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# Introduction

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# Introduction to the proceedings of the XIII Nacional Congress of Virology (Oaxaca, Mexico)

Rosa Elena Sarmiento Silva, Isabel Salazar Sánchez, Joel Vázquez Pérez, Montserrat E. García Hernández, Susana López Charretón, Gerardo Suzán Aspiri, Marisa Mazari Hiriart, Ana Cecilia Espinosa García and Fernando Puerto Manzano.

[1]Departamento de Microbiología e Inmunología, Facultad de Medicina Veterinaria y Zootecnia, Universidad Nacional Autónoma de México, Ciudad Universitaria, Av. Universidad #3000, Ciudad de México 04510, México
[2]Departamento de Inmunología, Escuela Nacional de Ciencias Biológicas, Instituto Politécnico Nacional, Mexico City 11340, Mexico
[3]Instituto Nacional de Enfermedades Respiratorias, Mexico City, Mexico
[4]Instituto de Biotecnología, Universidad Nacional Autónoma de México, Av. Universidad 2001, Cuernavaca 62209, México
[5]Departamento de Etología, Fauna Silvestre y Animales de Laboratorio, Facultad de Medicina Veterinaria y Zootecnia, Universidad Nacional Autónoma de México (UNAM), Ciudad de México, México, International Joint Laboratory ELDORADO, IRD/UNAM, Mérida, Yucatán, México
[6]Laboratorio Nacional de Ciencias de la Sostenibilidad, Instituto de Ecología, Universidad Nacional Autónoma de México,A.P. 70-275 Circuito Exterior, Ciudad Universitaria, Ciudad de México 04510, México
[7]Laboratorio de Enfermedades Emergentes y Reemergentes, Centro de Investigaciones Regionales 'Dr. Hideyo Noguchi', Universidad Autónoma de Yucatán. Avenida Itzáes, No. 490 x Calle 59, Col. Centro, C.P. 97000. Mérida, Yucatán, México.

The Mexican "XIII National Congress of Virology" was held on 5th to 7th October 2023 and took place in Oaxaca, Mexico

## 1. The meeting.

The meeting was organized by Mexican Society of Virology and involved the participation of 317 attendees from different education and investigation Mexican institutes and from 5 countries. The scientific quality of the speakers was excellent and covered all issues and objectives of the meeting. A total of 37 oral presentations were presented in addition, there were two poster sessions with a total of 190 posters.

At the different sessions we discussed the importance of the study of virology as an essential discipline whose approach under the One Health context requires intense and close collaboration between scientists, physicians, veterinarians, educators, and environmental health experts and government, which is crucial to face current and future challenges

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## 2. Challenges in Virology

# One Health and Virology

Susana López

Instituto de Biotecnología/UNAM.

The recent COVID-19 pandemic has dramatically reminded us that we are increasingly witnessing the arrival of emerging or re-emerging diseases, which are either new to the human population or had not been seen in recent decades or were geographically limited and have been responsible for major epidemics or even pandemics. The majority of these diseases are caused by viruses; the World Health Organization and the World Organization for Animal Health have estimated that approximately 75% of these diseases have a zoonotic origin, meaning that the natural host of these pathogens is an animal species, and through direct contact with humans, the pathogen can spillover to a human and adapt to its new host.

In general, viruses replicate millions of times in their host, and this massive replication results in numerous mutations in viral genomes, giving them a tremendous capacity to adapt to different hosts.

As the world's population has grown, zoonotic events have increased significantly because, in the pursuit of new places to live and new areas for agriculture and livestock to meet the needs of the growing population, animal and insect habitats are being encroached upon, and extensive deforestation is taking place worldwide, disrupting existing ecosystems. The concept of One Health has emerged with the idea that it is necessary to recognize that human health is interconnected with the health of animals and the environment, and that a multisectoral, transdisciplinary, and collaborative approach is needed to find optimal solutions for health, taking into account the interaction between people, animals, plants, and the environment in which we live.

It is clear that virology as a whole needs to adopt the One Health perspective to be able to understand and contend with emerging and re-emerging diseases with a more comprehensive approach.

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Dr. Gerardo Suzán

Facultad de Medicina Veterinaria y Zootecnia/UNAM.

Virology is a science that has come to solve public and animal health problems and has allowed the development of technology for the prevention of viral diseases including the development of vaccines and drugs. However, virology has been more than that, currently virology is a dynamic adaptive science that has provided important information to learn more about the origin and evolution of life on the planet. It is known that viruses represent the most abundant biological entity on Earth, and it is estimated that more than 10 31 types of viruses exist on earth. Most viruses infect bacteria, archaeobacteria and microeukaryotes that are fundamental to biogeochemical cycles (carbon, nitrogen and phosphorus) influencing ecosystem processes. Viruses infect all types of living beings, increaseing genetic diversity and drive biological evolution and species diversification. On the other hand, the bad news is that many viruses, behave like invasive species, that can move into different microhabitats, can cross-species transmit infections and produce host switch events, change geographic regions and generate epiphytias, epizootics, epidemics, panzootics and pandemics. Some viruses can compromise human, animal and plant health, and some viruses can even compromise food security. This is why the ONE HEALTH paradigm, which integrates human, animal, plant and ecosystem health, has restructured the science of virology and highlighted the need for transdisciplinarity.

Today, the ONE HEALTH paradigm, which is not only to study the impact of viruses on plants, animals and humans, it is to begin to understand the world of viruses in a new dimension of diversity that connects all living beings.

The understanding of the complex interactions underlying the emergence of viral diseases has been surpassed by the traditional epidemiological approaches, which are characterized by approaches based on a single host and/or a single virus, without studying the interaction with other symbionts (pathogenic or not) that can facilitate or limit infection processes. Likewise, little emphasis is placed on the interactions of reservoirs with other alternative host or vector species that may determine the spatiotemporal persistence of viruses and the occurrence of diseases. Therefore, virology must integrate advances from different research disciplines to meet the challenge of emerging and re-emerging viral diseases under the One Health Paradigm.

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Dr. Fernando Puerto Manzano

Universidad Autónoma de Yucatán

One Health is an interdisciplinary approach that recognizes the close interconnection between human, animal, and environmental health. In this context, virology becomes essential to understand and to deal with viral diseases that affect humans and animals. Virology focuses on the study of viruses, which are responsible for a wide range of diseases in humans and animals. Biologic and genetic understanding of viruses is essential to develop effective prevention, diagnosis, and treatment strategies. Likewise, it is also crucial to integrate into this knowledge the study of the ecological and sociocultural environment in which the population that suffers from viral diseases is living. Anticipation and preparedness for possible new pandemics and viral outbreaks depends on this comprehensive and integral knowledge.

A critical aspect of virology within the One Health framework is the identification and comprehensive study of viruses with zoonotic and even epidemic potential. Viruses such as HIV, H5N1 and SARS-CoV-2 had a devastating impact on public health and the global economy, leaving a key role for virology in its early detection, the study of their molecular origins, evolution, and propagation. Thus, the current challenges for virology are significant. The COVID-19 pandemic has highlighted the need for continued research focused on epidemiological surveillance and preparedness for viral emergencies. This is because the evolution of viruses and the emergence of variants resistant to vaccines and treatments pose additional challenges, so the identification and study of new antigens to develop better antiviral therapies and advanced diagnostic methods are essential.

In summary, virology is an essential discipline whose approach under the One Health context requires close collaboration between scientists, physicians, veterinarians, educators, and environmental health experts, which is crucial to face current and future challenges. Thus, investment in research, community education, and divulgation are essential to protect global public health and minimize the impact of emerging viral threats.

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# Aquatic ecosystems, virus, and One Health

Ana Cecilia Espinosa García and Marisa Mazari Hiriart

Laboratorio Nacional de Ciencias de la Sostenibilidad, Instituto de Ecología/UNAM.

Currently, we face challenges to safe water use in terms of health. This is related to wastewater discharge and accumulation of liquid and solid wastes into aquatic systems. In the One Health context, the problem turns complex when we understand that the water supply sources are ecosystems where wildlife and human populations converge. All, not only consume water from these sources but also contribute fecal material to the ecosystem. The water from these systems can make up a pathogen transmission route from infected animals and humans.

In the virus case, some types can be part of the aquatic ecosystem, but others constitute a problem when the virus can be related to waterborne diseases. There is evidence of virus presence in water for enterovirus, adenovirus, norovirus, hepatitis A and E, rotavirus, and others; various are zoonotic. Viruses of animal and human fecal origin can mix and get transported by water with the potential to be drunk by other animals or humans or transferred by irrigation to produce. There have been proposals to include some viral indicators in the water quality evaluation. Countries such as Canada, the United States, and Europe have integrated enterovirus as an indicator, but this has not been considered in countries from the Global South. In Mexico, some research groups have made some effort in this sense and generated information, nevertheless limited, and there are no routine analyses. It is necessary to act based on the scientific evidence about Mexico, where the surface aquatic ecosystems are bad or very bad contamination conditions. Which has impacts on the natural functions of the ecosystems, besides which is the water provision for both animals and humans. It is necessary to visualize this problem in an interdisciplinary way and with a long-term vision.

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## 3. The organizing committee

Isabel Salazar Sánchez[a], Joel Vázquez Pérez[b], María Asunción Santiago Calderón[c], Montserrat E. García Hernández[d], Rosa Elena Sarmiento Silva[d] and Yuko Nakamura López[e]

[a] Departamento de Inmunología, Escuela Nacional de Ciencias Biológicas, Instituto Politécnico Nacional, Ciudad de México, 11340, México
[b] Instituto Nacional de Enfermedades Respiratorias, Ciudad de México, México.
[c] Hospital General de Zona #1. Instituto Mexicano de Seguridad Social, Oaxaca
[d] Departamento de Microbiología e Inmunología, Facultad de Medicina Veterinaria y Zootecnia, Universidad Nacional Autónoma de México, Ciudad Universitaria, Av. Universidad #3000, Ciudad de México 04510, México
[e] Responsable de Enseñanza, Capacitación e Investigación Consejo Estatal para la Prevención y Control del SIDA-Centro Ambulatorio para la Prevención y Atención en SIDA e Infecciones de Transmisión Sexual (COESIDA-CAPASITS), Oaxaca, México.

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## 4. Invited speakers.

a. W. Ian Lipkin. Columbia University. "New Molecular Approaches For Detection and Characterization of Potentially Pandemic Viruses"
b. Audrey Arnal. Institute of Research for Development. "Ecology and Evolution of diseases"
c. Rosa María Del Ángel CINVESTAV. "Control del transporte núcleo-citoplasma: Clave para una replicación viral feliz"
d. Darwyn Kobasa. Public Health Agency Of Canada. "Pathogenesis of avian influenza virus H5N1"
e. Eugenio Hottz Federal University Of Juiz De For a. "Tromboinflammation in Severe Viral Infections"
f. César López Camacho University of Oxford. "Desvelando la protección inmunológica ante el COVID y explorando tecnologías de ARNm"

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## 5. Scientific committee.

Dra. Ana Laura Vigueras Galván - Facultad de Medicina Veterinaria y Zootecnia, UNAM.
Dr. Carlos Sandoval Jaime-Instituto de Biotecnología, UNAM.
Dr. Edgar Sevilla Reyes-Instituto Nacional de Enfermedades Respiratorias | INER
M C. Erika N. Hernández Villegas- Facultad de Medicina Veterinaria y Zootecnia, UNAM.
Dra. Gloria Guerrero Márquez-Universidad Autónoma de Zacatecas
Dr. Hugo Castelán Sánchez-Consejo Nacional de Humanidades, Ciencias y Tecnologías
Dr. Hugo Ramírez Álvarez-FES Cuautitlán, UNAM.
Dr. Juan Francisco Contreras Cordero-Facultad de Ciencias Biológicas, UANL
Dr. Luis F. Lozano Aguirre-Beltrán-Centro de Ciencias Genómicas, UNAM.
Dra. Montserrat Elemi García Hernández-IRD
Dra. Rosa Martha Yocupicio Monroy-Universidad Autónoma de la Ciudad de México
Dra. Sofía Alcaráz Estrada-ISSSTE Centro Médico Nacional 20 de Noviembre.
Dr. Tomas David Lopez Diaz-Instituto de Biotecnología, UNAM.

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## 7. Abstracts (Oral)

a. Oral session I
b. Oral session II
c. Oral session III
d. Oral session IV

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## 8. Abstracts (Poster)

a. Poster session I
b. Poster session II