



edinburgh  
international  
science  
festival

For the 6th year running SGM took part in this well established science promotion event, where over 250 different activities were attended by tens of thousands of people. SGM contributed hands-on workshops for children and a public symposium.

## Edinburgh International Science Festival 1999

Jane Westwell

### ■ Antibiotics: Use or Abuse?

An audience of about 200 people (ranging from students to senior citizens) gathered in the lecture theatre of the Royal Museum of Scotland to learn about the problems posed by antibiotic resistance and how we can take steps to overcome them. Dr Bernard Dixon, SGM member and well known science writer, chaired the symposium.

Professor Richard Wise, President of the British Society for Antimicrobial Chemotherapy, began by warning against making dangerous assumptions such as that of the US Surgeon General 30 years ago who predicted that infection would become a thing of the past. In practice, antibiotic resistance has been a growing problem and subject to a great deal of attention in recent years. Prof. Wise was an adviser to the House of Lords Select Committee on Science and Technology during their 9 month inquiry into antibiotic resistance which concluded that the problem posed a major threat to human health. Since the report's publication many organizations have produced documents in response.

He then went on to summarize the overall use of antibiotics which is spread evenly between agriculture and humans. In humans 80% of use takes place in the community where about 50% is considered to be clinically unnecessary. Figures from the USA suggest that 20% of antibiotic use in agriculture is therapeutic and the remaining 80% is for prophylaxis and growth promotion and in this case 75% of use is questionable. Anti-fungal and anti-viral drug resistance are emerging problems.

Antibiotic resistance is due to the pressure of use and over-prescription must play a part in this. There is also some pressure from the use of the drugs in agriculture. Prof. Wise believes that use of antibiotics for growth promotion should be curtailed and, in fact, the EU has banned the use of four growth promoters. However, measures should be taken on both sides, including enhancement of infection control procedures in establishments such as nursing homes and children's day nurseries. Patients should be educated to accept reduced use of antibiotics and doctors should be regulated more carefully. These measures will only bring about a gradual effect since practices are slow to change. Other suggested actions include improved surveillance of resistance, research into the mechanism of gene transfer and a limit on the use of disinfectant-impregnated household products since disinfectant resistance is a growing problem. Prof. Wise concluded that there is a difficult task ahead and it will take time to control drug resistance.

Dr David Livermore from the PHLS Central Public Health Laboratory reflected that, compared to other European countries, the UK uses relatively few antibiotics and in 1997 the average Briton had only one course of antibiotics. He indicated that of the antibiotics prescribed in the community about 50% are for respiratory tract infections, 25% for urinary tract infections, the remainder being used against a variety of other problems. Use of antibiotics favours resistant bacteria and introduction of new drugs leads to acquisition of resistance. Where antibiotics are used heavily, resistance is higher and sometimes resistant organisms are selected in individual patients. This perfectly illustrates Darwin's theory of evolution. Resistance can spread from one individual to another and from species to species.

Dr Livermore outlined the ways that resistance spreads among the bacterial community and commented that individual drug resistance is less of a problem than multi-drug resistance. Some bacteria that are resistant to penicillin tend to be resistant to other drugs; this reduces the options for

treatment. In addition, cross-infection of multi-drug-resistant bacteria between patients can be a big problem. Changing lifestyles, such as childcare practices and increased foreign travel, have contributed to the spread of resistance. Resistant bacteria can be selected in animals and passed to humans in a minority of cases. Dr Livermore concluded that we cannot stop evolution or the use of antibiotics but careful use will reduce the problem. The pharmaceutical industry is working hard to develop new drugs but this is a slow process.

Dr Kornelia Smalla from the Federal Biological Research Centre, Braunschweig, Germany, discussed antibiotics in the environment. She pointed out that environmental fungi and bacteria themselves produce antibiotics, possibly as a means of communication. However, these antibiotics are produced in tiny quantities and are different from those introduced into the environment by human activities. Genes conferring antibiotic resistance are disseminated by different practices, for example growth promotion antibiotics enter soil and surface water via animal manure. Rhizosphere and soil bacteria contain resistance genes which can be transferred to humans via the food chain. Transfer of antibiotic resistance (to drugs not used in man) from animals to humans is rising every year. Dr Smalla concluded that antibiotic use has altered the composition of microbial communities due to man-made selective pressure. Further studies are needed to find reservoirs of resistance and the development of new technologies will allow us to follow the evolution of antibiotic-resistant genes.

Neil Cutler from the National Farmers' Union explained that farmers need to use antibiotics to treat and prevent disease. Farmed animals generally exist in large populations and are susceptible to infections. Reasons why these should be treated include animal welfare, food safety, food quality and prevention of economic losses. All antibiotics used to treat disease are prescription medicines and growth promotion antibiotics are available only from qualified merchants. Mr Cutler gave an overview of the use of therapeutic, prophylactic and growth promotion antibiotics in sheep, pig, beef, dairy and chicken farming. He pointed out that growth promoters

### British Association Annual Festival of Science

University of Leeds, 13-17 September 1999

#### Prospering Through Science

In 1999 nearly one hundred sessions throughout the week will focus on different strands of the overall theme. The strands are:

- creating economic prosperity
- promoting health and quality of life
- building scientific awareness and understanding
- working towards a sustainable environment
- enriching culture
- learning from the past
- exploring new frontiers

The programme is delivered through talks and discussions with leading scientists, a fun-packed hands-on programme for families and young people, exhibitions showing the application of science and technology in industry and the world around us, a series of lunchtime and evening public lectures, visits and field trips to local areas of scientific interest and debates on a broad range of ethical and social issues.

Residential accommodation is available. Further information about the meeting may be found on the Web ([www.britassoc.org.uk](http://www.britassoc.org.uk)) or by contacting the British Association Major Events Department, 23 Savile Row, London W1X 2NB (Tel. 0171 973 3075; Fax 0171 973 3051).



## SGM Workshops

Jane Westwell from the External Relations Office joined forces with the National Centre for Biotechnology Education (NCBE) during the Edinburgh International Science Festival in April. Several hands-on workshops, catering for all age groups, brought microbiology and biotechnology to children and their parents.

LEFT: Participants in the SGM workshops at the Edinburgh International Science Festival earlier this year.



Primary school children enjoyed getting into a sticky mess making edible sweet models of microbes. The children discovered that almost every aspect of their lives is affected by these tiny organisms and learned about the diversity of shape and size in the microbial world. They went on to make models, which included features such as cell walls, DNA and cytoplasm. Modelling materials included chocolate, fondant icing and other delicious ingredients. At the end of the workshop children (and parents) left clutching their 'microbes' in boxes that they had decorated themselves. However, several creations were gobbled up before the chocolate had set!

Other young children had fun with fungi and spent an interesting hour having dough races and setting up oyster cap mushroom cultures on toilet rolls. All participants left the workshop with a mushroom culture and clear instructions on its care ringing in their ears!

Twenty-six individuals spent a morning trying out the techniques of genetic fingerprinting to solve a murder mystery. They digested DNA samples from 'suspects', separated the fragments by electrophoresis and made them visible with a blue dye to work out 'whodunit'.

Another group of visitors became DNA detectives and joined 'Superintendent' John Schollar in the laboratory. Using techniques similar to the genetic fingerprinting workshop they traced the inheritance of the mystery ESF gene through three generations of a fictitious family.

The Edinburgh Science Festival workshops are part of an ongoing programme of events that the SGM commissions from the NCBE. These events are always expertly prepared and delivered and never fail to generate a great deal of enthusiasm among participants. Thanks are also due to SGM member Dr Bob Rastall from the University of Reading who gave up some of his Easter break to take part in the festival workshops.

are only allowed in chicken and pork production and in growing beef cattle. In all three cases a prophylactic effect is observed. If farmers reduce antibiotic use then other factors in disease control should be considered. There will be a need to control further the animals' environment but this would result in a less natural system which would be perceived poorly by the public. Vaccination, reduction of stress and use of probiotics could also play a part in disease control. The organization RUMA (Responsible Use of Medicines in Agriculture) is looking at how to manage antibiotic use. However, on welfare grounds alone, we must retain the use of antibiotics since animals will always suffer from diseases.

The last speaker, Professor Peter Hawkey (University of Leeds), discussed the lessons to be learned for patients and doctors. He commented that antibiotic resistance is as old as antibiotics themselves. The first clinical use of penicillin was reported in the same month as the first case of resistance in staphylococci. The main factors that drive antibiotic resistance are use, rate of development, and movement of resistance and the mobility and prevalence of disease-causing bacteria (brought about by increased foreign travel). He pointed out that sometimes it is better to use older drugs than driving resistance by the use of newer products.

Prof. Hawkey concluded with a reiteration of points made by previous speakers. Bacteria are surprisingly adaptable and resistance cannot be predicted. To combat resistance, immunization and infection control programmes should be improved and GPs should be equipped with better diagnostic tools to identify patients with a real need for antibiotic therapy. The search should continue for new antibiotics and we should bear in mind that both individual bacteria and their genes can spread.

After the talks, the speakers were joined by Dr Robin Bywater from FEDESA and Dr William Strohl from Merck and Co, USA. The audience responded with great enthusiasm and a lively discussion took place. Questions were diverse, including bacteriophage treatments, unregulated drug sales and the effect of stringent regulations on drug development. A retired GP from the audience emphasized the need for improved hygiene practices by health care workers and in the home; at 75 years old he was an excellent example to follow!

● Jane Westwell, SGM External Relations Office

## Going Public?

### Advice, information & funding for SGM members who wish to explain microbiology to the public

- Will your employer be putting on Millennium open days, SET2000 events and lectures where you will be expected to explain your work?
- Do you struggle to complete forms sent to you by research councils asking how you disseminate your results to the 'wider public'?
- Do you get invited to speak to schools or adult groups about the research that you do?
- Are you not quite sure what is safe or appropriate to present to schools?
- Would you like some help from the SGM?

This summer SGM education staff will be preparing factsheets to help you devise effective means to communicate your science to the public safely. If you would like to get this information when it becomes available send a brief e-mail entitled 'Public info' to Darrel Burdass at the SGM (d.burdass@socgenmicrobiol.org.uk).

If you are already accomplished at 'Going Public' then don't forget that the SGM now funds grants of up to £1,000 for Public Understanding of Microbiology activities. See p. 81 of the May 1999 issue of *Microbiology Today* for details. If you'd like to offer an article on your activities for the 'Going Public' section of *Microbiology Today* contact Janet Hurst (j.hurst@socgenmicrobiol.org.uk).