

The 21st SEM National Congress (Seville, 17–20 September, 2007)

Almost 700 scientists met in the historic city of Seville, September 17–20, 2007, to attend the 21st National Congress of the Spanish Society for Microbiology (SEM). The attendees—from Spain and other European and American countries—had an opportunity to share the newest discoveries in their fields of research and to learn of the progress being made in numerous areas of microbiology through 64 symposia lectures, 1 workshop, 50 oral communications, and more than 400 posters. The meeting was brilliantly organized by Antonio Ventosa (University of Seville) and his team (Fig. 1).

Anthony P. Pugsley, from the Institut Pasteur (Paris, France), gave the inaugural lecture, “Putting things in place: protein traffic in bacteria”. He reviewed the knowledge amassed over the past 25 years regarding the translocation systems that actively move proteins across the outer membrane of gram-negative bacteria, and focused his talk on his own work with type II secretion systems. The systems and mechanisms described by Pugsley provided the background for a series of talks on intercellular communication that were held during the Congress and which covered contact-dependent growth inhibition in *Escherichia coli*, sporulation and “cannibalism” in *Bacillus subtilis*, and quorum sensing between *Pseudomonas aeruginosa* and *Staphylococcus aureus*. These talks emphasized the importance of the signaling molecules (metabolites, toxins, and proteins) that are transferred between different bacterial cells.

Most of the research reported at the Congress fit into one of three mainstream areas: health (especially, infectious diseases), environment (microbial ecology, diversity, adaptation

to extreme habitats, and evolution), and biotechnology (industrial uses of microorganisms, and the development of new technologies in food preparation, safety, and microbial source tracking). A prevailing idea in all symposia was the major roles that genomics and molecular techniques have played in modern microbiology.

Microbiology has come a long way over the past five decades, with enormous advances in basic and applied fields of research. The 1990s witnessed the emergence of the genomics era, with the publication of the complete genome of *Haemophilus influenzae* in 1995, the first organism sequenced. Today, more than 600 bacterial and archaeal genomes have been completely sequenced and other 500 are in advanced stages of the process. The application of computer science, together with innovative experimental methods and the new molecular approaches, to the study of these genomes has led to considerable progress in our understanding of the physiology of microorganisms. This dive into the future, however, is best appreciated by first examining the past.

Fifty years of *The Microbial World*. The 2007 SEM National Congress commemorated the 50th anniversary of the publication of *The Microbial World*. This seminal

textbook, by Roger Y. Stanier, Michael Doudoroff, and Edward A. Adelberg (Prentice-Hall, 1957), is regarded as a developmental milestone in microbiology. *The Microbial World* laid the foundations for the field’s current “Third Golden Age,” in which microbial ecology and the use of genetic and proteomic tools to study microbes have led to renewed appreciation of the vital role played by microorganisms in supporting and maintaining life on Earth. Ricardo Guerrero, current SEM president, with the collaboration of the American Society for Microbiology (ASM) and the Federation of European Microbiological Societies (FEMS), coordinated a Special Symposium entitled “Influence of *The*



Fig. 1. Poster announcing the 21st National Congress of the Spanish Society for Microbiology.

Microbial World in microbiology, 50 years later” to celebrate the book’s publication. The symposium was sponsored by Fundación Ramón Areces (Madrid), with the collaboration of Editorial Reverté (Barcelona) and paid homage to former ASM presidents Frederick C. Neidhart (1981-1982), Moselio Schaechter (1985-1986), and John L. Ingraham (1992-1993) for their dedication to the teaching of microbiology throughout their professional careers and for the work they have carried out on the physiology and genetics of bacteria over the last five decades. The results of this work, which have been essential in establishing our current knowledge of prokaryotes, form the basis of their most recent book, *Microbe* (ASM Press, 2006). (See Guerrero & Berlanga, *Int Microbiol* 10:157-168, DOI: 10.2436/20.1501.01.23.)

In their talks, Ingraham, Neidhardt and Schaechter—the self-proclaimed “Three Musketeers”—emphasized the repercussions of *The Microbial World*, not only for microbiology as a field but for their professional lives as well. Ingraham reminisced about the successive editions of *The Microbial World* as well as his experience as one of the coauthors in the book’s 4th and 5th editions. Neidhardt acknowledged the book’s role in showing him and other microbiologists how their studies in bacterial growth fitted into the larger scheme of cell growth

in the biological world (see Schaechter et al. *Int. Microbiol* 10: 153-156, DOI: 10.2436/20.1501.01.22). This knowledge was elaborated upon in two other highly respected books, *Growth of the Bacterial Cell* and *Physiology of the Microbial Cell*. Finally, Schaechter entertained the audience with excerpts from his blog, “Small Things Considered,” on unusual aspects of microbial morphology, fungi, symbioses, and parasitic manipulations. The Symposium paid homage to the three American authors already mentioned and to the three translators of the 2nd edition of *The Microbial World* into Spanish: Julio R. Villanueva and Isabel García-Acha, from the University of Salamanca, and Manuel Losada, from the University of Seville, all of them present in the meeting (Fig. 2).

During the second part of the Symposium, Villanueva explained his work in translating the book (together with his wife, García-Acha) and the influence of the Spanish translation of *The Microbial World* on developing the field of microbiology in Spain and Latin America, and Losada recalled his relationship with R.Y. Stanier and C.B. van Niel, as a postdoc in Berkeley. Finally, Eliora Ron and Milton da Costa, former and current FEMS presidents, respectively, talked about the significance of *The Microbial World* in their own teaching and research careers and the influence the book has had in Europe. ASM past-president Diane Griffin closed this Symposium by reviewing developments in virology over the last fifty years, with an emphasis on the control of measles in developing countries.

The struggle against infectious diseases. Two symposia were dedicated to what are considered “neglected”

diseases of developing countries, especially, malaria, tuberculosis, HIV/AIDS, and pneumococcal infections. These diseases have exacted a particularly serious toll in Sub-Saharan Africa, where more than 70% of deaths, mainly children under the age of five and women, are attributable to infectious diseases (in contrast to 23% in the rest of the world). The inability to treat most of them is highly related to poverty but also to a

lack of material resources and the means to distribute them. For example, diarrhea—a condition that can be easily prevented by simple therapeutic strategies—continues to be one of the most important causes of child mortality worldwide. The main obstacle to fighting diarrhea lies in the fact that it can be viral, bacterial, or parasitic in origin, and the misuse of antimicrobials has led to high levels of resistance.

Dengue fever is another disease of major epidemiologic concern. Unlike malaria, this viral disease can occur in urban areas of developed tropical countries, and its distribution is continuously expanding. Dengue fever is endemic in more than 100 countries, and epidemics of hemorrhagic dengue fever have been reported in over 60 countries. In addition,

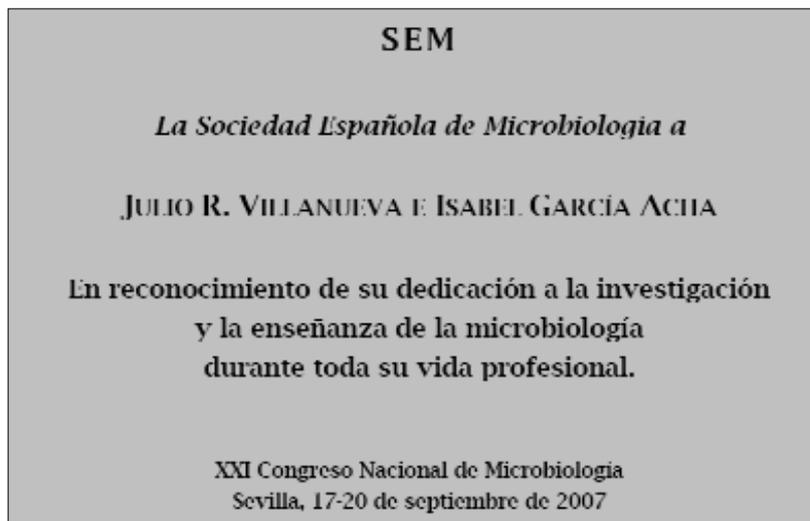


Fig. 2. Legend on the five silver plaques that the Spanish Society for Microbiology offered to Moselio Schaechter, John L. Ingraham, Frederick Neidhardt, Julio R. Villanueva–Isabel García Acha, and Manuel Losada, “in acknowledgement of [their] dedication to the research and teaching in microbiology throughout [their] professional life”.

current migration trends have changed the distribution and the way in which many infectious diseases spread. The continuous movement of travelers, due to emigration, business-related travel, or tourism, has accelerated the dispersal of infectious agents to remote places, sometimes thousands of kilometers away from where the infection originated. In this scenario, molecular epidemiology will play a key role in designing strategies for intervention, through the development of rapid genotyping and the integration of universal genotyping into conventional epidemiological research.

Life at the extremes. The discovery of bacteria in extreme habitats such as the deep sea and hypersaline and/or alkaline lakes has resulted in an extraordinary expansion of our knowledge on the limits of life. This, in turn, has revolutionized studies of microbial phylogeny and metabolism and has led to numerous biotechnological and industrial applications, such as bioplastics, enzymes, polysaccharides, and compatible solutes. New insights into the mechanisms that extremophiles use to survive under extreme conditions were discussed in several talks. Advances in molecular techniques, including innovations in cloning and PCR, have allowed microbiologists to study the genetics and physiology of organisms directly in nature, overcoming the problems posed by bacteria that could not be cultured in the laboratory. The results of these studies suggest that extremophiles such as halophiles and hyperhalophiles have a much wider ecological distribution than was previously recognized.

Working together, researchers from different disciplines have shown that, in extremely acidic habitats, especially those resulting from the mining of metals, the low pHs—usually less than 3—are due to microbial chemoautotrophic activity rather than to geophysical processes, and that such habitats sustain a great diversity of microorganisms in the different niches created by these ecosystems. Through metagenomic studies, which concentrate on those parts of the biosphere subject to extreme physicochemical conditions where unique microorganisms can be found, new microbial activities have been detected.

Between ecology and biotechnology. Another symposium discussed how microbial pesticides are an alternative or complement to synthetic chemical products and have provided a new approach to pest management. The main advantage of this new technology lies in its more ecological approach and less toxic profile, although the effectiveness of microbial pesticides may be lower. Thus far, the use of control methods based on microorganisms is limited to a few cases due to the difficulty in selecting effective agents, the slow legal registration of products, and the great variabil-

ity in the results because of the many factors that can influence outcome. For example, the activity of live organisms depends on their viability as well as on complex biotic and abiotic interactions and changing environmental conditions, including weather, host, and resident microbiota. Thus, it is necessary to distinguish between those biological control methods whose value already has been demonstrated and those whose potential has yet to be tested. Studies also suggest that a direct search should be made based on the capacity for biocontrol activity (rather than the selection of biological agents from different habitats), and on the screening and selection of the antagonist microorganisms that could control the pathogen.

In other cases, important data on the behavior of microorganisms in environments such as food have led to innovations in the field of food microbiology. An example of this is the Enochip, an electronic nanochip consisting of a series of specific probes that was developed to detect and identify beneficial or harmful microorganisms in alcoholic beverages. Fast molecular techniques, such as real-time quantitative PCR, allow for example, identification of the strain of lactic bacteria used in the elaboration of cured sausages, which facilitates food standardization and offers a bioprotective approach to certify the alimentary safety of many foods. Similarly, food-borne pathogens, such as the two main food-borne viruses (norovirus and hepatitis A virus), can be detected through RT-PCR, which permits identification of the microorganism in question as well as the quantification of the number of genomic copies present. This approach can be used to identify infected lots of food.

Bacteria are known to frequently be the culprits in the biodeterioration of the historic heritage. Recently, however, attention has been drawn towards biomaterials and how, through biotechnology, the metabolic activities of bacteria can be taken advantage of in the biocleaning of works of art or in the regeneration of ornamental stone.

Finally, a more “practical” symposium dealt with how microbiologists can create their own businesses. Microbiologists need to obtain, protect, and commercialize their research results that have practical applications in the agricultural, veterinary, or industrial sectors. The many ways in which a company can be set up and the types of financing available for this type of endeavor were discussed from the public and private points of view.

Awards. The SEM was founded in 1946 to promote scientific developments in microbiology. It is one of the oldest and most active Spanish learned societies. The SEM is interdisciplinary, with professionals organized in specialized Groups according to their lines of research: biodeterioration and

biodegradation; filamentous fungi and yeasts; clinical microbiology; industrial microbiology; food microbiology; molecular microbiology; microbiology of aquatic systems; plant microbiology; protistology; taxonomy, phylogeny and biodiversity; and environmental microbiology. During the closing ceremony of the Seville meeting, each of these Groups gave an award to what they considered was the best communication delivered at the meeting. The SEM also presented awards (1st, 2nd, and 3rd prizes) to the best communications during the Congress as a whole. Finally, the 3rd "Federico Uruburu Prize" for photography in microbiology was also awarded.

Luis Ángel Fernández (CNB-CSIC, Madrid) was the recipient of the 12th "Jaime Ferran Award", which is given to young researchers (under 40) for excellence in their scientific careers in microbiology. In the Congress' closing lecture, Fernández explained how the capacity to express antibodies in *E. coli* has opened up a great number of biotechnological possibilities. Aspects such as improvement of the binding properties, stability, and immunogenicity of antibodies, their conjugation with toxins, and the simultaneous recognition by antibodies of several antigens or even non-immunogenic ones have generated new therapeutic possibilities regarding the use of antibodies in treating infectious and autoimmune diseases as well as cancer. During the past few years, Fernández's laboratory has worked to develop systems that allow the expression of immunoglobulin fragments by different parts of the *E. coli* cell, such as the cytoplasm or the bacterial surface, which can then be secreted or even injected by the bacterium into human cells. Antibody-producing strains of *E. coli* could be used as vectors for the in vivo administration of the respective antibody. A better understanding of the protein secretion systems of *E. coli* will expedite their use as antibody factories.

Final remarks. Overall, this 21st SEM National Congress was a resounding success, thanks to its impeccable organization, the high quality of the topics covered during the symposia, and the communications presented. Many of the social events, which took advantage of the beautiful city of the meeting, were coordinated such that all participants were able to enjoy some of Seville's finest architectural treasures: a reception was held at the former tobacco factory—now the headquarters of the University of Seville—and there was a guided night-time tour of the Alcázar, the city's world-renowned Moorish-style royal palace. As Antonio Ventosa, the president of the Congress, stated during the closing dinner, these meetings are an occasion not only to exchange information, but also to revive or establish ties of friendship with former and newly discovered colleagues. Most importantly, they are a place for young and not so young scientists to share the results of the hard work they have carried out during the previous two years and to learn about the progress made in other areas, particularly as the field of microbiology becomes ever more specialized. The enthusiastic participation in the different sessions offered proof of the high level that research in microbiology has reached in Spain. Keep up the good work, and let's meet in 2009 in the 22nd SEM National Congress, in Almería!

Nicole Skinner

INTERNATIONAL MICROBIOLOGY
n Skinner@microbios.org
