

Highlights of Latin American microbiology: the 19th ALAM Congress

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In the spectacular world heritage city of Quito, Ecuador, in a valley of towering Andean volcanoes, the 19th ALAM Congress (15–18 October, 2008) brought together around 500 microbiologists from 18 countries, including 11 from Latin America (Argentina, Brazil, Colombia, Costa Rica, Cuba, Chile, Ecuador, Mexico, Peru, Uruguay, Venezuela, Canada, USA, Spain, Belgium, UK, France and Poland) [www.microbiologiaecuador.com]. The meeting was held in conjunction with the 6th Ecuadorian Congress of Microbiology. The program covered a well balanced combination of scientific themes related to clinical, veterinary, environmental and industrial microbiology. The meeting was organized by the ALAM (Latin American Association for Microbiology) [Int. Microbiol. 11:221-225 (2008)], and the Ecuadorian Society for Microbiology, with the collaboration of the Spanish Society for Microbiology. María Fernanda Espinoza, president of ALAM and of the Ecuadorian Society for Microbiology, chaired this meeting.

The participants attended an intensive four-day scientific program combined with evening social events in the beautiful, well preserved historic center of Quito. In this part of Quito, at the end of the eighteenth century, the Ecuadorian physician and hygienist Eugenio Espejo pioneered preventive measures to curb the spread of microbial diseases such as smallpox [see

backcovers of Int. Microbiol. 8(3,4), in 2005]. He also promoted public hygiene and sanitary conditions. As a pioneer of microbiology, Espejo stated as early as 1785 that a variety of “small living atoms” (*atomillos vivientes*) are the agents of the diverse epidemic infections and that these “mobile corpuscles” (*corpúsculos movibles*) must be studied to further our understanding of infections.

Emerging and re-emerging diseases. In recent years the risks of exposure to emerging pathogens have increased due to climate change, urbanization, globalization, increasing international trade and travel, lifestyle changes, and closer interaction with animals.

Tuberculosis (TB) is one of the most important re-emerging diseases, with a tragically high mortality of nearly 2 million deaths each year. In some areas of sub-Saharan Africa, TB is now the most frequently reported cause of adult deaths (WHO). Detection

and treatment of infectious cases is crucial, due to the absence of an effective vaccine. New methods for diagnosing TB include rapid point-of-care tests and the detection of circulating biomarkers and antigens (R. McNerney, UK). Novel diagnostic technologies being investigated are dipsticks to detect circulating biomarkers and antigens, and rapid tests for volatile organic compounds in the headspace of specimens. Cholera is another re-emerging disease in Latin America.



Since the January 1991 outbreak in Peru, cholera has spread to 18 countries. Since 1817, seven pandemics, all caused by the bacterium *Vibrio cholerae* serotype O1, have been reported. Pulse field gel electrophoresis has allowed two pathogenic serotypes to be identified in Argentina (N. Binsztein, Argentina). *V. cholerae* serotype O1 has been detected in aquatic reservoirs in Argentina and, under non-favorable conditions can be found in a viable non-cultivable state with pathogenic potential. Interestingly, it may sometimes be associated with the marine dinoflagellate *Noctiluca scintillans*. Many other pathogens such as *Salmonella*, *Campylobacter*, *Escherichia* and other *Vibrio* species may also be found in a viable non-cultivable state in the environment (F. Andueza, Venezuela). Cultivation-independent molecular biology methods are therefore required for the detection of these pathogens.

Yellow fever remains an important health problem in tropical regions of America and Africa. Epidemic cases of this viral disease have been detected in Paraguay in 2008 for the first time after 30 years (M. Martínez, Paraguay), and thus far ten lives have been claimed. Novel molecular-biology-based methods were used for confirmation of the virus.

HIV infection in humans is pandemic. AIDS has killed more than 25 million people since the virus was first recognized in 1981 by Luc Montagnier, Nobel Prize for Medicine, 2008. In 2007, more than 30 million people were living with HIV (WHO), and more than 2.1 died. In the same year in Latin America and the Caribbean 1.9 million people had HIV infection and around 77,000 people died of AIDS (UNAIDS). The prevalence of HIV infection ranged from 0.1% in Cuba and 0.2% in Bolivia to 2.5% in Guyana and 3% in the Bahamas. Novel aspects of HIV protein synthesis and the search for novel drugs were presented at the conference. It was shown that the protein HuR has a modulating role in the IRES-mediated translational control of HIV-1 (M. López-Lastra, Chile). HuR represses the translation of HIV-1 IRES while it acts as a translational activator for hepatitis C virus IRES. The search for novel inhibitors for the RNase H of the reverse transcriptase of HIV-1 is under investigation using a recombinant variant of RNase H (O. León, Chile).

Leishmaniasis, a disease with skin eruptions caused by the protozoan parasite *Leishmania*, is found from northern Argentina to Texas. Transmitted by the bite of the sand fly (genus *Lutzomyia*), this disease is prevalent in Brazil and in Andean regions of Ecuador and Peru (E. Gómez, Ecuador), where the reservoirs for the parasite are rodents (*Rattus rattus*) and canids (*Canis familiaris*).

Antibiotic resistance. Antimicrobials are essential for the control of human and animal pathogens, but the increasing antibiotic resistance of bacterial pathogens has been

observed world wide. This issue is a very important one and resistance is currently subject to surveillance in many regions of Latin America. A program of the Pan American Health Organization (PAHO) and the National Microbiology Laboratory (NML) of Canada collects surveillance data on the antimicrobial resistance of foodborne pathogens in the Latin American and Caribbean countries (L.K. Ng, Canada). The spread of a genetic material leading to multidrug resistance between different bacterial pathogens has been detected. Increasing antibiotic resistance has been observed in anaerobe pathogens such as bacteroides and species of the genera *Fusobacterium*, *Prevotella*, *Porphyromonas* and *Clostridium* (H. Biannchini, Argentina). Vancomycin-resistant *Enterococcus* spp. associated with nosocomial diseases were detected in hospitals in Paraguay (J. Otellado, Paraguay). In remote communities in the coastal region of Ecuador, horizontal transfer of antibiotic resistance genes in *Escherichia coli* isolates was observed (G. Trueba, Ecuador). These genes were transferred between bacterial strains using integrons and gene cassettes.

Diagnostics. Accreditation and certification of microbiology and clinical laboratories of Latin America is a special program of WHO and PAHO (J.M. Gabastou, France). Chile, Brazil and Argentina are leading the accreditation of laboratories in the region (K. Sáenz, Ecuador). Regulations affecting microbiology laboratories have to be updated in many countries in the region. The role of microbiology laboratories in pharmaceutical companies was also addressed (M. Soubes, Uruguay).

Advances in the diagnosis of the most common infectious diseases in Latin American countries through methods based on molecular biology were presented. Myths of clinical microbiology (J. Zurita, Ecuador) and the advantages and limitations of molecular-biology-based techniques for microbiological diagnosis were discussed (J.C. Hormazabal, Chile). It was shown that the detection of *Helicobacter pylori* in gastric biopsies can be 25% higher with such methods in comparison with histopathology (O. Rodríguez, Ecuador). *Mycobacterium genavense* and *Mycobacterium haemophilum* were detected in patients in Venezuela for the first time (J. de Waard, Venezuela). Randomly amplified polymorphic DNA analysis discriminates the novel species *Mycobacterium colombiense* from *Mycobacterium avium* strains in non-tuberculous patients (C. Soto, Colombia).

PCR methods discriminate diverse diarrheic *E. coli* paratypes in the feces of children in Mexico (T. Estrada-García, Mexico). It was also shown that around 40% of the taco dressings sold on the streets in Mexico City were contaminated with *E. coli*. Multiplex PCR techniques were applied to detect and characterize clinical isolates of entero-

toxigenic *E. coli* (R. Vidal, Chile), a cause of diarrhea accounting for 380,000 deaths annually world wide. National reference laboratories have to play a major role in the diagnosis of infection by pathogens of concern for public health. For example, the NML of Canada supports scientists in rapidly identifying pathogens in such events as nosocomial outbreaks due to a new clone of *Clostridium difficile* or methicillin resistant *Staphylococcus aureus*, potential intentional threats (e.g., *Bacillus anthracis*), or the re-emergence of lymphogranuloma venereum (L.K. Ng, Canada). Finally, novel applications of clinical and in vitro antibiotic susceptibility testing criteria and quality control parameters for analyzing antibiotic-resistant pathogens, were discussed (E. Riera, Paraguay).

For training of microbiologists, a theoretical and practical pre-congress course of molecular biology techniques for the diagnosis of infectious diseases caused by pathogens such as *Mycobacterium* spp., *H. pylori* and *Streptococcus* spp. was taught by O. Rodriguez (Ecuador), A. García (Chile) and J. de Waard (Venezuela).

Veterinary microbiology. Current zoonotic infection diseases in Latin America and their diagnoses were reviewed. Representatives of the main control organizations of Latin American countries participated in the ALAM meeting. Animal pathogens such as *Campylobacter jejuni*, *Toxoplasma gondii*, mycobacteria (*Mycobacterium bovis*), *Brucella* spp., *Listeria* spp., and the parasite *Trichinella spiralis* were detected in diverse American regions. Brucellosis, porcine trichinosis, bovine tuberculosis, and paratuberculosis (Johne's disease) are still important zoonotic public health problems which are underestimated in the region due to the absence of diagnosis and control programs in many countries including Ecuador (F. Proaño, Ecuador; J. Ron, Ecuador). The epidemiology of scrapie-induced animal diseases was also presented (A. Andrade, Ecuador).

Campylobacter jejuni is the second or third causative agent of diarrhea in underdeveloped countries and the main cause of diarrhea in developed regions. *C. jejuni* and related pathogenic species are transmitted to humans by chicken meat, crude milk, water and domestic and farm animals. *C. jejuni* has been detected throughout Latin America, with an isolation frequency in humans ranging from 0.6% in Cuba to 23% in Iquitos, Peru (H. Fernández, Chile; M.B. Cevallos, Ecuador). Related bacteria of the genus *Arcobacter* have also recently been implicated in diarrhea. Shiga toxin-producing *E. coli*, a pathogen also implicated in zoonotic disease, was observed in 69% of feces of healthy pigs in Chile (R. Vidal, Chile). *Toxoplasma gondii* is an important animal and human pathogenic and parasitic protozoan which is transmitted from

its natural host, the cat, to humans. Toxoplasmosis can have serious and even fatal effects on fetuses or immunocompromised humans or cats. Seroprevalence in countries of this region is high, ranging from 30 to 40% (M. Valenzuela, Chile).

Environmental microbiology. The ecology and evolution of microbes are of increasing interest and importance in microbiology. Only a minor fraction of microorganisms are known. The microbial biomass represents half of the planet's biomass and although the microbial biodiversity is an outstanding treasure of Latin America, it remains mainly undiscovered. It is interesting that a growing number of researchers in the region are concentrating in this area. Moselio Schaechter described inspiringly beautiful examples of the close interactions of microbes with humans, animals and plants. Novel approaches and molecular biology-based methods are now allowing microbial ecology and evolution to be studied in what has been called the Third Golden Age of microbiology (M. Schaechter, USA). Diverse methodologies have been used for studying the ecology of soils (R. Dick, USA).

Fertilizers are routinely applied to agricultural soils to improve crop production. Microbial analyses of fertilizers are important for detecting human and plant pathogens (e.g., *E. coli* and *Salmonella* spp.) in order to avoid spreading diseases such as gastroenteritis. The importance of biofertilizers (nitrogen fixing and phosphorous solubilizing bacteria) for agricultural soil quality was also highlighted (M.M. Martínez, Colombia).

Bioremediation of petroleum polluted areas in the Ecuadorian Amazon region were discussed (D. Hidalgo, Ecuador). Bioaugmentation using bacterial consortia and biostimulation were both successfully applied for the decontamination of hydrocarbon-polluted soils. Microbial communities involved in herbicide bioaugmentation in agricultural soils were studied using classical and culture-independent approaches such as fluorescence in situ hybridization, the analysis of terminal restriction fragment length polymorphism (T-RFLP), and the construction of clone libraries (M. Seeger, Chile). Changes of specific bacterial groups were observed after bioaugmentation. Searching for novel microorganisms for biodegradation in cold environments, researchers have isolated psychrotolerant bacterial consortia able to degrade halophenol compounds from lakes in Chilean Patagonia (M. Martínez, Chile).

Biocontrol of plant pathogens by native microorganisms is an attractive alternative to chemical pesticides. For example, fungi of the genus *Trichoderma* control plant pathogens belonging to the genera *Rhizoctonia*, *Pythium* and *Fusarium*

by increasing root growth and N fixation of plants (M.E. Cazar, Ecuador). The search for and selection of viruses for the biological control of the potato moth (*Tecia solanivora*) were also described (J.L. Zedam, Ecuador). Beneficial bacteria for plant growth were screened in diverse soils using T-RFLP (M.S. Benitez, Ecuador).

Biofilms and microbial mats in water are complex biological systems that can be studied using modern molecular biology-based methods (C. Rodríguez, Spain). Structural and functional analysis of the genome of a nonpathogenic *Burkholderia* strain allows the reconstruction of their ability to metabolize aromatic compounds, leading to the design of improved biocatalysts for biodegradation (M. Seeger, Chile).

A symposium devoted to the bacterial culture collections of the Latin American Federation of Culture Collections (FELACC) was coordinated by M. Floccari (Argentina). This symposium included a discussion of the structure and financing of culture collections (V. Rodríguez-Lemoine, Venezuela), an important issue for the region if native and pathogenic microbial strains are to be preserved and quality control standards implemented.

Industrial microbiology. The fossil fuel-based world economy of the 20th century is changing to one based on the biotechnology that uses renewable raw materials, specifically its biomass and genes. Novel microorganisms and enzymes are required for industrial processes and the production of drugs (M. Gutiérrez-Correa, Perú). The use of beneficial bacterial strains as probiotics for the shrimp industry, the main economic activity along the Ecuadorian coast, is one relevant example (R. Cedeño, Ecuador). *Lactobacillus plantarum* is an interesting probiotic used in processing uchuva fruit pulp (O. Montoya, Colombia). Thermostable tannases with biotechnological potential were produced at high levels by an *Aspergillus ochraceus* strain isolated from Brazilian soil (L. Guimarães, Brasil).

Advances in water and food microbiology were discussed. Diverse pathogenic bacteria, viruses and parasites are transmitted in Latin American cities through drinking water and the regulation and control of drinking water must be improved in many Latin American countries in order to protect human health (M.A. Mosso, Spain). Important pathogens such as *H. pylori*, *Mycobacterium* spp., and *Legionella pneumophila* have been detected in drinking water (C. de la Rosa, Spain). In addition, water can contain opportunistic pathogens such as bacterial strains of *Arcobacter*, *Burkholderia*, *Pseudomonas* and *Stenotrophomonas* spp. Therefore, the use of bacteriophages for the control of pathogenic strains in water is of interest (A. López Merino, Mexico).

Latin American microbiology. The 19th ALAM meeting in Quito was a great success and has enhanced coordination and cooperation in microbiology within the region. The ALAM meetings are held every two years. In 2006, the conference was held in Chile, chaired by Michael Seeger, president of the Chilean Society for Microbiology. Held in the southern city of Pucón, the meeting attracted over 600 microbiologists [Int. Microbiol. 9:306-308 (2006)]. The ALAM meetings are important for exchanging and updating scientific information and for promoting scientific cooperation and exchange in microbiology among Latin American countries and between the region and the rest of the world. They are also essential for improving public health and environmental policies and regulations and for supporting scientific journals. Latin America is a complex and diverse region that has been growing and developing in recent decades, in spite of a history of political and economic instability. In this context, ALAM meetings have been important for maintaining and strengthening microbiology, public health, animal care, and agricultural, industrial and environmental development in Latin American countries.

ALAM highlights. During the 19th ALAM meeting, the Spanish Society for Microbiology was welcomed as a full member of the ALAM Assembly. This is the first society outside Latin America to belong to ALAM. Ricardo Guerrero, president of the Spanish society thanked ALAM for the acceptance and offered support for future activities. Microbiologists from Colombia and Costa Rica were invited to attend the ALAM Assembly as guests and to promote microbiology societies in their countries. The editors of Latin American and Spanish microbiology journals were called upon by Vidal Rodríguez-Lemoine (Venezuela) to promote communication and cooperation between scientific journals in the region.

Within the framework of this ALAM meeting, an information and documentation center for microbiology was opened at the Pontifical Catholic University of Ecuador, thanks to the generous support of the American Society for Microbiology (ASM). Finally, it was announced that the 20th ALAM meeting will take place in Montevideo, Uruguay, in 2010, under the presidency of Matilde Soubes [msoubes@fq.edu.uy]. The organizing committee is already working toward another successful Latin American microbiology meeting.

The enthusiasm of the young researchers and students who attended the ALAM 2008 meeting, together with the experience and expertise of leaders of science and technology, will open new doors and encourage hope for the growth and development of microbiology in this region.