closing date:
4 September 2009.

SGM has a wide range of grant schemes to support microbiology. See **www.sgm.ac.uk/grants** for details and closing dates.

Enquiries should be made to the: Grants Office, SGM, Marlborough House, Basingstoke Road, Spencers Wood, Reading RG7 1AG (**t** 0118 988 1821; **f** 0118 988 5656; **e** grants@sgm.ac.uk).

The Legacy of Fleming

The February 2009 issue of *Microbiology Today* focussed on the 80th anniversaries of the discovery of penicillin in 1928 by Alexander Fleming and the publication in 1929 of his paper '*On the antibacterial action of cultures of a* Penicillium' in *Br J Exp Pathol*. Copies of the magazine are regularly distributed to MPs and members of the House of Lords who have elected to receive it, but every now and then, if we feel that a particular issue would be of general interest to parliamentarians, we send it to all of them with an invitation to a free subscription. This is part of the Society's Microbiology Awareness Campaign, which aims to raise the profile and understanding of microbial science to opinion-formers and policymakers.

The Fleming issue seemed a good one to provoke interest and so a copy was sent to everyone in both houses of parliament. A surprising but pleasing outcome was an email from Des Browne, MP, who was seeking a partner organization to mark the Fleming anniversaries. Des is MP for Kilmarnock and Loudon, the constituency in Scotland that includes Darvel, where Alexander Fleming was born in 1881 at Lochfield Farm. As Fleming was the first President of the SGM, this was too good an opportunity to miss. I responded with the message that we would be delighted to explore ways of collaborating to celebrate Fleming's achievements. Soon after Ron Fraser and I found ourselves in Portcullis House, sitting with Des and his Researcher Shata Shetty over a cup of coffee discussing the various options.

Prior to the meeting, Ron and I had chewed over the most appropriate ways in which the Society could be involved and we both agreed that as promoting microbiology education is a significant SGM activity, it would be rather suitable for us to sponsor a science trophy and prize at a school or schools near to Alexander Fleming's home. Fleming attended school in Darvel and then Kilmarnock Academy, and the latter has a collection of memorabilia relating to their famous former pupil. We also thought that there should be some kind of event focussing on microbiology for schools around Darvel. On meeting with Des, we found that our ideas chimed with his own, and it was agreed that these activities would be explored further. Des also said that he would be able to secure an adjournment debate in the House of Commons as close as possible to the anniversary of the date that Fleming's paper was submitted to *Br J Exp Pathol*, 10 May 1929, in which he would deliver a speech on Fleming and penicillin, and raise issues relating to antibiotics today.

▼ Fleming's birthplace at Lochfield Farm (left), and the memorial in Darvel (right). *Kevin Brown*

As a result of these discussions, Des duly obtained an adjournment debate on Monday 11 May, the nearest date possible to the actual anniversary, and Ron drafted a speech which Des personalized and delivered. It covered the publication of Fleming's paper and some of its content, noted that while he discovered penicillin, its development for clinical use took place much later in World War II led by Florey and his group in Oxford, described briefly Alexander Fleming's humble beginnings and subsequent career and, in the light of current problems with antibiotic resistance, ended with a plea for continued research into the fundamental biology of pathogens and their interactions with the host, and the development of new drugs to combat infectious diseases. Des said that the legacy of Fleming and his successors was the 'Golden Age' of antibiotics and the saving of countless lives of people and animals, but the prospect of a post-antibiotic age, brought about by resistant 'superbugs' is terrifying.

The Minister of State at the Department of Health, Dawn Primarolo, responded at length, recognizing the significance of the Fleming anniversary and the subsequent revolution in health care brought about by antibiotics, not only in treating infections, but also in complementing other developments such as cancer treatments, complex surgery and transplantation. She noted that new anti-infectives had come on stream in recent years and that research into them continues. She stressed that there was a need for novel approaches and this was the big challenge for both Government and the pharmaceutical industry. The Medical Research Council's annual budget for research into infection was running at £72 million and the UK clinical research collaboration had invested £16.5 million in its translational infection research initiative, helping to boost research capacity and infrastructure and establish new career development and training programmes for scientists. The Technology Strategy Board's new detection and identification of infectious agents platform would make £55 million available to encourage collaborative research into faster diagnostic tests. She also emphasized that prevention was better than cure, and that investment in vaccines was vital. In conclusion, she joined Des Browne in recognizing the achievements of Fleming and reassured him that the Government was aware of its role in ensuring funding for the great scientists who continue to build on his legacy.

The full proceedings are reported in *Hansard* (www.publications.parliament.uk/pa/cm200809/cmhansrd/cm090511/debtext/90511-0021.htm#0905122000002). Not only did the debate provide an excellent medium for raising awareness of the need for research funding into infectious diseases, it also gave considerable publicity to the SGM, which was described in Des's speech. Even *Microbiology Today* received a mention, with a quote from one of the articles in the Fleming issue.

Plans are now well advanced for the event for local schools in Des Browne's constituency. It will be held on 13 November at Darvel Town Hall, which has recently been refurbished. Parties of students will be bussed in from nine secondary schools in East Ayrshire. The keynote speaker will be Hugh Pennington, a well-known expert on infectious diseases and, fittingly, also a former President of the SGM. Kevin Brown, Curator of the Fleming Museum at St Mary's Hospital and author of a biography of the great man, will be bringing along a historical display and collection of Fleming artefacts. Paul Hoskisson, an elected member of SGM Council who is based at Strathclyde University, will also be putting together a display to show what modern microbial science is all about. It has been decided that the new SGM trophies will be given to two secondary schools: Kilmarnock Academy and Loudon Academy to reward excellence in biological science. It is hoped that there will be good media coverage of the event.

In addition to hosting the event, SGM is also making a contribution to the refurbishment of the memorial to Sir Alexander Fleming in Darvel, which has become very worn and illegible. This is in partnership with the local authority, East Ayrshire Council.

This is an exciting venture for SGM, and one in which we are proud to be participating. We hope that it will raise the profile of microbiology to a whole range of audiences.

***Janet Hurst**, External Relations, SGM*

Fleming re-gilded

The stone commemorating the birth of Sir Alexander Fleming at Lochfield Farm, near Darvel, Ayrshire, has been re-gilded thanks to the efforts of the current owners of the farm, Phil and Heather Scott, with the advice of local MP Des Browne, and contributions from the Loudoun Valley Trust and Galston Rotary Club. The stone was unveiled on 29 May by Kevin Brown, Curator of the Alexander Fleming Laboratory Museum.

▲ Kevin Brown with the re-gilded commemorative stone at Lochfield farm. *Kevin Brown*

microshorts

Dariel Burdass and **Jane Westwell** have been checking the news for stories relating to micro-organisms

Machine developed to eliminate viruses from the blood

Specialists in the fields of infectious disease and biodefence have designed a machine that purifies the blood of infected patients by removing viruses such as HIV and hepatitis C. The haemopurifier works like a dialysis machine, using a network of thin fibres coated with antibodies to selectively capture and eliminate viruses from the blood before cells and organs can be attacked. Aethion, the company in San Diego who developed the device, see larger versions being used to treat patients in hospital, with a smaller version being taken to emergency situations where there has been an outbreak of a deadly disease like Ebola. It has the potential to protect populations from both bioterrorism threats and emerging pandemics such as bird 'flu where drug treatment or vaccines are unavailable.

www.sciencedaily.com/videos/2008/0602-cleaning_infected_blood.htm

Sunscreens from lichens

Lichens are made up of two types of microbe: a fungus and an alga, that live closely together in a partnership where each benefits the other. Lichens can survive in hostile environments, and scientists have found that those growing on rocks in Antarctica contain compounds that can absorb harmful rays from the sun. One of the compounds, calycine, absorbs UVA radiation, a major cause of skin cancer in humans. Researchers hope to extract the UV-blocking and antioxidant compounds produced by lichens and use them to develop new types of sunscreen to protect people from sunburn and cancers.

www.telegraph.co.uk/scienceandtechnology/science/sciencenews/5373523/Lichens-could-provide-new-sunscreens.html

Cholesterol-busting bacterium

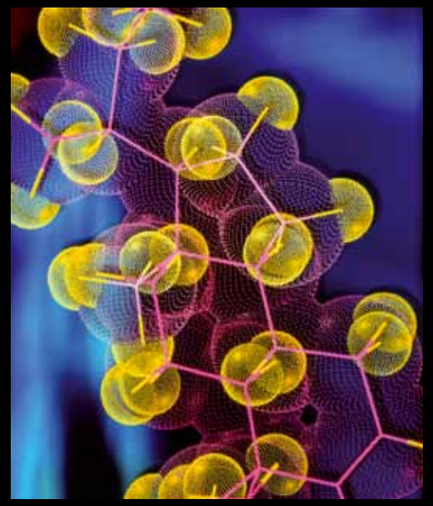
A novel organism that can break down cholesterol has been isolated from sewage sludge by scientists at the Universidad Complutense de Madrid in Spain. The findings were reported in the *International Journal of Systematic and Evolutionary Microbiology*.

Cholesterol is a steroid found in all body tissues and it is used in the cosmetics and pharmaceutical industries as a stabilizer, emollient and water-binding agent, hence its presence as a common contaminant of urban sewage residues.

The novel bacterium has been named *Gordonia cholesterolivorans* and it comes from a recently discovered group of microbes that can degrade a wide range of environmental pollutants. This novel species could well be useful in cleaning up contamination. Studies are also underway to produce genetically modified *G. cholesterolivorans* strains that can synthesize new and industrially useful break down compounds of cholesterol.

As some *Gordonia* species are pathogens, it is unlikely that they could be used directly to treat humans with high cholesterol levels in their blood.

http://ijs.sgmjournals.org/cgi/reprint/59/5/1011



▲ Top. Computer graphic of part of a cholesterol molecule. *Pasieka / SPL*

▲ Bottom. Petrol pump. *Polka Dot Images / Jupiter Images*

◀ Top. HIV particles budding from the surface of a cell. *Dr Klaus Boller / SPL*

◀ Bottom. Sun cream. *Stockxpert / Jupiter Images*

▶ Panamanian golden frog (*Atelopus zeteki*) in captivity in St Louis Zoo. *Tim Vickers*

Microbe power

New sources of energy are required for our power-hungry world, and microbes could be the environmentally friendly fuel producers of the future. Researchers at a recent ASM symposium reported on their findings into the potential of micro-organisms to make bioethanol, biodiesel and even hydrogen from renewable sources.

Bioethanol is big business, and maize is the major resource as the sugars in corn starch are readily available for fermentation by micro-organisms. This raises ethical issues – the 'food versus fuel' debate. Scientists are turning to the cellulosic biomasses found in wood residues and paper waste or non-edible plant parts as an alternative, but the sugars needed for fermentation are trapped inside the cellulose. At Oak Ridge National Laboratory they are screening poplar tree samples to study their ability to release sugars. The researchers are also exploring the potential of the hot-spring bacterium *Aneurocellum*, a consolidate bioprocessing microbe, that can both break down cellulose and convert the sugars to acetate and ethanol.

Researchers from Wisconsin are looking to produce hydrogen from renewable sources. They have been studying the purple bacterium *Rhodobacter sphaeroides* that uses photosynthesis to make hydrogen from cellulosic biomass and sunlight. A prototype 'microbial battery' has even been put together that can produce enough electricity to power a lap-top.

www.sciencedaily.com/releases/2009/05/090518101906.htm

Probiotics to protect frog populations

Researchers in the US have reported some success in treating Mountain yellow-legged frogs with a probiotic to protect against infection by the fungus *Batrachochytrium dendrobatidis* (Bd) which causes chytrid disease.

Twelve frogs were dipped in a bath of *Janthinobacterium lividum*, a probiotic bacterium which grows on the skin of several amphibian species. Six of the frogs were infected with Bd along with six untreated control frogs. After 5 weeks, five of the untreated frogs had died, but all of the treated frogs had survived and gained weight. The probiotic had produced the antibiotic violectin which was present in the skin of the treated frogs.

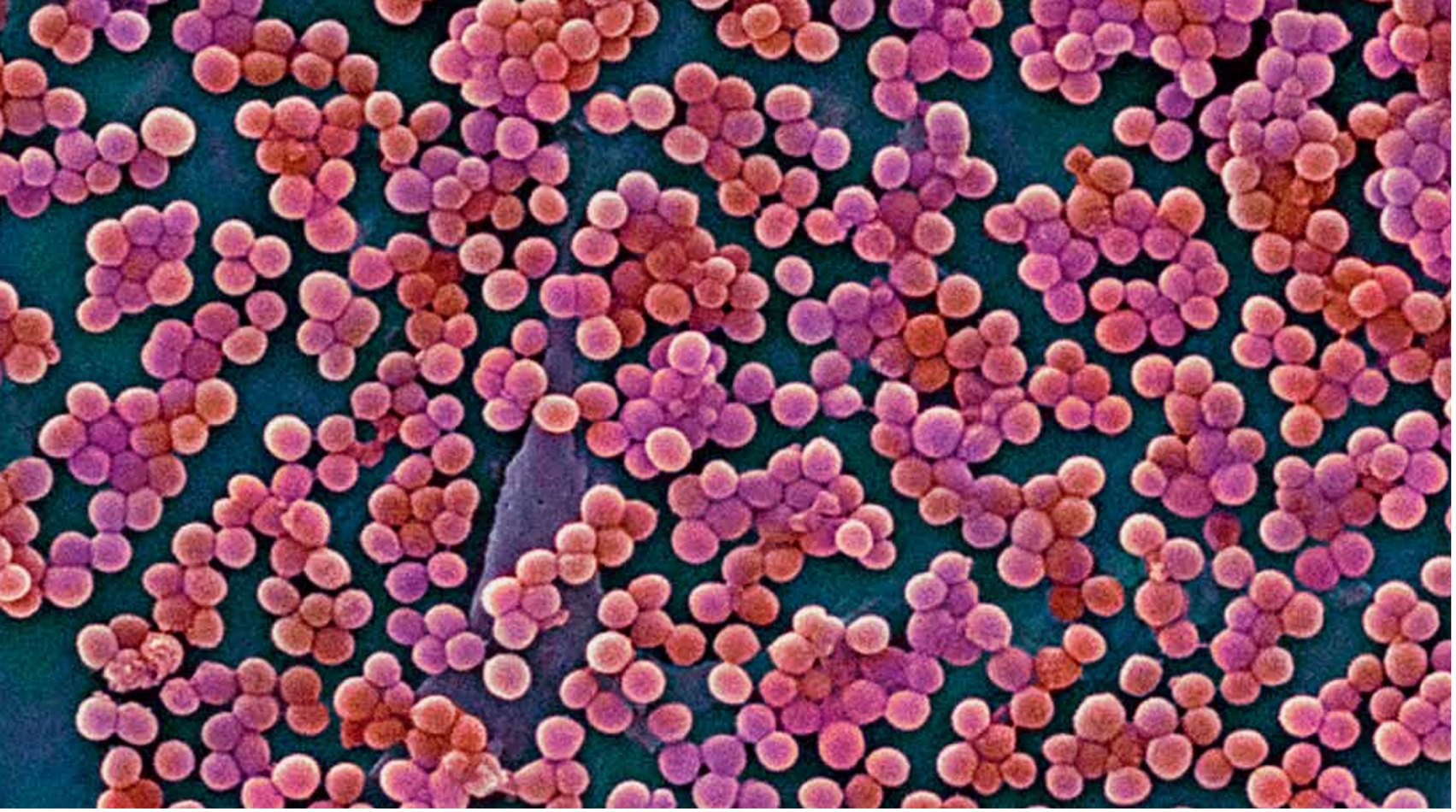
Researchers plan to test the treatment on captive bred Panamanian golden frogs (a species now extinct in the wild). They hope eventually to use the probiotic to protect wild populations of frogs by treating them and the soil and water in their habitats.

www.newscientist.com/article/mg20227115.300-probiotic-bug-is-a-frog-lifesaver.html

Selenium could be key to developing new antibiotics against *Clostridium difficile*

Selenium is found in several proteins in both human and bacterial cells that are called selenoproteins. A recent study by US workers has shown that disrupting the way selenoproteins are made can stop the growth of some bacteria, including the superbug *Clostridium difficile*. The team is hoping that this could lead to the development of narrow spectrum antibiotics able to combat bacteria like *C. difficile* that need selenium for growth. The researchers were greatly encouraged to discover that the gold drug Auranofin, used to treat arthritis, causes a chemical change in the selenium, preventing bacteria from using it to grow.

www.sciencedaily.com/releases/2009/06/090601111936.htm



Meticillin-resistant *Staphylococcus aureus* (MRSA) are usually found in hospitals, and cause infections of immunocompromised and elderly patients. **Jodi Lindsay** asks why is MRSA a problem in sport?

◀ Coloured SEM of MRSA. *CDC / Science Photo Library*

Can I catch MRSA from playing sport?

Staphylococcus aureus are bacteria that commonly live in the nose, and about 20% of us carry them all the time, with another 50% intermittently colonized. We have all had an *S. aureus* infection, usually an infected cut or wound that became inflamed and maybe produced some pus. Because of our healthy immune response, predominantly the production of neutrophils, we didn't need antibiotics and the infection cleared itself. Very occasionally, a *S. aureus* infection can become more serious in a healthy person, but we don't really know why. However, in the USA there have recently been outbreaks of a new type of meticillin-resistant *S. aureus* (MRSA), to which athletes are particularly vulnerable.

MRSA are *S. aureus* cells that have acquired an extra piece of DNA, called a staphylococcal cassette chromosome (SCC*mec*) that includes a gene called *mecA*. The *mecA* gene encodes a penicillin-binding protein required for cell-wall synthesis, enabling the bacterium to resist β-lactamase-resistant β-lactam antibiotics. This includes our favourites for preventing and treating *S. aureus* infection, such as flucloxacillin.

Recently, it has been discovered that there are about ten major lineages of *S. aureus*, each capable of causing disease in humans, and some additional animal lineages. Each strain within a lineage can also acquire mobile genetic elements – pieces of DNA that can confer additional virulence or resistance properties, including SCC*mec*.

MRSA in hospitals

All over the world, various types of SCC*mec* have moved into different types of *S. aureus* to generate MRSA. Some of these have been very successful in spreading in hospitals, probably because they are resistant to other antibiotics used in hospitals, such as fluoroquinolones. In the UK, we have two major types of MRSA, called epidemic MRSA-15 and MRSA-16 (lineages CC22 and CC30), and they account for about 40% of all *S. aureus*. Other countries have different types and different MRSA colonization rates, and there is good evidence that strains are continuing to evolve and spread.

Hospital MRSA cause infection in immunocompromised patients, particularly those with a wound, surgical incision or catheter that allows the bacteria to penetrate the skin barrier. If the innate immune response fails to clear the infection, antibiotics can help. Even so, the mortality rate of patients diagnosed with MRSA bacteraemia (blood infection) – who may also have other underlying disease – is approximately 25%.

MRSA spread in hospitals is controlled by hygiene, especially hand-washing, prophylactic antibiotics and a new screening strategy introduced by the UK Department of Health this year requiring all non-emergency patients to be swabbed, followed by decolonization if testing positive for the bacteria. There is now recognition that MRSA nasal colonization rates are significant and/or increasing outside of hospitals, especially in people with contact to the healthcare system (discharged patients, nursing homes, district nursing, veterinary). In the UK, these strains are predominantly MRSA-15 and MRSA-16.

Community-acquired MRSA (CA-MRSA)

In the USA, two novel strains of MRSA have evolved and caused a new type of problem. They did not evolve from hospital MRSA strains, and are not multidrug-resistant. Firstly, there was USA400 in lineage CC1, reported in

1997, and then USA300 in lineage CC8 which is now the predominant type. These strains all carry a mobile genetic element – a bacteriophage – encoding a toxin called Panton–Valentine leukocidin (PVL), which probably plays a role in killing neutrophils produced by the body's immune system. In normal *S. aureus*, PVL is found in only 2% of isolates. A survey of healthy US citizens in 2003/4 estimated that 1.5% carry MRSA in their nose; 23% of these were CA-MRSA, and these numbers are increasing.

The major problem with CA-MRSA is that they cause outbreaks of infection in people who are healthy, and therefore the strains are probably more virulent. CA-MRSA appears to spread in communities that are close-knit, particularly in prisons, the military, schools, homosexuals and athletic teams. They usually cause severe skin and soft-tissue infections, often presenting as an 'insect bite' that becomes inflamed, or a deep-seated boil or abscess. If the patient presents to their GP with a skin lesion, they are likely to be prescribed an oral antibiotic such as flucloxacillin, which is effective against *S. aureus* but not MRSA. This will delay diagnosis and may lead to more severe symptoms. In some cases, the infection develops into something more serious or life-threatening and fatalities occur.

The best treatment is usually surgical drainage of the lesion, and treatment with appropriate antibiotics, which may include trimethoprim with or without sulfamethoxazole, clindamycin, doxycycline, rifampicin and/or fusidic acid in various combinations, depending on severity of disease, age of patient, resistance rates in the community, ability of *S. aureus* to generate resistance, local guidelines and availability.

In the UK, USA300 and USA400 are sporadically reported, but they do not appear to cause outbreaks like those seen in the USA. In mainland Europe, a different CA-MRSA type (lineage ST80) can cause similar disease, but does not seem as prevalent. In Asia, CC59 is the dominant CA-MRSA, and in the South Pacific it is CC30. The reasons for geographical variation and the delayed spread of strains of MRSA between countries and continents are not known.

CA-MRSA in sport

Outbreaks in USA professional athletic teams such as the St Louis Rams and in high-profile athletes have been well documented. A recent report from 271 high schools in Nebraska identified a physician-diagnosed MRSA infection in 0.6% of all wrestlers and 0.25% of football players (gridiron). Volleyball, basketball, fencing, canoeing, weight-lifting and gyms have also seen outbreaks.

◀ Computer artwork of the molecular structure of the F subunit of the Panton–Valentine leucocidin (PVL) toxin from the *S. aureus*. This subunit combines with the S subunit to form the toxin. PVL targets white blood cells, making pores in the cell membrane, thus killing the cell. *Dr Tim Evans / Science Photo Library*

▼ Members of the St Louis Rams American football team tackle a Philadelphia Eagles player. This sort of contact in sport can lead to the transmission of CA-MRSA. A well documented outbreak of CA-MRSA occurred in the St Louis Rams team in 2003. *G. Newman Lowrance/Getty Images*

The risk factors for athletes developing infection appear to be: exposure to CA-MRSA, cuts and abrasions such as 'turf burns', close contact with other athletes in team sports, unhygienic practices such as sharing towels and razors, and inadequate cleaning of equipment, including whirlpools. The preferred treatment for a *S. aureus* infection may be ineffective, delaying diagnosis and more appropriate antibiotics, so that complications are more likely, there is increased spread to team-mates, and performance in elite athletes is compromised.

In the UK, participation in high-risk sports, such as gridiron and wrestling, is low. But an outbreak in 1996 in a rugby team in the UK affected 5 out of the 20 players with large abscesses on the arms, back, neck and face, and antibiotic treatment was required. The team had recently played against a team touring from the South Pacific, where CA-MRSA is prevalent. And while non-contact sports such as football (soccer) may not have some of the common risk factors, an outbreak in a Dutch football team in 2005 affected 9 out of 35 players and caused lesions on legs, arms and buttocks. The strain was the European ST80 lineage, and a player from an opposing team subsequently developed a lesion on the leg due to this strain.

The UK does not currently have a serious problem with CA-MRSA in sport, but this could change at any time with the introduction of strains from overseas or the evolution of home-grown varieties. In the meantime, when your mother told you not to pick your nose and to wash your hands frequently – she was probably on to something.

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► False-coloured TEM of HSV particles. *Hazel Appleton, Centre for Infections / Health Protection Agency / Science Photo Library*

Players of contact sports like wrestling and rugby can end up with a virus infection that could wreck not only their health, but their athletic career, according to **Julia Colston** and **Judy Breuer**.

Herpes Gladiatorum: a combative virus disease

Herpes Gladiatorum (HG) is an active herpes simplex virus (HSV) infection associated with close-contact traumatic sports, such as wrestling, rugby and martial arts. Other names for the condition include scrumpox in association with rugby, and matpox in wrestling. It was first described in the literature in 1964, where five members of a small amateur wrestling group (and a further unfortunate gymnast who had volunteered themselves for a demonstration of the 'crossface' manoeuvre!) developed lesions within a close time frame of individual fighting episodes. All five of these cases could be linked and they presented with similar symptoms of general malaise and an atypical vesicular rash affecting the exposed areas, namely the face and arms. Several further reports closely followed in 1965. It seems that outbreaks of HG were occurring well before this, with many unpublished epidemics taking place amongst wrestling groups. HG might have been described much earlier, had it not been for the ambiguity of the lesions produced, superimposed infections and a lack of appreciation for the relevance of the disease. Early reports list a vast array of alternative diagnoses, such as staphylococcal infections, herpes zoster, rickettsialpox and contact dermatitis, to name just a few. In fact, there are reports of unspecified disease in wrestling groups dating back as far as the 1920's.

HSV is a member of the alphaherpesvirinae subfamily. Like all herpes viruses, once an individual is affected, the virus will establish latency within the host. Active disease may reactivate at any time, in association with known triggers

▲ Wrestlers and rugby players are two groups of sports men and women who are particularly at risk from contracting HSV infections because of the unavoidable close body contact that forms part of their sport. The infections in wrestling and rugby have become known as matpox and scrumpox, respectively. *Wrestlers – Donald Miralle / Getty Images; rugby scrum – Stockxpert / Jupiter Images*

(such as stress, UV, menstruation, immunocompromise). HSV-1 is traditionally associated with cold sores and HSV-2 with genital herpes. However, there is an increasing crossover, where both HSV-1 and HSV-2 can be responsible for either manifestation of the disease. With HG there is some discussion about the mode of HSV infection, whether these are primary infections or reactivation of latent disease.

Transmission

Since 1989, further reports appeared of another outbreak of HG within 175 high-school wrestlers attending a 4-week intensive training course in Minnesota, USA. Unexpectedly, using restriction enzyme analysis, four distinct strains of HSV-1 among 21 isolates were identified. The researchers were able to show identity between 10 strains in one group of athletes who practised together and between 5 of 7 in another practice group. While serological analysis indicated that most of the infections were primary, at least two re-infections are thought to have occurred. Whether the initial cases had active lesions or were asymptomatically shedding virus, which because of the nature of the physical contact was transmitted in this unusual fashion, is not clear.

The finding that outbreaks of HG occur even when individuals with active lesions are excluded, would support transmission from latently infected individuals who are asymptomatically shedding virus, something that is well described for both HSV-1 and -2. Interestingly, although the original report concluded that either four individuals must have transmitted the virus or that some of the HG was actually due to reactivation, it has recently been demonstrated that shedding of more than one strain of virus may occur simultaneously in a single individual. In the group of seven athletes where three different viruses were found, an alternative explanation could be that the index case transmitted different viruses to three athletes, with one of them spreading virus to another three. The possibility that some strains may be more transmissible than others is also mooted in the paper, and further evaluation of this is needed.

Irrespective of how it originates, HG is now recognized as a serious hazard of contact sports especially in the light of estimates that 29% of wrestlers have a history of oro-labial HSV. Clinically, over 70% of lesions occur on the face, with the remainder distributed more or less evenly between the trunk and limbs. The location of lesions has been shown to reflect the handedness of the wrestlers; in one analysis 86% of contestants were right-handed and 74% of lesions occurred on the right side. There is little literature to support the role of HSV-2 in HG outbreaks. However, it seems probable with the increasing role of HSV-2 in oro-labial disease that a significant proportion of HSV-2 is responsible for HG outbreaks. Whether this has any bearing on the presentation of disease is also unknown.

Prevention and treatment

Measures to control HG began to be introduced in the 1990s. Despite this, high profile outbreaks continue to occur. A paper in 2003 highlights that understanding and correct diagnosis of HG were still not in place within large wrestling groups, and that in particular more was needed in terms of guidance from the US Nation Federation of State High School Associations (NFHS).

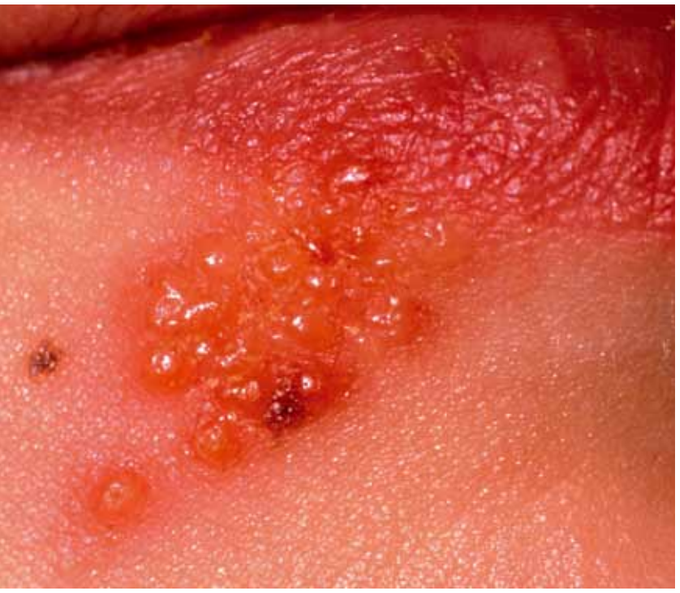
Two approaches are key, prophylactic measures and treatment of people with active infections. The literature discusses the relevance of inanimate objects (such as mats and head gear) and the role of these in transmission. From the initial report in 1964, it was noted that other classes were taking place in the same venue, using the same mats as the wrestling group. These individuals were not affected in the same way as the wrestling group and it was considered unlikely that disease could be spread in this way. The classic transmission of HSV involves mucocutaneous contact between the infected individual and the recipient, and the nature of the sports described enables this. The other factor involved is the traumatic nature of these sports, where broken skin is thought to potentiate active disease. Therefore, basic hygiene forms part of the recommendations for prevention of disease. Broken skin should be covered. This is of course relevant to other diseases associated with contact sports, such as tinea gladiatorum. Hygiene standards should apply to sporting equipment as well.

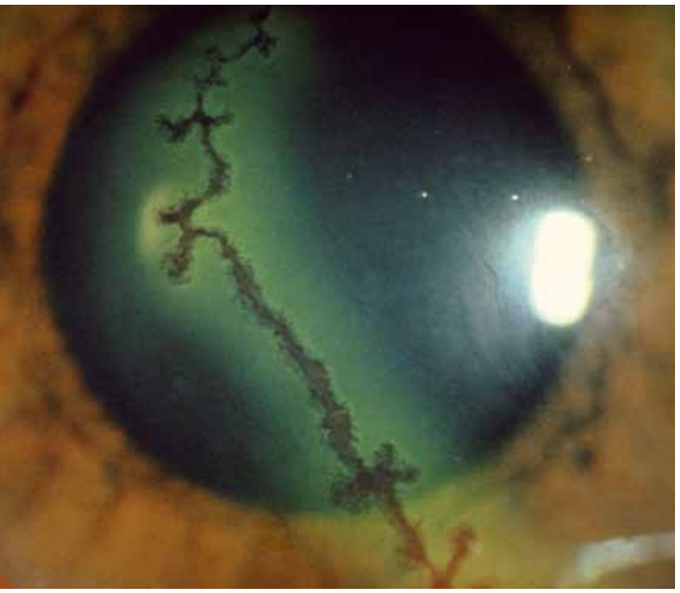
The next measures are for the appropriate exclusion of athletes where active disease is present. It has become clear over the course of the past few decades that merely attempting to cover lesions is not acceptable. Screening checks are also recommended prior to sporting events. Where athletes have a known history of HG, using prophylactic antivirals to prevent possible outbreaks has been considered. A great deal of research into HG in wrestlers has been done by Anderson, and in particular the usage of valacyclovir as prophylaxis. Of 332 male wrestlers at a 28-day camp, 94 participated in serological testing and the usage of prophylactic antivirals. Sixty-four members of this group were on antiviral medications. Serological tests showed a 29.8% positive IgG anti-HSV-1 titre in total. At the end of the camp, none of the participants had a positive IgM anti-HSV-1 or HSV-2 antibody. Compared to previous years at this 28-day camp, the reduction of HG outbreaks was said to be 87%.

For treatment of active disease, acyclovir, valacyclovir or famcyclovir are recommended. HG can produce quite severe facial disease, and due to the nature of skin to skin contact in these various contact sports, often atypical areas are affected. These include the temples and tissues around the eyes. Some of the more significant cases will involve eye complications, warranting prompt antiviral treatment.

Conclusion

The major complications of HG can involve the more serious manifestations of HSV. Given the distribution of the lesions, eye problems are quite common, and can be serious. The morbidity associated with this disease is not to be underrated. Overall, the impact is not just upon the athletes'





▲ *Top*. Close-up of blisters around the lips of a 12-year-old girl suffering from an HSV infection. *Dr P. Marazzi / Science Photo Library*

▲ *Bottom*. Cornea of an eye affected with a dendritic ulcer caused by HSV. *Argentum / Science Photo Library*

health, but also their sporting career. Simple measures for identification of affected individuals and appropriate prophylaxis could prevent further significant outbreaks, if properly overseen. Whilst disease is rarely life-threatening, it does contribute to significant morbidity, and clearly is a very successful pathogen. Large sporting events of the type described in this article are a breeding ground for this virus, and appropriate measures should be met by sporting and/or educational bodies in order to prevent its spread. Finally, the significance of HG also needs to be appreciated by health professionals, and where appropriate prophylaxis considered.

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Soil microbes may offer an alternative to the use of chemicals in sports turf. **Alan Gange** explains how these could affect your putting or maybe even who wins the FA Cup.

Can microbes be used to produce 'greener' sports turf?

April 2009: both Manchester United and Arsenal lose their FA Cup semi final matches at Wembley Stadium. Afterwards, both managers, Sir Alex Ferguson and Arsène Wenger, blamed the state of the Wembley pitch, Ferguson describing it as 'spongy and dead'. A few days later, the head groundsman was sacked and the pitch re-laid at a cost approaching £100,000. This is the sixth time that the pitch has been replaced since it was first laid in 2006.

Whether the pitch or the groundsman were in any way to blame for the fact that Everton scored more times in the penalty shoot-out than did United is, of course, debatable. However, these facts illustrate how important the quality of the playing surface is in sport and the vast sums of money that are spent to construct and maintain these surfaces.

The highest quality turf surfaces are to be found on golf courses. There are over 2,500 golf courses in the UK and nearly 32,000 worldwide. The quality of the tees, fairways and greens is of the utmost importance and are always to blame when one's approach shot hits the rough or that critical putt is missed!

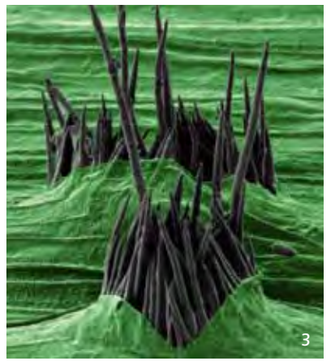
Sports turf is an unusual plant community, composed of just a few grass species. In British fairways and football pitches, the predominant grass is *Lolium perenne* (perennial rye). In our golf tees and greens, the desirable grasses are species of bents (*Agrostis*) and fescues (*Festuca*), with many cultivars of each species available. However, all turf systems become invaded by the weed grass *Poa annua* (annual meadow grass). *Poa* is undesirable, because it is nutrient and water hungry, susceptible to disease and provides an inferior quality playing surface. The control of *Poa* is the key to successful sports turf management.

Turf troubles

Putting greens in the UK are cut daily to a height of about 4.5 mm in the summer, and at least weekly in the winter. An average course in the UK experiences about 25,000 rounds per year and many will experience well over 50,000. It is not hard to see that the grass is under intense stress from foliage loss and soil compaction. As a result, putting greens are prone to attack from a wide variety of diseases, the most important of which is pink snow mould or Fusarium patch (causative organism *Microdochium nivale*). As the colloquial name suggests, this is a low-temperature pathogen, most prevalent in humid conditions in spring and autumn. This fungus can be devastating and has probably caused more greenkeepers to lose their jobs than any other microbe. It first appears as patches of dead grass 2–5 cm in diameter which can rapidly coalesce to cause near total loss of the sward if untreated with fungicide.

Other important diseases of turf in the UK include anthracnose (causative organism *Colletotrichum graminicola*), red thread (*Laetisaria fuciformis*), dollar spot (*Sclerotinia homeocarpa*), brown patch (*Rhizoctonia solani*) and take-all patch (*Gaeumannomyces graminis* var. *avenae*). The latter is interesting because it is most prevalent in turf 3–5 years old, subsequently disappearing in a phase known as 'take-all decline'. This is caused by a build up of fluorescent pseudomonads in the soil, which produce chemicals antagonistic to the fungus. This phenomenon has been observed in other soils too and is a classic example of a build up in disease-suppressive soils.

Fine turf is also affected by other microbial troubles. Fairy rings, mostly caused by the Basidiomycete fungus *Marasmius oreades* cause unsightly darker rings in the sward and a curious phenomenon known as dry patch occurs when the soil becomes hydrophobic. This condition is not exclusive to turf, and is thought to be caused by hydrophobic compounds produced by decomposer fungi in the thatch layer of the sward. Finally, black layer is a condition that occurs when soils become heavily compacted and oxygen in the root zone becomes depleted. Anaerobic bacteria produce hydrogen sulfide which reacts with



▲ 1. Anthracnose on a putting green. *Jeff Sexton / www.forestryimages.org*
2. Anthracnose on creeping bent (*Agrostis stolonifera*). Several dark, spore-producing bodies called acervuli can be seen at the base of the stem. *Paul Bachi / www.forestryimages.org*
3. *Colletotrichum* sp. – one of the causative agents of anthracnose. *Scimat / Science Photo Library*
4. Pink snow mould. *William M. Brown Jr / www.forestryimages.org*
5. Dollar spot on St Augustine grass (*Stenotaphrum secundatum*). *Division of Plant Industry Archive, Florida Department of Agriculture and Consumer Services / www.forestryimages.org*
6. Fairy rings in turf. *Lester E. Dickens / www.forestryimages.org*

iron to produce a black deposit of ferric sulfide, toxic to plants. Many years ago, when black layer was first observed, greenkeepers were puzzled, because by the time they had returned the affected soil to their shed, the black layer had disappeared, as the deposit reacted with oxygen in the air.

Beneficial microbes in turf

In natural situations, there is an extensive soil microbial community, which has been shown to affect the structure and functioning of the above-ground community, including protection against pathogens. However, it appears that microbial communities in sports turf soils are remarkably impoverished. A few studies have measured the abundance of bacteria and arbuscular mycorrhizal (AM) fungi in turf soils and found these to be at a fraction of the abundance of natural plant communities in which *Agrostis*, *Festuca* or *Lolium* predominate.

There are several reasons why sports turf soils have a depauperate microbial community. Bacteria in the rhizosphere are dependent on carbon compounds that exude from roots, while AM fungi depend upon plants for their carbon, sometimes extracting up to 20% of the annual amount of photosynthate. If grass plants are not allowed to grow more than 4.5 mm tall, then the amount of leaf area for photosynthesis is minimal and the amount of fixed carbon fed to the roots is small. Thus, from the soil microbe point of view, mowing is the worst thing that can happen to turf.

As sports turf is susceptible to so many diseases, frequent doses of fungicides are applied. All of these chemicals are broad spectrum in activity, but we have found that they do not seem to have as serious an effect on the non-target microbes as one might expect. Most modern-day chemicals have a relatively short persistence in the soil and a population of chemical-decomposer organisms seems to be present.

▲ Top. *Poa annua* in flower. *Ohio State Weed Lab Archive, Ohio State University / www.forestryimages.org*

Middle. Take-all root rot. *William M. Brown Jr / www.forestryimages.org*

Bottom. Turf showing signs of infection with brown patch. *William M. Brown Jr / www.forestryimages.org*

Turf also receives large amounts of inorganic fertilizer, in particular nitrogen and phosphate. As phosphate is a relatively immobile nutrient in soils, very high levels can build up. High phosphate levels are often correlated with low AM fungal abundance, the theory being that when phosphate is abundant, plants no longer receive a benefit from the mycorrhiza and the fungus is somehow reduced.

Microbial benefits to turf?

The majority of work with microbes in turf has concentrated on whether AM fungi can be used to improve grass production, thereby reducing the reliance on pesticides and fertilizers. Although the abundance of these fungi in putting greens and pitches is low, it has been found that their occurrence is negatively related to that of *Poa* and *Microdochium*. *Poa* is reputed to be non-mycorrhizal, but the fungi in putting greens can colonize its roots, and, in laboratory trials, can reduce its growth. Antagonistic effects of AM fungi on plants are not new, indeed it is thought that the benefit derived by plants from being mycorrhizal lies on a continuum, from negative to positive. Laboratory trials have shown that AM fungi are a potential biocontrol agent for *Poa*. However, field trials have been less successful and current research is directed at identifying the fungi in greens' soils and increasing their abundance. Hopefully, if AM fungal abundance can be increased, then there will be a concomitant reduction in *Poa* abundance and better quality turf surfaces.

Biostimulating sports turf

There are really two ways of increasing the abundance of beneficial microbes in turf. One is to add in the microbes themselves and the second is to add a product that relieves one or more of the limiting factors to their abundance. These methods are not mutually exclusive, though few attempts have been made to integrate the two. Products that seek to increase the biological content of soil and thereby improve the health and growth of plants are called 'biostimulants'. These are products of biological origin and vary widely in their content. Some aim to increase plant growth directly (e.g. amino acids or plant hormones), while some attempt to feed the microbial population (e.g. simple sugars, seaweed mixtures and humic acids).

In the former approach, a number of products have appeared on the market in recent years, containing mixtures of beneficial bacteria and/or fungi. The fact that many have come and gone, along with the companies that marketed them, should tell you how successful they were. The fact is that no one has yet identified the fungal and bacterial species that are able to live in the unusual conditions within sports turf soil. Although the content of most products is a closely guarded secret, it is highly likely that they contain 'off the shelf' microbes such as *Bacillus subtilis* and *Glomus* species. It is quite possible that the only thing that happens when such

▲ Could microbes have been to blame? Probably not! England captain David Beckham misses his penalty kick on 24 June 2004 during the European Nations Championship quarter-final football match between Portugal and England. England lost 6–5! *Lluis Gene/AFP/Getty Images*

a product is applied is death of the introduced organisms, followed by a burst of grass growth, from released nutrients. When we have followed microbial community abundance after inoculation, we have found in all cases that any increase is transient.

Such effects are almost certainly due to the fact that the main limiting factor, carbon availability, has not been alleviated. Thus, a more recent and successful approach has been to apply products rich in carbon to the soil. Those containing simple sugars or seaweed extracts have shown promising results, though timing of application is critical. In one instance, such a product was applied late in the season and resulted in an astonishing outbreak of pink snow mould.

'Greener' sports turf?

There is no doubt that the industry must embrace a more sustainable approach to turf management. Many of the pesticides in current use are likely to disappear and without these, golf or football could not be played to the standards demanded. Soil microbes offer a potential alternative to chemicals. If we can increase the availability of carbon in the rhizosphere, then we should be able to increase the abundance of beneficial bacteria and fungi, thus improving the processes of weed management, decomposition, nutrient cycling and disease protection. Sports turf will then be greener, in more ways than one. However, microbes cannot guarantee that you will hole that crucial putt, or that no one will miss a penalty at Wembley!

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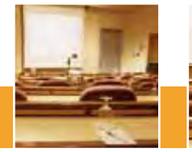

Autumn**09** | Edinburgh Conference Centre Heriot-Watt University

7–10 September 2009 www.sgmheriot-watt2009.org.uk

Putting microbes to work – the latest in translational and applied microbial science

Top international speakers will consider current challenges and developments in translational microbiology. Sessions will cover wide-ranging applications of micro-organisms in food and drug production, disease diagnosis and prevention, environmental clean-up, as microbial factories and as model organisms.

Programme Booklet

A booklet giving full details of the programme is enclosed with this issue of *Microbiology Today*. Any changes will be posted on the SGM website.

Who should attend?

Anyone who wants to keep up to date with modern microbial science, no matter what their field or stage of their career. The conference will also provide a great opportunity for networking.

Where is it?

Located on a pleasant rural campus on the outskirts of Scotland's capital city, Edinburgh Conference Centre has excellent facilities, including the purpose-designed James Watt Centre. High quality en-suite overnight accommodation is available on-site. Situated next to the city bypass and central to Scotland's motorway network, the Centre is only ten minutes from Edinburgh's International Airport and has good public transport links.

Grants

Conference grants are available to SGM Postgraduate Student Associate Members.

Deadline

Earlybird registration 7 August 2009

- Putting microbes to work (*environmental microbiology*)
- Microbial polysaccharides
- Microbial factories
- Alternative models to study mammalian pathogens
- Cultivating and sensing microbes in micro-scale devices (*industry session*)
- Glycoengineering
- Conjugate vaccines
- Microbial stress and food production: coping with the work environment
- Bioenergy fuel sources
- Meningitis (*clinical microbiology*)
- Bacterial cell walls
- Contribution of the global N cycle to global processes

Polar microbiology

A special session to mark Polar Year

Darwin's Tree of Life

A symposium on microbial evolution to commemorate the 200th anniversary of the birth of Charles Darwin

Special Lectures

Fred Griffith Prize Lecture

From spores to antibiotics via the cell cycle – Jeff Errington (Newcastle)

Hot Topic Lecture

Update on swine 'flu – Professor Wendy Barclay (UCL)

Microbial Genomics workshop

A beginner's guide to exploring sequences and their comparisons on free software (and everything you wanted to know but haven't yet asked) – Dr Nick Thomson (Wellcome Trust Sanger Institute)

Other highlights

Sir Howard Dalton Young Microbiologist of the Year Competition

CV workshop Gala dinner Trade exhibition

Evening poster sessions with wine

Spring**10** | Edinburgh International Conference Centre

29 March–1 April 2010

www.sgmeicc2010.org.uk

Systems microbiology

Autumn**10** | University of Nottingham

6–9 September 2010

Metals and Microbes

Other**Events**

ASM/SGM Joint Meeting

Aix-en-Provence, France
5–9 October 2009

3rd International Conference on Salmonella

www.asm.org/meetings

Federation of Infection Societies Meeting – Infection 2009

ICC, Birmingham
11–13 November 2009

Supported by Society for General Microbiology

www.infection2009.com

Irish**Division**

Spring 2010

University of Cork, Ireland

Recombinant protein synthesis

Organizer Gerard Wall
(e gerard.wall@nuigalway.ie)

Autumn 2010

University of Maynooth, Ireland

Joint meeting with Irish Society for Clinical Microbiology

Organizer Kevin Kavanagh
(e kevin.kavanagh@may.ie)

For details of all Irish Division activities, contact Evelyn Doyle (e evelyn.doyle@ucd.ie).

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Suggestions for topics for future symposia are always welcome.

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Abstracts

Titles and abstracts for all presentations must be submitted through the SGM website by the advertised deadlines. For further information contact the Administrator.

www.sgm.ac.uk/meetings

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Stockxpert / Jupiter Images

Couch potato or elite athlete? Finding the happy medium

Polka Dot Images / Jupiter Images

As we focus on microbes and sport in this issue of *Microbiology Today*, **Dariel Burdass** explores the impact of exercise on our ability to fight infections.

Infections of the nose, throat, windpipe (trachea) or the two airways that branch from the trachea as it reaches the lungs (bronchi) are common. These upper respiratory tract infections (URTIs) include the common cold, sinusitis and tonsillitis, and most are due to a viral infection. The average adult has two to three URTIs each year. We are constantly exposed to the viruses that cause these infections, but some people seem more susceptible to catching URTIs than others. Every day our immune system protects us from an army of pathogenic microbes that bombard the body. Immune function is influenced by an individual's genetic make-up as well other external factors such as stress, poor nutrition, lack of sleep, the normal aging process, lack of exercise or overtraining. These factors can suppress the immune system making a person more vulnerable to infection.

Exercise and its effect on the immune system

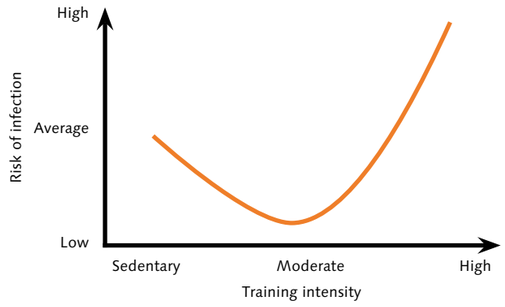
Exercise can have both a positive and negative effect on immune function and can influence an individual's vulnerability to infection. The underlying reasons for this variability are multifactorial and include infectious, neuroendocrine and metabolic factors, with the diet and training regime of the individual also playing a role.

For athletes, environmental factors such as travel and accommodation also contribute to the risk of infection.

Researchers have found a link between moderate regular exercise and reduced frequency of URTIs compared with a sedentary state and excessive amounts of exercise and an increased risk of URTIs. An epidemiological study carried out by Matthews *et al.* in 2002 on moderate to vigorous activity and risk of URTI showed that regular moderate exercise per day was associated with a 29 % reduction in the risk of getting a URTI compared to individuals that had a sedentary lifestyle. Professor Nieman of Appalachian State University, USA showed that when moderate exercise is repeated on a near daily basis there is a cumulative effect that leads to a long-term improvement in immune response. His research showed that those who walk at 70–75 % of their $V_{O_2\,max}$ (volume of oxygen that can be utilized while exercising at maximum capacity for 1 minute) for 40 minutes a day have half as many sick days due to colds or sore throats as those who don't exercise. Conversely, other studies have reported a 100–500 % increase in risk in developing an URTI in the weeks following marathons and ultra marathons. Following strenuous exercise, athletes enter a brief period of 'open window' time in which they experience weakened immune resistance and are more susceptible to viral and bacterial infections, in particular of the respiratory tract.

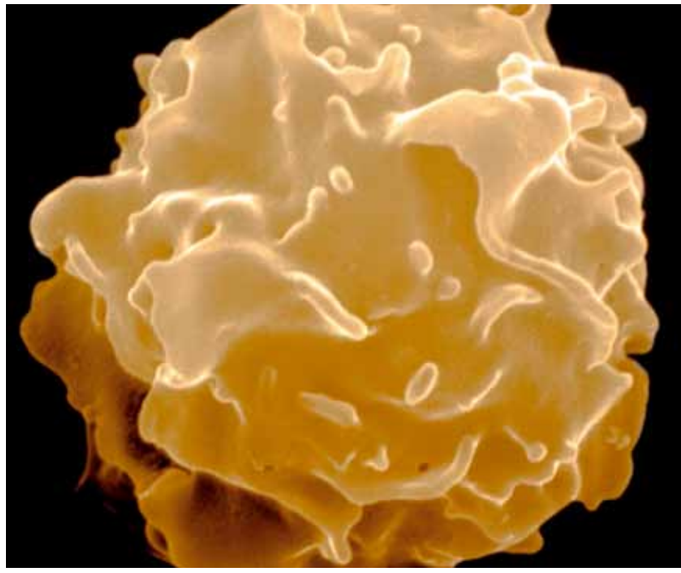
Evidence of URTIs collected for this research is not usually based on detection of the virus in isolates but taken from medical records or via an individual's response to questionnaires, so some of the reported sore throats may not be due to infectious agents but to non-infectious airway inflammation caused by allergies or inhalation of pollutants.

A 'J'-shaped model (see diagram below) has been used to describe the relationship between the amount of physical activity that is undertaken and risk of URTI. There is some evidence that this increased susceptibility to infection is due to a depression in immune system function of the individual. Recent studies have shown that exercise causes physiological changes in the immune system.



Immune response – natural killer (NK) cells

NK cells are a type of white blood cell that plays an important role in the host's defence against virally infected cells. NK cells are cytotoxic and recognize and kill host cells that have become infected with virus. NK cells are known as natural killers because they don't need to react to specific antigens, they just need to recognize that a cell is foreign. They form part of the innate immune system. When NK cells come into close contact with an infected cell they release granules of protein called perforin and proteolytic



▲ False-coloured scanning electron micrograph of a human natural killer cell. NK cells are a type of white blood cell known as T-lymphocytes. NK cells have the ability to destroy virus-infected cells and tumour cells. On contact with the surface of a foreign cell, the NK cell recognizes certain proteins called antigens, which activate its cell-killing mechanism. *Eye Of Science / Science Photo Library*

enzymes called granzymes from their cytoplasm. Perforin forms pores in the cell membrane of the infected cell, allowing the granzymes to enter and cause apoptosis. The infected cell breaks up into membrane-bound fragments that are then removed by phagocytes. An advantage of killing infected cells by apoptosis is that the cell's contents, including virus particles are not released as they are during cell lysis, thus preventing their spread into uninfected cells. NK cell activity can be modulated by many different agents. The cytolytic activity of NK cells is enhanced by cytokines such as interferon and interleukin, signalling molecules that are released by the host cell in response to infection by the virus particle. Conversely, prostaglandins and immune complexes downregulate NK cells.

NK cells are highly influenced by physical exercise. The possible important mechanisms behind exercise-induced changes in NK cell function are cytokines and stress hormones.

During moderate activity, NK cell activity is enhanced. Studies show that NK cells are recruited to peripheral blood during exercise and that the cells recruited respond to interleukin. Intense activity experienced by elite athletes involved in training and competing in endurance events such as marathons and ultra-marathons has been shown to downregulate NK cell activity. This immunodepression is thought to be caused in part by prostaglandins.

Hormones

Adrenaline

Adrenaline, often known as the 'flight or fight' hormone, is produced by the adrenal gland in response to physical activity. It is constantly produced in small amounts to maintain normal blood pressure.

During exercise, larger amounts of the hormone are released into the bloodstream where it prepares the body for increased physical activity by speeding up the heart rate, diverting blood flow to the muscles, widening the airways, dilating the pupils and raising the blood sugar level.

Increased NK cell activity during exercise may relate to adrenaline levels, since it has been shown that the increase in activity occurs within 15–30 minutes after subcutaneous administration of adrenaline to healthy individuals.

Corticosteroids

Corticosteroids are a class of hormones with a wide range of physiological functions that are produced in the adrenal cortex. They include glucocorticoids – the most important of which in humans is cortisol.

Cortisol is known as a stress hormone as it is secreted at higher levels in response to stressful situations.

Elite athletes are exposed to the psychological stress of competition (worry/anxiety). During endurance events and over-training, the body is exposed to the physiological stress of prolonged exercise, and taking part in extreme environments – heat, cold and altitude can also put stress on the body. Repeated bouts of intensive exercise can cause the elevation of stress hormones, particularly glucocorticoids, which may suppress the immune system.

Corticosteroids have been shown to inhibit NK cell activity *in vitro* and also *in vivo* when measured more than 24 hours after administration of the synthetic corticoid drug methylprednisolone. However, other studies have shown that NK cell activity increases 4 hours after cortisol is given.

Whilst it is known that during intense physical exertion stress hormones temporarily lower immunity, further research is needed to determine how such exercise might influence NK cell activity.

Get a move on…

The message from current research seems to be that moderate exercise does have a positive effect on the immune system. So to keep colds at bay we should all go out for a brisk, daily walk.

Dariel Burdass
SGM Education Manager

Further reading

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2009 MiSAC Microbes and climate change Competition

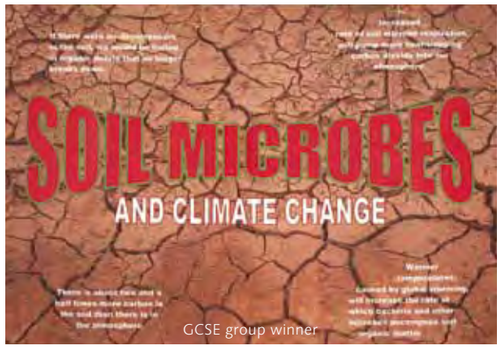
SGM sponsored the 21st MiSAC competition for UK and Ireland secondary schools. This year's topic was chosen because climate change is a global problem that is very likely to have an impact on this generation of students. To enter the ongoing public debate and make informed decisions they need to understand the causes of climate change and be able to evaluate current research. The students were asked to produce an illustrated A3 poster to inform their peer group about one important aspect of the role of microbes in climate change, such as soil microbes, biogas or landfill.

Over 60 schools took part in the competition, and in excess of 350 posters were submitted. A panel of microbiology education experts made up of MISAC members and SGM staff carried out the judging. They were impressed by the high quality of the entries and it was extremely difficult to select the winning posters. Adjudication took account of originality, scientific content and accuracy, presentation and the effectiveness of the poster as a means of communicating with peers.

Feedback from the teachers was positive and many said how pleased they were to have an environmentally based competition. As one teacher declared, '*most of the students think of disease when I mention microbes*'.

The winner of the 11–14 age range was Sophie Hill from Edgbaston High School, West Midlands, and the winners of the GCSE age range were Eadie Shaw, Rosie Stewart and Sara Spiers, from St Nicholas School, Fleet, Hampshire. Further details of the winners are available on the SGM education website (www.microbiologyonline.org.uk/misac).

11–14 age group winner



GCSE group winner

Each school entering the competition received a pack of microbiology teaching resources, including the new SGM book *The Good, The Bad and The Ugly: Microbes* which has been specifically written to engage this age group. Every student also received a certificate of entry.

Next year's competition will be sponsored by the Society for Applied Microbiology and an entry form will be downloadable from the MiSAC website (see above) in September. MiSAC wishes to express its sincere thanks to SGM for sponsorship of the competition.

The winning posters will be displayed at the SGM autumn meeting at Heriot-Watt University, Edinburgh (7–10 September) where many members of the microbiology community both from the UK and overseas will be able to view them.

Dariel Burdass, SGM Education Manager

Review

SAW Showcase: Science from the John Innes Centre and Institute of Food research presented by children from schools in and around Norfolk

Edited by A. Osbourn
Published by John Innes Centre (2009)
pp. 159, ISBN 978-0-9550180-2-2

This book, showcasing the Science, Art and Writing (SAW) initiative, is an anthology of work from 7- to 11-year-olds. Scientists from fields including microbiology and food science took images, and a wealth of knowledge and experience, into schools to inspire children to develop science-based art and literature.

The initiative aims to break down barriers between science and the arts. There is concern that innate curiosity about the natural world is hammered out of children by the constraints of a dull and compartmentalized science curriculum. Scientists too are often so specialized that they begin to lose the ability to communicate effectively with different audiences. So scientists and children are brought together in a cross-disciplinary approach. The outcome is charming; from sculptures of pollen grains to collages and haiku poems. It seems that everyone involved enjoyed themselves immensely; after all, who can fail to be inspired by fractals or electron micrographs of *Salmonella*?

Now I am all in favour of creative work in science lessons, but as a science teacher I have my concerns. This project certainly demonstrates that science is both fascinating and beautiful and as an inspirational tool it appears to have been successful. It brought a drop of science into the Art and English curricul,a but I fear it did little to enhance the learning and understanding of scientific concepts. Maybe this was because some of the topics were too difficult for the age group: your average 8-year-old will be none the wiser about topoisomerases or the regulatory genes controlling meristems (just two of the themes). To illustrate my point here is a poem written by a 9-year-old about DNA.

Telephone wires tangling together,
Springs bouncing out of place,
Spaghetti from a different galaxy,
Spaghetti is crawling down your settee,
Spaghetti is like telephone wires,
Eat it in the car and your mum will go haywire. (Joe Evans, 9)

Nice poem, but where is the science? But there is a nagging feeling in the back of my mind: maybe I am missing the point. Maybe I am even part of the problem.

For more information visit **www.sawtrust.org**

Gemma Sims, Leighton Park School

As the Microbiology in Schools Advisory Committee reaches its 40th birthday Chairman **John Grainger** reflects on how it began and what the organization has achieved.

MiSAC: a brief history

Origins

In the late 1960s as part of a movement among the major UK biological societies to establish means of discussing problems arising from the teaching of specialist aspects of biology, the SGM held a symposium *Teaching microbiology in schools*. Convened by Derek Smith (University of Birmingham) and chaired by John Norris (Shell Research Ltd), the outcome was a resolution to establish a joint committee of representatives of SGM, Society for Applied Bacteriology (SAB) and the British Mycological Society (BMS) to promote and help microbiology teaching in schools. Thus began MiSAC in July 1969.

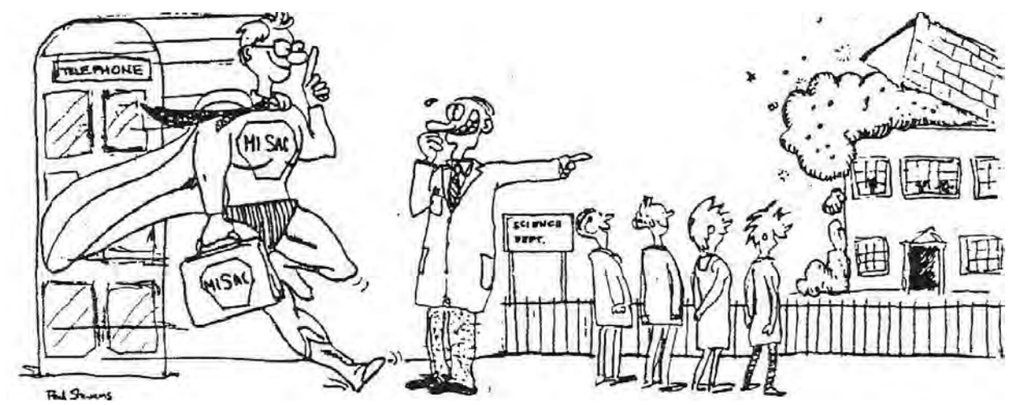
The aims were to publicize the relevance of microbiology in school syllabuses, encourage practical work, promote the safe use of micro-organisms, support teacher and technician training, and promote career opportunities. These aims have stood the test of time though with changes in emphasis according to current needs.

Organization

The range of organizations represented on MiSAC was promptly enlarged to include the Association for Science Education (ASE), Association of Training Colleges and Departments of Education, Department of Education and Science (DES), Public Health Laboratory Service and Schools Council. Schools representation from DES through HM Inspectorate of Schools was an unusual and invaluable link which began with a decidedly equivocal reaction to MiSAC's aspirations, but prospered until 1992 when HM Inspectorate was reduced in numbers and its role changed.

Initially, basic administrative costs were met by grants of £50 each from SAB (later SfAM) and SGM. Sponsorship was received from Society of Chemical Industry (SCI), Science and Plants for Schools (SAPS) and United Kingdom Federation of Culture Collections (UKFCC) for limited periods, but financial support from SfAM and SGM continued and became enhanced by regular sponsorship from BMS, CLEAPSS, Institute of Biology (IoB), National Centre for Biotechnology Education (NCBE) and Scottish Schools Equipment Research Centre (SSERC). The present membership of MiSAC consists of a representative from each of these sponsors and others appointed for their particular expertise in microbiology education.

Among those who guided MiSAC through its early development, three people took on particularly demanding roles, rotating the positions of Chairman and Secretary between them for the first 10 years or so: Brian Bainbridge (Queen



▲ MiSAC 40th birthday celebrations. From left to right: John Schollar (NCBE), Sue Hunt (Kew), Brian Spooner (Kew), John Grainger (Chairman), John Tranter (partially hidden), Margaret Whalley (BMS) and Janet Hurst (SGM).

Elizabeth College, London, John Wray (Chelsea College, London) and Geoff Holt (Polytechnic of Central London). Links with these early years are maintained through present members Peter Fry and John Grainger who subsequently held various positions, including that of Chairman.

For the first decade, the administration was carried out by the officers, but this arrangement was not sustainable. The MiSAC secretariat has since been IoB, NCBE and, currently, SGM. MiSAC became a registered charity in 1984.

Advisory work

In 1973 a national network of MiSAC local advisers was created, consisting of members of BMS, SfAM and SGM willing to provide advice to nearby schools. The initiative prospered, but was disbanded in 2000, as information became available on the web. MiSAC became a member of the Royal Society's working group on biotechnology education in 1982.

Invitations to advise on government booklets on the use of micro-organisms in schools published in 1977, 1985 and 1990, led to MiSAC becoming a recognized authority on safety in school microbiology, a status maintained through involvement with the current published authority, *Topics in Safety* (ASE, 2001). As MiSAC's profile rose, the number of direct enquiries from schools increased and expanded from safety issues to questions on the educational use of micro-organisms, and collaborations developed with publishers, schools suppliers, examination boards and industry.

MiSAC members also helped to promote microbiology as a career by writing articles for education, science and careers magazines, advising on the CRAC degree course guides on a regular basis, and contributing to the 1985 and 1990 editions of the SGM's *Careers in Microbiology*. Need for work in this area declined as other professional organizations developed their own career support activities.

Courses and conferences

Soon after MiSAC was established, attention turned to providing training for teachers in practical microbiology and several well-attended, one-day courses were organized in London and Birmingham in the mid-1970s. However, these became difficult to sustain and were replaced by a small grants scheme to encourage microbiologists to give courses locally; 15 such awards were made in the 1980s. Training provision continued a decade later when MiSAC chairman John Grainger and John Schollar, Director of NCBE, were commissioned by SGM to deliver courses in basic practical microbiology for teachers and technicians: 9 years on, these continue.

Eventually MiSAC felt that a more effective use of its members' limited time would be to take part in

conferences rather than organize them. In 1985 MiSAC had its first exhibition stand at the ASE Annual Conference. This became a regular and rewarding commitment which expanded to joint sponsorship with SGM of talks in the *Biology in the Real World* programme, and in 2009 to organizing a hands-on practical workshop as part of MiSAC's 40th anniversary year activities; taking part in the annual IoB Scottish Teachers Conference became another regular feature. However, as costs to exhibitors have escalated in recent years, MiSAC now takes a selective approach to attending such events.

Projects and publications

In its early years, MiSAC published book reviews and lists of audio-visual materials and drew up analyses of school syllabuses, but the first major project undertaken was the production of slide-sets on 7 microbiological topics through *Camera Talks* in the mid-1970s.

In 1984–85, SGM funded a project to develop a series of practical activities for secondary schools under the management of a MiSAC group. Teacher Paul Wymer was seconded to work with John Grainger at the University of Reading, resulting in *Practical Microbiology and Biotechnology for Schools* published by Macdonald Educational. An immediate consequence was funding through the Department of Trade and Industry (DTI) for them to found the National Centre for School Biotechnology (later re-named NCBE) at Reading in 1985. MiSAC later compiled *Practical Microbiology for Secondary Schools*, published by SGM in 2002, as a successor to the Macdonald resource.

The MiSAC Competition, begun in 1985, aims to reach students directly. Each year it attracts up to 2,000 entries from the KS3 and KS4 (GCSE) age groups. Special sponsorship, currently from BMS, SfAM and SGM in turn, provides money prizes for students and their schools.

MiSAC factsheets was a new venture in 1998 resulting in 17 titles. Copies were produced in-house by SGM for free distribution and also put on the MiSAC website. In 2005, they progressed to being professionally designed and printed, and re-designated as *MiSAC activities*, *MiSAC briefings*, *MiSAC helps* and *MiSAC matters*. Preparing new titles in these series is now a major activity.

Looking back – and ahead

That MiSAC has reached its 40th year is a tribute to the succession of officers and other committee members who have willingly given their time and expertise. Their commitment and the unfailing generosity of the sponsoring organizations have enabled MiSAC to flourish, despite some difficult periods, and remain key to its continuing endeavours in sustaining and extending the encouragingly sound position of microbiology in school and college education.

John Grainger
Chairman, Microbiology in Schools Advisory Committee (t 0118 926 7204; e j.m.grainger@reading.ac.uk)

Further reading

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Society for General Microbiology (1972). Teaching microbiology in schools. *J Biol Edu* 2, 187–195.

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www.microbiologyonline.org.uk/misac

Microbiology in Schools Fund

Teachers working in SGM member schools are invited to apply for grants of up to £1,000 to support microbiology teaching initiatives and events. All topics in microbiology will be considered, but projects linked to climate change, health and food are particularly encouraged.

Applications are considered throughout the year, but should be made no less than 3 months before the planned activity.

BananStock / Jupiter Images

After-dinner speeches at SGM meetings were rather different in the 'old days', as **Michael Carlile** describes.

Diphtheria and a death mask – Peter Wildy's Story

It was January 1979, and the SGM was meeting in Cardiff. The Society Dinner had gone well, with good food and pleasant conversation. The time had come for the Society's President, Peter Wildy, to rise and thank the meeting's organizers, local hosts and speakers. Peter did this, commenting on the various parallel sessions. He had been unable to attend the Ecology Group's session on the Biosphere; a pity, because he was sure that he would have learnt a lot, as there was only one bio-*sphere* that he knew anything about. This, he said, had recently received adequate attention, and he described with his hand a generous curve in front of the abdomen. The Pathology Group's session he had found of great interest, and had reflected on how many once deadly diseases were now rare owing to progress in microbiology. And this, he said led to a story – a true story, because he had no skill in the invention of after-dinner stories.

'There was once,' said Peter, 'a very good little boy. He was all that a good Victorian boy should be – neat, polite, obedient and respectful to his elders. He ate his greens, took his cod liver oil, and learnt his Latin grammar without complaint. The little boy was clearly too good for this world, and in due course a nasty microbe, *Corynebacterium diphtheriae*, rectified matters. The paragon succumbed to diphtheria, and his parents grieved. They had a death mask prepared. The years passed, and in due course the parents died, and the death mask passed to the little boy's sister, my mother. She said to my father, "*I can't bear this horrible thing. It must be disposed of, but that must be done reverently.*" They put the object deep in a bonfire that was being prepared by their jobbing gardener who, like many jobbing gardeners, was very good at making and watching bonfires, if little else. The gardener was not quite satisfied with his preparations, and made rearrangements. As a result he turned up in the

kitchen, "'*Ere Ma'am, I've found this 'ere thing in the bonfire.*" A few weeks later a second attempt at disposal was made. A corner of the garden rarely visited by the gardener was selected, a deep hole was dug, and the death mask reverently buried at a depth that the gardener's shallow probing was unlikely to reach. However, a large and lively puppy had recently been bought, and he too turned up in the kitchen, proudly displaying his fascinating find.'

'My father and mother were keen sailors, and one day they wrapped up the death mask, took it on their yacht into deep water off the Isle of Wight, and cast it overboard. "*At last*", my mother said with relief, "*and now for lunch*". She turned to her second package and opened it. There was the death mask. After these three unsuccessful attempts my parents gave up their attempts to dispose of the mask. It is now on top of my wardrobe, and the problem of disposal is mine. A pity,' Peter concluded, 'that microbiology was not more advanced in the 19th century'.

Michael J. Carlile
SGM Meetings Secretary, 1977–1980
(e mjcarlile@mjcarlile.plus.com)

Gradline aims to inform and entertain members in the early stages of their career in microbiology. If you have any news or stories, or would like to see any topics featured, contact **Jane Westwell** (e j.westwell@sgm.ac.uk).

The island of opportunity

As a PhD student from overseas, **Federico Dorati** shares with readers his experiences of some UK schemes that have been a great boost to his personal development.

I am Italian, and in 2007 I moved to Reading to do a PhD in Microbiology. Two exciting years have already flown by and I have been very lucky during this period, both professionally and personally, because here in England I have had the opportunity to find a system of serious institutions and great people that allow me to express myself and which can help me transform my research into something more. I would particularly like to tell you about two competitions, *Biotechnology YES* and *SET for Britain*; participating in these has literally changed my life. By writing this I hope to be able to communicate not just my gratitude to the scientific community and the organizers of these wonderful events, but also to convince young scientists like me to participate too. Science doesn't finish on the bench – it can go much further…

Biotechnology YES

Biotechnology YES (Young Entrepreneurs Scheme – www.biotechnologyyes.co.uk/index.html) is a science/business competition developed to raise awareness of the commercialization of bioscience ideas among postgraduates/postdocs. Participation is free; you just need an idea which is scientifically 'possible' (whether or not it's real) that could potentially be sold to industry. The preliminary phase is based on a 3-day workshop where the participating teams have the opportunity to learn about business and acquire the knowledge to build a real company around their idea. During the meeting I met people from the BBSRC (the organizers of the event) and I had the opportunity to talk with scientists that started their own business. I learnt a lot about communicating science to a wide audience (many businessmen are not scientists) and realized that research is not only successful if it's published, as its potential can be exploited in different ways.

I was part of a team of bioscientists from the University of Reading (Nadia Abed, Joao Lopes, Cristina Fante, Abby Thompson and myself, mentored by Samantha Decombel). We were lucky enough (and worked hard enough!) to be one of 14 teams

out of 73 that made it through to the national finals in London. Our proposal for a hypothetical company called Ovega and its revolutionary new product which aims to produce vegetarian Omega-3 oil from food industry waste impressed the judges. We won! We received a prize of £1,000 and a trip to Houston, Texas. Whilst there we presented our company at the RICE Business Plan Competition, the biggest business/science-based competition in the world, where all the companies that were participating were real. I can't describe how exciting and interesting it was to be there; the organization is extraordinary and so are the people and the professional experience. It truly made me realize how many opportunities there are in life and what a pity it would be to miss them, just because we are intimidated and think that what we are doing is not 'good enough'.

SET for Britain

SET for Britain (www.setforbritain.org.uk/) is a scientific poster-based competition, organized to encourage and promote early-stage career research scientists.The 1-day-long competition is held in the House of Commons. After abstract selection, the best 60 works are presented in poster format to a panel of judges. I was the lucky winner of the second prize this year with a poster entitled *A threat to our conkers? Characterization of the horse chestnut bleeding canker pathogen*, a research project supervised by Dr Robert Jackson (my PhD tutor at Reading). This prestigious prize brought a lot of publicity and attention to our research. At the House of Commons I had the opportunity to speak to Reading's MP Robert Wilson, who communicated my research to the local media. Being in the House of Commons and being able to discuss the research done in the University of Reading was an amazing experience!

I hope I have communicated how important these experiences were for me. Even if we are in a period of economic recession, the scientific world is still active and vibrant and there are groups of passionate people working hard to highlight and communicate the work of young researchers and give them these great opportunities.

Organizations such as the BBSRC and societies like the SGM really do offer postgraduates the opportunity to do more than just research; they offer us tools to realize our goals and reach our dreams. Personally I hope that my scientific contribution will allow me give something back to this country that has already given me so much.

Federico Dorati
(e f.dorati@reading.ac.uk)

In the melting pot

Crucible (www.nesta.org.uk/crucible), organized by National Endowment Scheme for Science Technology and Arts, brings together early- and mid-career researchers in three weekend workshops to explore issues such as creativity, policy-making, communication and public engagement. Participants, who come from the arts, humanities, technology and sciences, have the opportunity to explore ideas outside their own discipline and develop new collaborations. SGM member **Mark Clements**, senior lecturer in biotechnology at University of Westminster and part of the 2009 cohort shares his impressions of the first weekend workshop.

I first heard about Crucible through my Dean of School, but my interest really grew after watching a video about the programme via the NESTA website. It looked like a fun way to meet fellow scientists from a wide range of disciplines. The application process was straightforward, and I was very excited when I heard I had been selected for the programme.

I went to first innovation camp weekend with trepidation as I was not sure what to expect, and I was going to spend a long weekend with 30 people I had never met before. Upon arrival, however, my reservations soon evaporated due to the well-designed programme and the expert facilitation of writer and broadcaster Vivienne Parry (former *Tomorrow's World* presenter) who made the whole weekend stimulating and fun.

The first session involved each participant presenting a poster about themself, including personal and professional interests, to break the ice. Initially, I wondered what a palaeontologist, sociologist, chemist, physicist, archaeologist and myself could have in common, but it was clear we all had a passion for our subjects and an open-minded desire to breakdown conventional discipline boundaries to generate new ideas.

We explored ways of engaging the public with our research as well as how to get involved with the media and other communication-based organizations. We also examined our role in influencing government policy and the mechanisms by which we can do this. Each session was led by a panel of experts who shared their experiences and gave practical tips about how various organizations work. It was refreshing to talk about science with people outside of my subject area and to find areas of common interest. By the end of the weekend I was buzzing with new ideas and had made an exciting group of new friends. We have continued to get to know each other through an online network forum which has facilitated the sharing of ideas emerging from the first camp. Crucible has exceeded my expectations and I am really looking forward to the next weekend where we are going to explore ways to develop cross-disciplinary ideas.

Mark Clements
(e clemenm@westminster.ac.uk)

Profile

Present occupation
Assistant Professor in Molecular and Cellular Nutrition, Texas State University

Previous employment
New York University Medical Center, 2004–2007
I worked on an NIH-funded study aimed at understanding how dietary fish oils exert their beneficial lipid-lowering effects. One way fish oils are able to do so is by reducing the output of very low density lipoproteins (VLDL) by the liver. These lipoproteins are the precursor to 'bad' LDL-cholesterol and also associated with raised plasma triglycerides. My project investigated the effect of fish oils on the various stages of VLDL assembly in liver cells in order to elucidate the molecular mechanism of reduced VLDL output.

University of Reading, 2003–2004
Short-term contract on a BBSRC-funded study aimed at understanding how different dietary fats influence lipoprotein composition and the progression of atherosclerosis.

Education
PhD, Food Biotechnology, University of Reading, 2003
My project was aimed at synthesizing 'anti-adhesive' oligosaccharides with defined structures to mimic the biological receptors of certain gut pathogens. The goal was to use these sugars as decoys for pathogen attachment, thus preventing bacterial attachment to their real receptors in the gut and subsequent infection. I developed enhanced enzyme-based techniques for the synthesis of these decoy sugars at higher yields and purity.

MSc, Food Technology, Central Food Technological Research Institute, Mysore, India, 1999
BSc Microbiology, Mount Carmel College, Bangalore, India, 1997

A job in…
Research in the USA

If you are planning your next career move, you might be considering a period of postdoctoral research in the USA. Although the current economic climate is having an impact on recruitment in the USA, there are still some opportunities. Catherine Armstrong outlines the current situation on the **jobs.ac.uk** website.

Vatsala Maitin's profile shows how a combination of careful planning, networking and planned happenstance (covered in the last issue of Gradline) can lead to achieving career goals.

What influenced your choice of PhD project?

It was governed by a combination of factors, including my research interests, prior exposure to published research from the supervisor's lab and being awarded a Felix scholarship and Overseas Research Student award to support my PhD studies at the University of Reading. As an undergraduate and master's student, I had a keen interest in microbial biotechnology and also gained some research experience in the area of microbial enzymes. Fortunately, the project matched my interests well and had considerable prophylactic potential, making it an attractive subject for a PhD thesis.

How did you go about finding your postdoc in America?

I took two different approaches: sending open applications to a faculty whose research I was interested in, and responding to advertised positions of interest. As an international applicant, I also needed faculty support for a visa to work in the USA. I obtained the postdoc by responding to an advert in *New Scientist*. The principal investigator in offered me a 3-year contract along with a secure visa status. The lab had a good

publication output, was in a renowned institution and offered good potential for collaboration and networking. I accepted this position after conferring with both my mentors at Reading who supported my decision.

How did you obtain your faculty position?

I heard about this post through my spouse, who was already a faculty member in my current department. I had been anticipating a possible faculty position opening for about 2 years, considering the steady growth in the scope of the nutrition programme in the department. I met the department chair informally to express my interest in any positions that might open up. I applied for this post and underwent a two-stage interview process; a telephone interview followed by an on-site interview which was a gruelling all-day process. It included a teaching presentation and research presentation, including a research proposal for my own lab if hired. I was interviewed by two different committees, the college dean and the department chair. Following negotiations on the lab start-up package, equipment needs and salary, an informal offer was extended to me via email outlining the conditions of employment. This was followed by a formal letter in the mail.

You have worked in different research fields – was this planned?

The course of my research has certainly been very varied, spanning biotechnology, enzymology and basic cell biology. For the most part, this was circumstantial rather than planned. My foray into lipoprotein research happened due to the departure of the assigned postdoc one year before the end of the project, which coincided with the completion of my PhD. This serendipitous occurrence not only allowed me to work on a very exciting project, but also helped lay the foundation to my postdoc position in New York and my present faculty position.

It sounds quite challenging

The main challenge I faced was lacking in-depth knowledge of literature and techniques in the new research area, but I was able to overcome this over time, by extensive reading and the help of my colleagues and faculty mentor. In the current research environment I have found my multidisciplinary training to be an asset rather than a drawback.

What workplace cultural differences have you noticed in the countries you have studied and worked in? How easy was it to adapt?

My transition to PhD research was fairly smooth as the Indian education is closely modelled on the UK system. I also benefited from the prior experiences of my father who also got his PhD in the UK. A feature of the UK system was the emphasis on the ability to work independently to drive a project. This was hard to adapt to at first, but has really helped me in my career.

Compared to the UK, I have found the work environment in the USA to be considerably more demanding, competitive and regimented, especially in big cities with multiple premier institutions. There is an expectation to consistently perform at the highest level and one cannot rest on one's laurels. While it does lead to high productivity it can be a little stressful at times. The academic tenure process is much longer and uncertain compared to the UK, lasting about 6–7 years.

On the plus side, networking and collaborations are easier since most professors are very approachable and helpful. Funding opportunities and salaries are also slightly better than elsewhere

Can you describe a typical day?

During semesters, my week is usually organized into teaching and non-teaching days. I teach 2 days a week, and the bulk of the time on those days is spent on lecture preparation and delivery.

On 'non-teaching' days, my time is spent on research-related activities such as meeting graduate students, following up on research progress, analysing data, planning new experiments, review of manuscripts, catching up on literature and writing up research for publication.

At this stage of my career, I spend a lot of time on identifying and applying for funding. I do not teach in summer, so I use this block of time to focus on research, writing and idea-development. In addition, I have to spend a few hours each month on commitee work and administrative duties.

What is rewarding about your job?

Aside from the joy and stimulation of driving new research ideas, the most rewarding part of my job is to be able to really engage some students and get them excited about a career in research. When I am able to spark that kind of interest, it is really satisfying. I also enjoy contributing to students' career development.

How do you see your future?

Over the next few years, I hope to establish a well-funded and well-published research laboratory and carve a niche for myself in my research area.

Further information

www.jobs.ac.uk/careers/articles/1250/Staffing_Crisis_the_US
Staffing Crisis: the US by Dr Catherine Armstrong

www.txstate.edu
Texas State University

goingpublic

SGM aims to promote microbiology to a wide range of audiences. In this issue we react swiftly to the worldwide 'flu outbreak, find out how carrying out public engagement activities changed the lives of both an undergraduate and postgraduate student of microbiology, listen in to a podcast on STIs, and explore the Greenland ice.

Swine 'flu briefing

In response to the current outbreak of swine 'flu, which shows no sign of abating, the SGM External Relations Office, with the help of 'flu expert Wendy Barclay, put together a one page information sheet about the infection.

This has been distributed to all UK secondary schools and also to parliamentarians and other policymakers in the UK.

Copies are freely available. Contact **pa@sgm.ac.uk** if you would like one.

Dariel Burdass is taking over the SGM half of the joint podcasting activity with Lucy Harper of Society for Applied Microbiology. She describes the latest broadcast. Why not check it out, download the file and listen in?

Micropodonline returns www.micropodonline.com

Safe sex – who needs to be educated?

Micropodonline, the microbiology podcast is back. Dariel and Lucy talk about sex, relaying the news that people over 45 are putting themselves at risk of sexually transmitted infections (STIs) by not taking precautions. A survey by the Royal Pharmaceutical Society of Great Britain found that of the 2,000 adults they surveyed about their sexual practices, nearly a fifth of those between 45 and 54 years old admitted to having unprotected sex with someone other than their long-term partner. And with the number of diagnoses of STIs among under 16s in England rising 58% from 2,474 cases in 2003 to 3,913 in 2007, it is obvious that we all need to take on board the important message that safe sex pays.

Any individual who engages in unprotected intimate sexual contact is putting themselves at risk of catching an STI. STIs don't care if you are young or old, male or female, straight, gay or lesbian – they don't discriminate. You don't have to be promiscuous – having unprotected sex just once with an infected individual puts you at risk. And you can't tell if someone is infected by just looking at their genitals for rashes or blisters because many people have no symptoms but are still infectious.

In this episode of *Micropodonline*, to be released soon, Lucy discusses STIs in general, how they are transmitted and how we can protect ourselves, with Dr David White, a consultant Genito-Urinary Medicine clinician based at Birmingham Heartlands Hospital. She also talks to David about his speciality – vaginal thrush.

Stockxpert / Jupiter Images

◀ Joanna Heaton with a pupil at an outreach workshop. *J. Heaton*

▼ Bug. *J. Heaton*

Joanna Heaton, first winner of the new Education Division Outreach Award, sponsored by Yakult, tells us how her involvement in public engagement led to a new career.

Prize-winning outreach

As a postgrad, my first outreach workshop involved smelly sewage biofilms, swearing sixth formers and a promise to myself never to bother with that again! But after finding out that the group had loved it, and had actually learnt something too, I didn't hesitate in offering more workshops when the opportunity came up. It was great experience during my PhD, improving my communication skills and constantly reminding me of my own passion for microbiology.

I spent the second summer of my PhD co-ordinating a 2-week summer school course, *Disease Detectives*, covering both microbiology and molecular biology. This included a mock food-poisoning outbreak and murder, plus a trip to a sewage works, the microbiology rap, lab macarena and countless 'wow' moments. I came back to the bench with renewed enthusiasm and not a sign of those second-year blues.

I then successfully applied for funding from The Wellcome Trust to run a series of workshops, *Superhero Superbug* and having this on my CV secured me a knowledge transfer position at the University of Central Lancashire, straight from my PhD.

I'm now Educational Liaison Co-ordinator at the University of Central Lancashire (UCLan), developing outreach workshops across the Faculty of Science and Technology and sourcing external funding. I'm still running plenty of microbiology workshops, and my fifth summer school, but also get to build rockets, understand the maths behind hovercrafts and investigate crime scenes too.

Joanna Heaton
Educational Liaison Coordinator, Faculty of Science and Technology, University of Central Lancashire
(e jheaton@uclan.ac.uk)

Don't miss Jo's talk at the SGM autumn meeting – on Tuesday, 8 September at Heriot-Watt University. It's called Schools, Spiderman and Superbugs; Communicating Microbiology at Primary Level *and she hopes to inspire the audience to get out and promote microbes to little people.*

Greenland ice bacteria hit the headlines

The SGM policy to promote microbiology and its journals through regular media releases on selected papers works well, but recently a story really went global.

With over 11,000 hits on 'Google' and numerous articles in newspapers ranging from the *Independent* to the *Sun*, research findings published in the June issue of the *International Journal of Systematic and Evolutionary Microbiology* attracted attention all around the world. Microbiologists Jennifer Loveland-Curtze, Vanya I. Miteva and Jean E. Brenchley of Pennsylvania State University isolated a novel species of bacteria from deep in the glacial ice in Greenland. It took the scientists nearly a year of incubation at low temperatures to coax the dormant microbes back to life, after being trapped for an estimated 120,000 years. The bacteria are very small and purple-brown in colour. They have been named a tongue-twisting *Herminiimonas glacei*.

H. glacei is 50 times smaller than *Escherichia coli* and is known as an ultramicrobacterium. It can pass through a 0.2 micron filter, the pore size used to sterilize laboratory fluids, but it is not harmful to humans. The tiny size is believed to be key to the survival of the bacteria in the liquid veins among ice crystals and the thin films on their surfaces. Ultramicrobacteria can survive on low levels of nutrients and oxygen.

Although this story is intrinsically interesting, and the bacterium was dubbed the 'Resurrection bug' by *New Scientist*, it probably caught the eye of the press because of the potential link between the habitat of the newly described bacteria and extraterrestrial environments. The researchers speculated that the ability of the microbes to survive in a glacier for so long means that similar life-forms could have evolved and survived in extreme environments on planets such as Mars or Europa, an ice-covered moon of Jupiter. They believe that cells and DNA can be preserved at exceptionally low temperatures for even millions of years.

The headlines for the story were polarized between the extraterrestrial life angle and the revival aspect. The most extreme headline for the former seen so far was in the *Metro* which shouted '*Bug could hold key to alien life*', but which went on to report the story responsibly, despite the opening words '*In an experiment that could come straight from a science fiction film, scientists have awoken a tiny bug found deep under the Greenland ice from a 120,000-year sleep*'. The *Sun*, often vilified for its stories, also got the science right, even though they described '*boffins bringing a bug back to life*'. They gave the full name of the novel species correctly and added an interesting quote from a scientist involved in the *Mars Express* mission who thinks that alien microbes are lying dormant in ice on Mars and wants to blast a crater in the area to take samples to test.

The point of issuing press releases such as these is, that if taken up by the media, they reach wide audiences and help to spread the word about the exciting world of micro-organisms and the research that is being carried out into these fascinating life-forms. Authors who are approached by the SGM for permission to produce a media release about their work should not be scared. In practice, most articles repeat the words of the release to a greater or lesser extent, and so if crafted carefully by a media professional, as SGM ones are, can only provide good publicity for a scientist and their lab. When trying to disseminate your findings, how do 11,000 hits on Google compare with the fact that a published scientific paper is read only four times on average?

SGM press releases

The SGM issues press releases from research papers in its journals and also from presentations at Society meetings. No releases are produced without the authors' consent. Authors are consulted at all stages of the process and do not go out until approved, embargoed as necessary. We do not aim to sensationalize, but we do have to make the story interesting and relevant. SGM press releases are produced either in-house by a staff press officer, or media consultants such as Dianne Stilwell, who was responsible for the Greenland story covered here. If you think your research is worthy of publicity, let us know by emailing **press@sgm.ac.uk**

Janet Hurst
External Relations Manager

Reference

Loveland-Curtze, J., Miteva, V.I. & Brenchley, J.E. (2009). *Herminiimonas glaciei* sp. nov., a novel ultramicrobacterium from 3042 m deep Greenland glacial ice. *Int J Syst Evol Microbiol* **59**, 1272–1277.

The full text of the press release

www.sgm.ac.uk/news/releases/IJS.0609.JLC.cfm

A tiny frozen microbe may hold clues to extraterrestrial life

A novel bacterium that has been trapped more than 3 km under glacial ice in Greenland for over 120,000 years, may hold clues as to what life forms might exist on other planets.

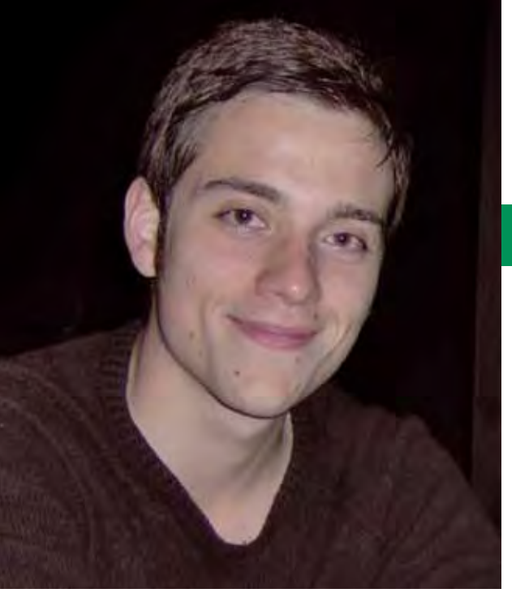
Dr Jennifer Loveland-Curtze and a team of scientists from Pennsylvania State University report finding the novel microbe, which they have called *Herminiimonas glaciei*, in the current issue of the *International Journal of Systematic and Evolutionary Microbiology*. The team showed great patience in coaxing the dormant microbe back to life; first incubating their samples at 2°C for 7 months and then at 5°C for a further 4.5 months, after which colonies of very small purple-brown bacteria were seen.

H. glaciei is small even by bacterial standards – it is 10 to 50 times smaller than *E. coli*. Its small size probably helped it to survive in the liquid veins among ice crystals and the thin liquid film on their surfaces. Small cell size is considered to be advantageous for more efficient nutrient uptake, protection against predators and occupation of micro-niches and it has been shown that ultramicrobacteria are dominant in many soil and marine environments.

Most life on our planet has always consisted of micro-organisms, so it is reasonable to consider that this might be true on other planets as well. Studying micro-organisms living under extreme conditions on Earth may provide insight into what sorts of life forms could survive elsewhere in the solar system.

'*These extremely cold environments are the best analogues of possible extraterrestrial habitats*', said Dr Loveland-Curtze. '*The exceptionally low temperatures can preserve cells and nucleic acids for even millions of years.* H. glaciei *is one of just a handful of officially described ultra-small species and the only one so far from the Greenland ice sheet; studying these bacteria can provide insights into how cells can survive and even grow under extremely harsh conditions, such as temperatures down to –56°C, little oxygen, low nutrients, high pressure and limited space.*'

'H. glaciei *isn't a pathogen and is not harmful to humans*', Dr Loveland-Curtze added, '*but it can pass through a 0.2 micron filter, which is the filter pore size commonly used in sterilization of fluids in laboratories and hospitals. If there are other ultra-small bacteria that are pathogens, then they could be present in solutions presumed to be sterile. In a clear solution very tiny cells might grow but not create the density sufficient to make the solution cloudy*'.



Recent UEA graduate **Jaeger Hamilton** helped with an SGM-funded project to set up an online photographic resource about fungi. **Jane Westwell** asked him how he got involved and what he gained from the experience.

Fungi for everyone

I noticed you worked with Kay Yeoman on a public engagement project. How did you get involved?

I have been involved with a couple of Kay's outreach events, most recently as part of a module in science communication. I was asked to organize a science-learning event as part of the National Science and Engineering Week held at the Norwich Castle Museum. My event was based on having fun with microscopes and observing micro-organisms such as the water mould *Saprolegnia* and a myriad of other beautiful creatures that associate with it, such as rotifers, *Vorticella* and *Paramecia*.

What did you enjoy most about this?

My objective was to facilitate an open learning process; it had as much to do with what the learner brought to the table as it did my own experience. So above all I enjoyed the sense of creating something new with someone else.

Did anything surprise you?

I was surprised by the extent to which I was swept up in other peoples' learning. It was as though I set the preconditions to make it possible, but once underway the learning activity had a logic of its own.

What was the most challenging aspect?

Trying to understand the learning needs of others in a very small frame of time. I tried to be attentive to the individual needs of the learner, whether that was subjective reflection, or theoretical information, or simply to have the space to contemplate. I was very aware of tailoring my event to different learning styles (using David A. Kolb's 'experential' learning model): activists learn by doing, so the event had to involve activity; theorists like to incorporate their experiences into general schemes, so I had to ensure there was something of a theoretical framework behind the event; pragmatic learners would want to know how this knowledge could be applied, and reflective learners would need lots to contemplate from a distance without being embroiled in the action. So shaping an event that would appeal to different learners was the most challenging aspect – but this was part of what made the whole experience rewarding.

What have you liked most about being a student?

I think my experience of everything has been enhanced by studying microbiology. I think that science has a certain austere beauty that appeals to me. It has certainly permeated many areas of my thoughts.

What are your plans for the future?

I'm starting a Wellcome Trust PhD at the University of Dundee in September. I'm looking forward to learning lots of new techniques, meeting new people and pushing my understanding further.

Jane Westwell
External Relations Office

A report of Kay Yeoman and Jaeger Hamilton's 'joy of fungi' project appeared in the February 2009 issue of Microbiology Today *(pp. 54–57). You can visit the website at http://biobis.bio.uea.ac.uk/fungi/index.html*

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hotoffthepress

Science writer **Meriel Jones** takes a look at some recent papers in SGM journals which highlight new and exciting developments in microbiological research.

Warts and all

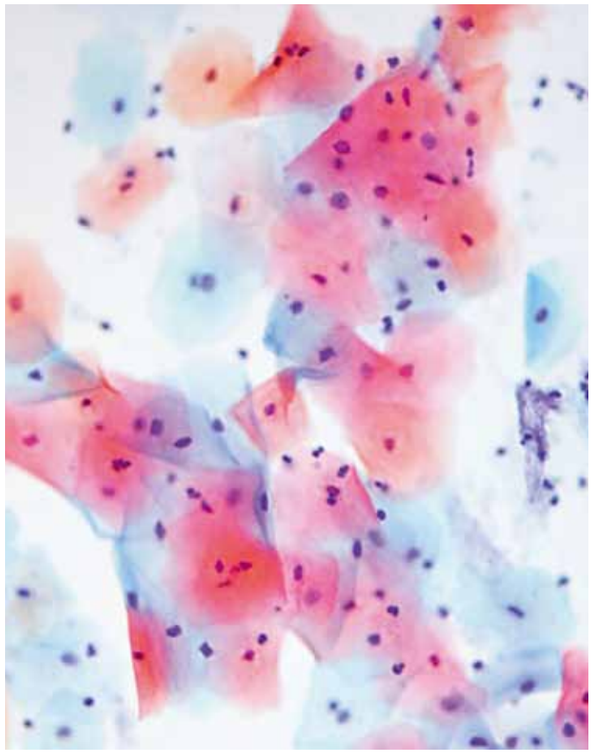
Waterboer, T., Neale, R., Michael, K.M., Sehr, P., de Koning, M.N.C., Weißenborn, S.J., Sampogna, F., Abeni, D., Green, A.C., Bouwes Bavinck, J.N., Pawlita, M. and the EPI-HPV-UV-CA Group (2009). Antibody responses to 26 skin human papillomavirus types in the Netherlands, Italy and Australia. *J Gen Virol* **90**, 1986–1998.

Researchers have characterized over 100 different types of human papillomaviruses (HPV) and there are certainly many more. They infect the surfaces of the body, including skin and the linings of the mouth and genitals. Some types are unfortunately well known because they cause cervical cancer, while others are associated with harmless skin warts. The role, if any, of other HPVs in human cancer remains to be identified.

Ultraviolet (UV) light is the main cause of skin cancer. There are several types of skin cancer and one of them, cutaneous squamous cell carcinoma, has been associated with the beta types of HPV. However, this occurs in a small number of people who either suffer from a rare genetic complaint or are receiving immunosuppressive treatment because they have been given an organ transplant. A big question for researchers is whether beta HPV types have any role in development of this cancer among the vast majority of people who have a fully functioning immune system. Surprisingly, little is known about HPV infections in otherwise healthy adults and an international collaboration of scientists has set out to remedy this.

Research groups in Germany, Australia, the Netherlands and Italy collaborated to carry out the biggest study so far into the natural history of HPV. The German researchers had a method to rapidly identify antibodies to 26 different HPV types and they analysed 807 samples from healthy Italians, Australians and people from the Netherlands. The results made it very clear that the three countries were very similar in the levels of HPV infections and the viral types that caused them. The gender of each person made a much bigger difference, with men more likely to be infected than women.

An obvious difference between the three countries was the amount, and intensity, of sunshine and the UV light within it. The researchers estimated that 1 hour of sun exposure in Italy was about twice as intense as in the Netherlands and about half that of Australia. All the volunteers had filled in questionnaires about topics such as how much they went out in the sun and whether they had had painful sunburns. Interestingly, the Australians reported spending less time in the sun than the other volunteers, probably due to increased public awareness of the risk of skin cancer from sun exposure. Using all this information, the researchers calculated that the differences in amount of and exposure to UV light did not explain any differences in HPV infection.



▲ Light micrograph of cells infected with HPV. *Biomedical Imaging Unit, Southampton General Hospital / Science Photo Library*

The results of this large survey show that the distribution of beta HPV types in people of European descent is probably similar all round the world. Most healthy people carry at least one type of the virus and some have antibodies to HPV, indicating that their immune system has recognized it. If HPV has any role at all in skin cancer, it must be acting together with other factors such as UV exposure or an individual's genetic characteristics, with the latter being probably much more important.

Spore wars

Cote, C.K., Bozue, J., Twenhafel, N. & Welkos, S.L. (2009). Effects of altering the germination potential of *Bacillus anthracis* spores by exogenous means in a mouse model. *J Med Microbiol* **58**, 816–825

The disease anthrax is caused by the bacterium *Bacillus anthracis*. It is a highly infectious animal disease, usually caught as a skin infection by humans from handling infected animals. If untreated, about one-fifth of patients die. There are 20,000–100,000 cases of anthrax each year around the world, most of which are skin infections.

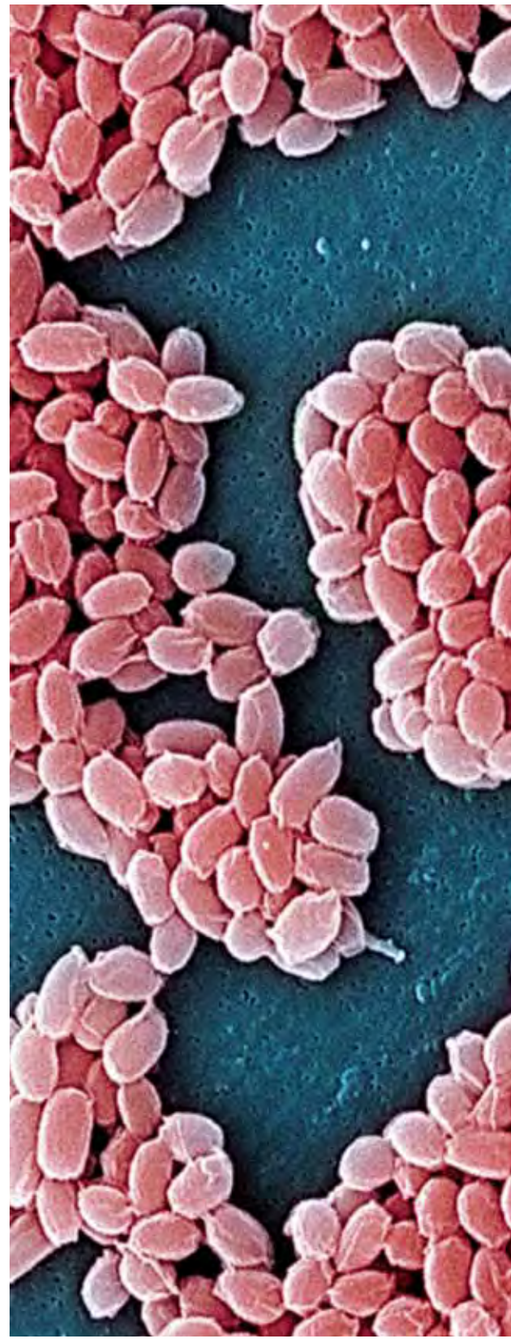
However, some infections are caused by breathing in bacterial spores from animal products like untreated wool and skins. This is almost always fatal unless treated promptly, and as few as 8,000 spores can set up a lethal infection. The tiny spores have an amazing ability to survive adverse circumstances and remain viable for decades. These properties are the reason why anthrax was developed from the 1940s to 1969 for biological warfare by many countries, including the USA and UK. Since this time, research has continued to develop better protection strategies for both civilians and military personnel.

Antibiotics are a very effective therapy against anthrax, but the bacterial spores are immune until they germinate. Once inhaled, the spores remain deep within the lungs or can be taken up by cells of the immune system and distributed around the body. The big problem is that they release toxins that damage the surrounding tissue as soon as they germinate, thus starting the fatal disease.

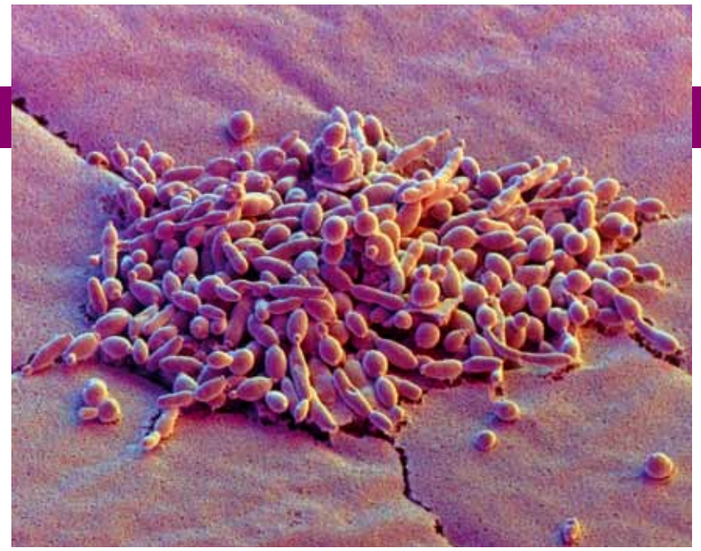
Researchers know that the germination of *B. anthracis* spores is slowed or accelerated by several chemicals. The amino acid D-alanine inhibits germination, while a mixture of L-alanine, adenosine and Casamino acids (AAC) initiates germination. These are effective in the laboratory and researchers in the USA have now tested whether there is an effect on spores within lungs. They first checked that the chemicals themselves did not have an adverse effect when breathed as aerosols or dripped into the nose in a solution. The next step was to see whether there was any effect after the spores had been soaked in the chemicals before they were inhaled by mice. AAC reduced the lethality of the infections, suggesting that the germination process itself affects the severity of the disease. However, the effects of soaking in D-alanine, a potent germination inhibitor, did not make the spores any less lethal, and might actually have made it more intense.

In real life, any therapy will have to begin once the spores are in the lungs, so the researchers tested the consequences of inhaling the chemicals after the *B. anthracis* spores. To their surprise, this time AAC intensified the infection and reduced the time the mice survived while D-alanine had a small beneficial effect in the early stages of infection.

The outcome from these experiments is that the researchers were unable to do anything to give a more favourable disease outcome. Germinating spores are clearly less likely to cause a fatal infection than inactive ones, because they become vulnerable to the body's immune system. However, once the spores are in the body, they will release toxins soon after they germinate, whether this happens naturally or is induced by chemicals like AAC. A germination inhibitor like D-alanine may actually protect the pathogen from the body's defences by forcing it to stay in a protected, inactive state. During this time, the spores can be carried around the body and deposited in several organs. Unfortunately, the inhibition will eventually wear off and the spores will then germinate to initiate infection all round the body resulting in a more virulent disease. The researchers will have to think further for an effective strategy that aids treatment for inhalation anthrax.



▶ Electron micrograph of *Bacillus anthracis* spores. *Scott Camazine / Science Photo Library*



▲ Cells of the yeast *Saccharomyces cerevisiae*. *David Scharf / Science Photo Library*

Starvation stress in yeast

Zhang, N., Wu, J. & Oliver, S.G. (2009). Gis1 is required for transcriptional reprogramming of carbon metabolism and the stress response during transition into stationary phase in yeast. *Microbiology* **155**, 1690–1698

The yeast *Saccharomyces cerevisiae*, used for producing beer and bread, was the first eukaryote to have its genome completely sequenced. This was finished in 1996, although researchers continue to update the information weekly. One consequence is that there is now immense knowledge about how this single-celled organism works, but important features are still unknown. For example, when yeast grows in its typical environment with glucose as a source of nutrition, it grows rapidly, producing ethanol as a waste product. The carbon atoms from the glucose are essential for constructing new yeast cells. Eventually, when all the glucose has gone, the yeast consumes the ethanol and finally enters a resting form when that in turn has been used up and no carbon is available. The cells can survive quiescently for a time even under this severe starvation. Researchers know that at least a quarter of the yeast's 6,607 genes are involved in making these major life-style changes. However, having a list of genes is a long way from knowing how the processes are orchestrated.

Researchers at the Universities of Manchester and Cambridge in the UK have focused on the protein produced from the *GIS1* gene, which turns out to be essential for yeast cells to organize changes in carbon metabolism and to respond appropriately once all the carbon runs out. The Gis1 protein functions as a transcription factor, meaning that it can interact with both DNA and protein in the nucleus to alter usage of genes. It switches some genes on and others off, recognizing them through a DNA sequence near to each gene that it regulates. A second protein, Rim15p, is also required, probably by relaying signals when nutrient stress is becoming serious.

The researchers had already discovered that a set of 17 genes was always activated when yeast cells were starved of any of the major nutrients such as carbon, and called them the UES genes since they were universally expressed at starvation. The Gis1 protein worked with Rim15p to activate them once the situation changed from merely a limited amount of nutrient to complete starvation. Researchers can bring information like this together with data from other studies to build up a picture of the networks of interacting proteins that make a cell function. This is a big challenge, but for an economically important species like yeast, the end result could have a commercial benefit. Another valuable use is that parts of the network will turn out to be similar in other species, including ourselves, and may give an insight into how our own cells react under stress.

Mining novel species

Doerfert, S.N., Reichlen, M., Iyer, P., Wang, M. & Ferry, J.G. (2009). *Methanolobus zinderi* sp. nov., a methylotrophic methanogen isolated from a deep subsurface coal seam. *Int J Syst Evol Microbiol* **59**, 1064–1069.

Bacteria will live anywhere on this planet where they can find a source of nutrients. Access to adequate carbon is essential and coal is, of course, solid carbon, but does not usually spring to mind as a good material for bacteria to feed on. One of the hazards of coal mining is explosive gases, including methane, and it is known that some of this gas is of biological origin.

James Ferry and his colleagues in the USA have therefore been searching for bacterial life in coal mines. They have discovered that there are many novel species in these deep subsurface environments, but most can only be recovered as traces of DNA, rather than living cells. There is substantial interest in the USA in enhancing the biological production of methane from coal as a future fuel source. Studying the bacteria that carry out this conversion is necessary to optimize the process.

This team have now reported the culture of a strain of bacteria called SD1^T from the Wilcox coal beds in Louisiana. It can produce methane and has to be kept in strictly oxygen-free conditions. The cells can use several carbon sources, including methanol and trimethylamine. To identify what sort of bacterium SD1^T might be, molecular biological methods were used to provide the sequence of the 16S rRNA gene. This sequence showed that SD1^T is related to *Methanolobus* species, but is sufficiently different to be considered a novel species. The researchers have named it *Methanolobus zinderi* after Stephen H. Zinder, an American microbiologist from Cornell University who has made an outstanding contribution to the microbiology and ecology of biological methane production.

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Gene and Cell Therapy: Therapeutic Mechanisms and Strategies, 3rd edn

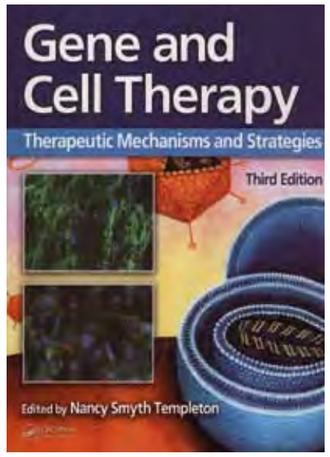
Edited by N. Smyth Templeton
Published by CRC Press / Taylor & Francis Group (2008)
US$229.95 pp. 1,160
ISBN 0-84938-768-5

In very simplistic terms, disease results from cellular malfunction. Even when the body is infected with a bacterium or virus, for example, symptoms often result from effects of the agent on normal processes of the cell. Conventional treatments rely on the delivery of small molecule drugs to the site of action, with a view to modifying the disease process, often by interacting with cellular proteins within, or on the plasma membrane. Gene- and cell-based approaches are much more fundamental. A gene-based approach acts by manipulating the genes so that different proteins are expressed in the cell or are expressed in different amounts, in an attempt to bring about a therapeutic effect. A cell-based approach takes things a step further, by replacing malfunctioning cells by fully competent ones. A number of specialized textbooks can be criticized for lacking a general introduction, and I believe that this book is one of them. It would have benefited from a comparison of gene- and cell-based strategies with more conventional treatments, emphasizing their potential advantages and disadvantages.

Furthermore, the book title indicates that the emphasis of the text is on the treatment of disease and it is my opinion that a bit more of an in-depth description of the disease mechanism would be helpful. The theory of gene- and cell-based therapies has been discussed for a number of years. However, in practice these approaches are still very much in their infancy. The strategies are related and in some cases, there is distinct overlap in the technologies. As these approaches are still relatively new ones, the emphasis of this book, and of others in the area, is the development of the technology *in vitro* and pre-clinical studies.

This book, now in its third edition, attempts to present the latest developments in the field. The first edition was published in 2000 and I'm sure, with the speed at which progress is being made, that it will not be too long before someone is reviewing edition number 4! Although there has been much more progress with gene-based strategies, it is disappointing that so little of the text is devoted to cell-based approaches – so little, I would say, that it is difficult to justify its mention in the book title! Indeed, I have yet to come across a single book that adequately covers both of these approaches. One chapter describes the use of embryonic stem cells in regenerative medicine and tissue engineering, but this does not do justice to the vast potential of such an approach. The book also misses the opportunity to highlight the great progress made in the area of the treatment of cardiac, kidney, pancreas and skin pathology. If you are looking for a comprehensive text on cell-based strategies, this is probably not the book for you.

Having said that, all of the major gene-based approaches are covered in the book, by authors who are experts in their field. The book is comprehensive and easy to read – so much so that I found it hard to put down, despite its weight! Readers of *Microbiology Today* are most likely to be interested in the first section of the book which describes the different viral-based delivery systems. A large proportion of this section is devoted to viruses, not



surprising considering the efficiency with which viruses transfer genes between cells. It is a little surprising, however, that there is little mention of the use of viruses to deliver shRNAs for down-regulating the expression of pathology-associated genes or indeed vaccines (both prophylactic and therapeutic ones). Moreover, considering the level of detail on technical issues such as vector design and production, perhaps areas such as safety and intellectual property could have been described in greater detail.

A collection of colour plates, corresponding to some of the black and white figures, is included in one section of the book, between two of the chapters. It is a shame that these colour figures could not have appeared in the appropriate chapter, to save flicking between book sections. As expected, the references at the end of each chapter point the reader to further sources of information.

The book is a very comprehensive reference text, suited both to students and experienced researchers. The price, however, is definitely going to restrict its purchase to institutions. Despite my concerns regarding the coverage of cell-based approaches, I would recommend this book to all those interesting in gene therapy.

***Christopher Ring**, Middlesex*

Manual of Diagnostic Tests and Vaccines for Terrestrial Animals (mammals, birds and bees), 6th edn, Vols 1 and 2

By B. Vallat
Published by Office International des Epizooties (OIE) (2008)
€140.00 pp. 1,343
ISBN 9-29044-718-4

In recent years the public awareness of animal diseases has been heightened by outbreaks of foot-and-mouth disease, bluetongue virus, BSE and the potential for pandemics in humans arising from avian or porcine influenza strains. However, it is unlikely that the public, and for that case many microbiologists, are aware that there is a well-developed and controlled set of requirements and regulations in place to prevent animal diseases from crossing international borders. The OIE, the World Organization for Animal Health, is responsible for this set of activities and this manual contains all the tests that it prescribes and more that it recommends.

The main stated aim of this manual is to facilitate international trade in animals and animal products and to contribute to the improvement of animal health services worldwide. These two volumes provide not only an authoritative compendium of the diagnostic tests that are internationally recognized, but also the latest developments in diagnostic techniques and vaccines for the livestock diseases that are a constraint on international trade. It does this by describing clearly what needs to be done and how to do it. Very rarely do you encounter a book where the stated aims are so evidently achieved. This is such a book.

The manual has been updated from the fifth edition (2004) with the addition of chapters on camel pox, *Aethina tumida* (small hive beetle infestation), turkey rhinopneumonitis and *Mycoplasma synoviae*, and new diagnostic procedures such as real-time PCR. One of the issues of being the sixth edition is that the format and a large portion of the content have been road-tested previously and the challenge is to make the latest edition as current as is possible. The Editors have ensured that the manual has been brought bang up to date and, for example, the chapter on leptospiral infections has been revised to include 20 more references detailing new molecular techniques applied to these bacterial pathogens.

I found this an easy manual to read which I imagine reflects the tight editorial control which has ensured consistent layout and formatting of each chapter. It is also helped by the fact that this manual is a companion text to the OIE *Terrestrial Animal Health Code* which details the health measures to be used by the veterinary authorities of importing and exporting countries to avoid the transfer of infectious diseases, in ways which do not provide artificially barriers to trade. As you might expect the two books match up very closely.

The introductory chapters cover general information relating to diagnostic tests and vaccines and should be compulsory reading for every student engaged in microbiological research as they give very clear guidance on the procedures associated with diagnosis, from organizing sampling to recording of results, and also the regulatory requirements for the development and preparation of vaccines. A chapter describing the use of modern molecular biological methods in diagnostics and vaccine development covers all the tests that a scientist needs to understand to follow the manual. The section in this chapter dealing with vaccines gives a good introduction to the various vaccine approaches currently in production, but also includes information on the potential for those in developmental stages such as nucleic acid vaccines.

The major part of the manual is concerned with the individual diseases and is more directed towards the specialist.

While it functions wonderfully as a manual, it also a reference book in which you can very quickly find very recent information on the important diseases affecting the animals on the global farm. That the global farm also has room for bees is an added bonus.

Although it has a primary purpose for those laboratories linked to surveillance and diagnosis because of its comprehensive content, I thoroughly recommend this book for all veterinary teaching faculties and all research laboratories, commercial and academic, concerned about the health of livestock.

***William Donachie**, Moredun Research Institute*

Climate change: impact on the epidemiology and control of animal diseases, Vol. 27, No. 2

By S. de la Rocque, S. Morand & G. Hendrickx
Published by Office International des Epizooties (OIE) (2008)
€55.00 pp. 318
ISBN 9-29044-697-2

This publication usefully brings together the sciences of climatology and infectious diseases, but with the main focus on the latter. The main messages, repeated in many of the chapters, are: that climate change is only one of a number of factors which are likely to affect future disease distribution; and the importance of assessing which diseases may be a future problem and establishing surveillance capacity for them. The final section of the book highlights the worrying variability in surveillance capacity of different countries and continents. Diseases caused by a wide range of micro-organisms are covered, including those of the honey bee, but more focus on diseases which just infect animals was expected. Many of the diseases discussed are zoonoses which could attract a wider audience. However, this publication is a useful source of the thoughts of a range of scientists around the world and provides a source of references for further reading. It makes a convincing case that priority should be given to preparing for changes in the epidemiology of animal diseases, whether those changes are due to climate change or not.

***Janice Bridger**, Berkshire*

Autism's False Prophets: Bad Science, Risky Medicine & The Search For A Cure

By P.A. Offit
Published by John Wiley & Sons Ltd (2008)
£17.95 pp. 298
ISBN 0-23114-636-4

This book reaches far beyond microbiology. It reviews aspects of the distressing story of autistic children, their emotionally and financially exhausted, totally desperate parents, and of interest groups trying to pinpoint an external cause of autism and to pursue class-action lawsuits. Autism is a severe impairment of social interaction abilities of young children who develop aggressive behaviour or '*walk as if in a shadow, and live in a world of their own where they cannot be reached*'. Much work has gone into researching the cause(s) of this devastating condition. In the late 1990s, some doctors in the UK came up with the theory that the measles mumps rubella (MMR) vaccine may be one of the causes of autism, and vigorous publication of this claim led to a significant decrease in vaccine uptake and to small outbreaks of measles, a vaccine-preventable disease, including a few deaths. It took many large epidemiological studies before the theory was finally repudiated. The discovery of the vested interests of the researchers involved did not help their case. But the damage was done. Parents, mistrusting vaccinations, were looking for other possible causes, and thimerosal, a mercury-containing disinfectant added to many vaccines, was accused as another possible culprit. The discussions became increasingly heated and political, and again years passed before the results of large epidemiological studies abrogated this hypothesis. The observation that within a period of 6 years when thimerosal had been removed from vaccines in several countries, the numbers of local cases of autism did not drop, but rather increased, was the final counterargument. The book contains an impressive chapter in which the proceedings of a court case on MMR vaccine as a possible cause of autism with all its ramifications (personal tragedy, heated accusations and replies, cross-examination of witnesses, etc.) are described. Furthermore, many therapies of autism were found to be '*diverse, expensive, and unproven*'. Doctors using them were accused of working up parents who were '*hooked on hope*'.

The book discusses interrelationships between science and the media, science and society and the difficulties of achieving a public understanding of science in matters which are loaded with emotions. Whilst the stories of claims of and objections to theories of the cause of autism and the description of various cures offered to treat autism make fascinating reading, I felt that the evaluation of credible causes of autism (chapter 11) was not comprehensive.

Paul Offit is very perceptive on issues at the interface of medicine, science, public health and the law. He is determined to mediate mutual understanding among representatives of different perspectives by describing the backgrounds and basis on which people operate and act. Dr Offit's great abilities in this respect were already obvious in his engaging books *The Cutter Incident* and *Vaccinated*.

It is highly desirable that this book gains a wide readership among health care workers of all specialties, scientists in academia, government and industry, public health opinion leaders, lawyers, interested students of the biomedical sciences, and, last but not least, members of the wider public.

***Ulrich Desselberger**, Cambridge*

Reviews on the web

Reviews of the following books are available on the website at www.sgm.ac.uk/pubs/micro_today/reviews.cfm

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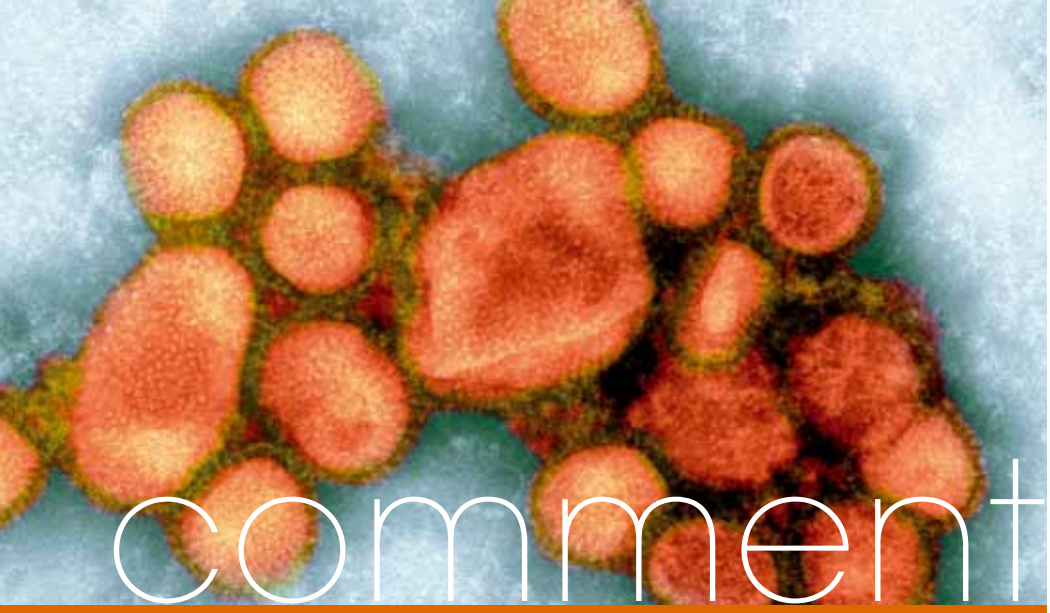

comment

Sw-HINI-ng on about 'flu again

Hot on the heels of bird 'flu comes a novel influenza A H1N1 strain to cause fears of a worldwide pandemic. Influenza virologist **Wendy Barclay** ponders on how effectively we are prepared to cope if disaster strikes..

In the spring of 2009 we have once again had a pertinent reminder of the aleatoric behaviour of influenza virus evolution. As if pulling the handle of the reassortment slot machine, Nature has rung up a viral genetic constellation that is an octagenic 'jackpot' in terms of posing the latest pandemic threat to man. Swine-origin influenza H1N1 has crossed a species barrier in Mexico from pigs to people and then spread beyond, stealing across the border to the US and hitching on air travel routes to new continents. Causing a mild upper respiratory illness with case fatality of around 0.1%, why should we be worried about swine 'flu? At least this is not the dreaded H5N1 bird 'flu pandemic that influenza virologists have been wittering on about for a decade!

If the events of the recent months reinforce any one thing about influenza, that is its unpredictability. If the virus survives the unfavourable summer climate, and our Lilliputian attempts to restrain its circulation by administering the antiviral drug Tamiflu to cases and their contacts, it may infect many more of us during the winter months. Moreover, every additional human infection increases the potential for the virus to gain mutations that enhance its replicative capacity in human cells. This might be achieved by the accumulation of point mutations in swH1N1 viral genes, or by acquiring whole gene segments from a human influenza virus by reassortment with a circulating seasonal strain. The nature of such swH1N1 derivatives is unknown at present, but is of significant consequence to those involved in planning appropriate public health measures. Does this virus, like currently circulating strains of human H1N1, have the capacity to tolerate mutations that render it resistant to Tamiflu? If the virus acquires a set of polymerase genes by reassorting with seasonal human H3N2 or H1N1 subtype influenzas, will its replication and transmissibility in humans increase? Such questions could be addressed in advance by employing the technique of reverse genetics to create these viral possibilities inside high containment laboratories so we can study their behaviour before nature throws them at us. This type of approach was employed last year by workers at the CDC in Atlanta USA to assess whether the highly pathogenic avian influenza virus H5N1 had the potential to recombine with a circulating human strain of virus. The same technique can also allow the rapid generation of a tailor-made swine 'flu vaccine and the development of important diagnostic reagents that will help to differentiate between infections with swine 'flu and other human circulating strains in the coming months.

The swine 'flu zoonosis has served as a timely dress rehearsal of pandemic plans under a situation that could not have been kinder. Has the intense research focus on H5N1 avian influenza virus been worth anything in our ability to deal with this new event? Ten years ago we would not be considering a 'pre-pandemic' vaccine because we did not believe that there would be adequate cross protection with related but non-identical strains. Now we know that by using different formulations for influenza immunization such as incorporating new adjuvants, these issues can be overcome. Nonetheless, vaccine manufacturers still lack capacity to deal with the increased demand that results from a pandemic threat, and difficult decisions about interrupting seasonal vaccine manufacture and prioritizing target groups for the monovalent (pre-) pandemic vaccines will be necessary. The realization that we still cannot supply sufficient vaccine to immunize the world's population may prompt a re-look at live-attenuated flu vaccines as a 21st century strategy to deal with the inevitable but unpredictable influenza pandemics of the future.

▲ Coloured TEM of H1N1 virus particles from the April 2009 outbreak. *AMI Images / Science Photo Library*

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Further reading

Chen, L.M., Davis, C.T., Zhou, H., Cox, N.J. & Donis, R.O. (2008). Genetic compatibility and virulence of reassortants derived from contemporary avian H5N1 and human H3N2 influenza A viruses. *PLoS Pathog* 4(5), e1000072. doi:10.1371/journal.ppat.1000072

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