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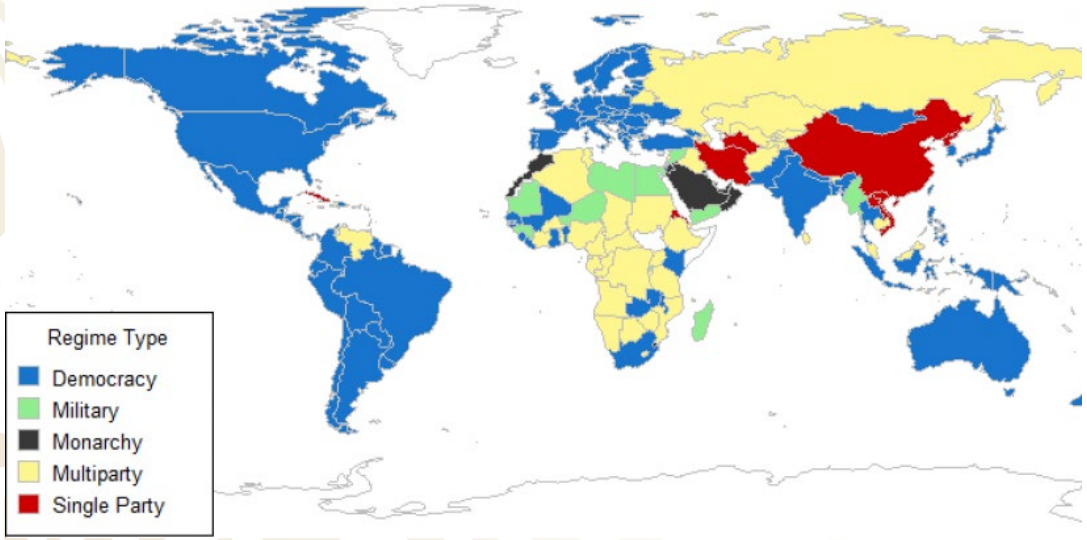
Strengthening the International Cooperation against Emergencies between North America: Biosafety, Biosecurity and Epidemiological Surveillance of Infectious Diseases to the North Hemisphere

September 18th, 2019

195 countries in the world:



54 in Africa

48 in Asia

44 in Europe

35 in America

14 in Oceania

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How big is the LATAM Region?

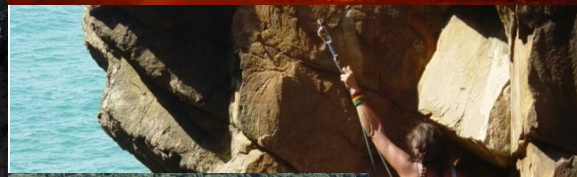
- **21** "***Spanish speaking***" countries in the world
- **7** in Central America
- **16** in the Caribbean region + **15** "dependent" territories
- **12** in South America + **3** "dependent" territories

What do we know about Mexico?









What do we know about Mexico?

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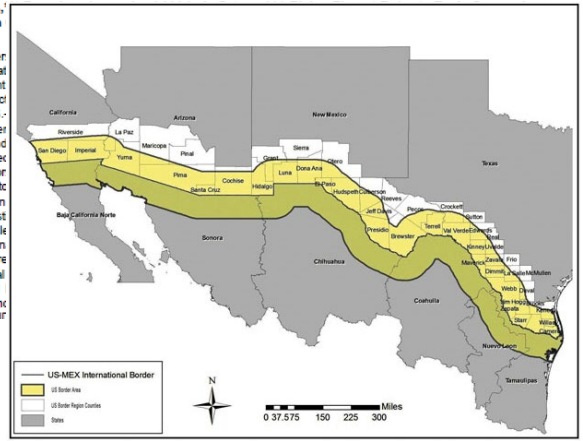
How big is the challenge?

RESEARCH

The U.S.-Mexico Border Infectious Disease Surveillance Project: Establishing Bi-national Border Surveillance

Michelle Weinberg,* Stephen Waterman,* Carlos Alvarez Lucas,† Veronica Carrion Falcon,† Pablo Kuri Morales,† Luis Anaya Lopez,† Chris Peter,‡ Alejandro Escobar Gutiérrez,§ Ernesto Ramirez Gonzalez,§ Ana Flisser,¶ Ralph Bryan,* Enrique Navarro Valle,# Alfonso Rodriguez,** Gerardo Alvarez Hernandez,†† Cecilia Rosales,‡‡ Javier Arias Ortiz,§§ Michael Landen,¶¶ Hugo Vilchis,## Julie Rawlings,[and Martin

In 1997, the Center the Mexican Secretariat began the development veillance (BIDS) project diseases along the U.S.- a binational team implem system for hepatitis and The network developed surveillance coordinator Mexican border laboratc sharing and notification BIDS facilitated invest Tamaulipas and measle demonstrates that a bin eral participation can cre crosses an international structure, and political collaboration will enhanc tion projects such as BI



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Epidemiological Surveillance

What do we know about epidemiology efforts in the region?

PLOS ONE

RESEARCH ARTICLE

Zika virus: Epidemiological surveillance of the Mexican Institute of Social Security

Concepción Grajales-Muñiz[1], Víctor Hugo Borja-Aburto[2], David Alejandro Cabrera-Gaytán[1], Teresita Rojas-Mendoza[1], Lumumba Arriaga-Nieto[1], Alfonso Vallejos-Parás[1]*

1 Division of Epidemiological Surveillance of Communicable Diseases, Instituto Mexicano del Seguro Social (IMSS), Ciudad de México, México, 2 Unit of Primary Health Care, IMSS, Ciudad de México, México

* alfonso.vallejos@imss.gob.mx

Abstract

Introduction

At the end of 2015, the first cases of Zika were identified in southern Mexico. During 2016, Zika spread as an outbreak to a large part of the country's coastal zones.

Methodology

The Zika epidemiological surveillance system records cases with clinical symptoms of Zika virus disease (ZVD) and those confirmed by means of a reverse polymerase chain reaction (RT-PCR) assay. This report includes the suspected and confirmed cases from 2016. Incidence rates were estimated by region and in pregnant women based on the proportion of confirmed cases.

Results

In total, 43,725 suspected cases of ZVD were reported. The overall incidence of suspected cases of ZVD was 82.0 per 100,000 individuals and 25.3 per 100,000 Zika cases. There were 4,168 pregnant women with suspected symptoms of ZVD, of which infection was confirmed in 1,082 (26%). The estimated incidence rate of ZVD for pregnant women nationwide was 186.1 positive Zika cases per 100,000 pregnant women.

Conclusions

The incidence of Zika in Mexico is higher than that reported previously in the National System of Epidemiological Surveillance. Positive cases of Zika must be estimated and reported.

Check for updates

OPEN ACCESS

Citation: Grajales-Muñiz C, Borja-Aburto VH, Cabrera-Gaytán DA, Rojas-Mendoza T, Arriaga-Nieto L, Vallejos-Parás A (2019) Zika virus: Epidemiological surveillance of the Mexican Institute of Social Security. PLoS ONE 14(2): e0212114. https://doi.org/10.1371/journal.pone.0212114

Editor: Abdallah M. Samy, Faculty of Science, Ain Shams University (ASU), EGYPT

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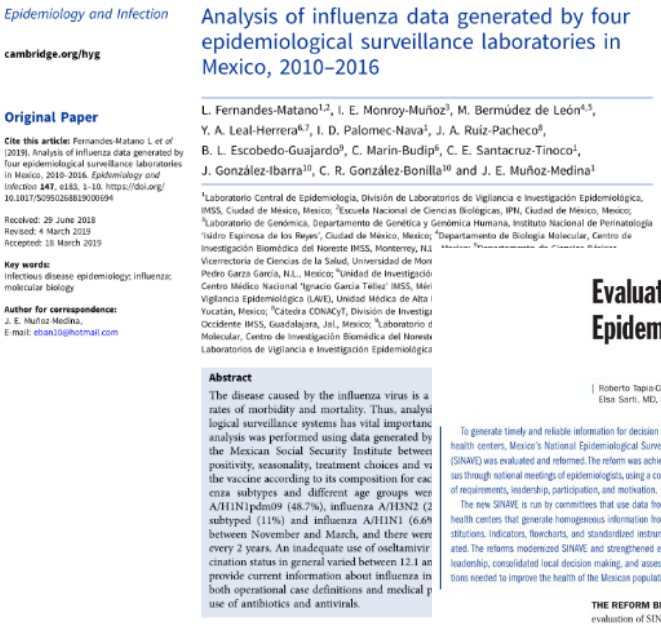
Funding: This work was supported by CONACyT (Mexico's National Science and Research Council). Through the Technical Committee and Fund Management International Cooperation in Science and Technology CONACYT (FONCICYT) number

Introduction

Zika virus (ZIKV) was originally identified in a sentinel rhesus monkey in the Zika Forest of Uganda in 1947. The virus is a member of the family Flaviviridae, genus *Flavivirus*, and is mainly transmitted to humans by *Aedes* genus of mosquitoes [1]. The first recorded outbreak



Epidemiology and Infection

cambridge.org/hyg

Original Paper

Cite this article: Fernandes-Matano L *et al* (2019). Analysis of influenza data generated by four epidemiological surveillance laboratories in Mexico, 2010–2016. *Epidemiology and Infection* **147**, e183, 1–10. https://doi.org/10.1017/S0950268819000694

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Key words:
Infectious disease epidemiology; influenza; molecular biology

Author for correspondence:
J. E. Muñoz-Medina,
E-mail: eban10@hotmail.com

Analysis of influenza data generated by four epidemiological surveillance laboratories in Mexico, 2010–2016

L. Fernandes-Matano[1,2], I. E. Monroy-Muñoz[3], M. Bermúdez de León[4,5], Y. A. Leal-Herrera[6,7], I. D. Palomec-Nava[1], J. A. Ruíz-Pacheco[8], B. L. Escobedo-Guajardo[9], C. Marín-Budip[6], C. E. Santacruz-Tinoco[1], J. González-Ibarra[10], C. R. González-Bonilla[10] and J. E. Muñoz-Medina[1]

[1]Laboratorio Central de Epidemiología, División de Laboratorios de Vigilancia e Investigación Epidemiológica, IMSS, Ciudad de México, Mexico; [2]Escuela Nacional de Ciencias Biológicas, IPN, Ciudad de México, Mexico; [3]Laboratorio de Genómica, Departamento de Genética y Genómica Humana, Instituto Nacional de Perinatología 'Isidro Espinosa de los Reyes', Ciudad de México, Mexico; [4]Departamento de Biología Molecular, Centro de Investigación Biomédica del Noreste IMSS, Monterrey, N.L. Mexico; [5]Departamento de Ciencias Básicas, Vicerrectoría de Ciencias de la Salud, Universidad de Monterrey, Pedro Garza García, N.L., Mexico; [6]Unidad de Investigación Médica en Epidemiología, Centro Médico Nacional 'Ignacio García Téllez' IMSS, México; [7]Coordinación de Vigilancia Epidemiológica (LAVE), Unidad Médica de Alta Especialidad, Yucatán, Mexico; [8]Cátedra CONACyT, División de Investigación Biomédica Occidente IMSS, Guadalajara, Jal., Mexico; [9]Laboratorio de Biología Molecular, Centro de Investigación Biomédica del Noreste IMSS, Monterrey, N.L. Mexico; [10]Laboratorios de Vigilancia e Investigación Epidemiológica

Abstract

The disease caused by the influenza virus is a
rates of morbidity and mortality. Thus, analysi
logical surveillance systems has vital importanc
analysis was performed using data generated by
the Mexican Social Security Institute betwee
positivity, seasonality, treatment choices and va
the vaccine according to its composition for eac
enza subtypes and different age groups wer
A/H1N1pdm09 (48.7%), influenza A/H3N2 (2
subtyped (11%) and influenza A/H1N1 (6.6%
between November and March, and there were
every 2 years. An inadequate use of oseltamivir
cination status in general varied between 12.1 an
provide current information about influenza in
both operational case definitions and medical p
use of antibiotics and antivirals.

Evaluation and Reform of Mexican National Epidemiological Surveillance System

Roberto Tapia-Conyer, MD, MPH, MSc, Pablo Kuri-Morales, MD, MSc, Luis González-Urbán, IE, and Elsa Sarti, MD, ScD

To generate timely and reliable information for decision making in local health centers, Mexico's National Epidemiological Surveillance System (SINAVE) was evaluated and reformed. The reform was achieved by consensus through national meetings of epidemiologists, using a conceptual model of requirements, leadership, participation, and motivation.

The new SINAVE is run by committees that use data from 16 468 local health centers that generate homogeneous information from all health institutions. Indicators, flowcharts, and standardized instruments were created. The reforms modernized SINAVE and strengthened epidemiologists' leadership, consolidated local decision making, and assessed control actions needed to improve the health of the Mexican population.

THE REFORM BEGAN WITH AN evaluation of SINAVE by means of a qualitative interview, with a guideline to detect potential solutions to several perceived problems at the first national meeting of 150 state epidemiologists

the cutoff. Participants also considered which diseases should be reported immediately or weekly and whether a case study should be conducted. Listings were subjected to a frequency analysis, and three standardized formats were defined: a Weekly Report of New Cases of Disease (EPI-1-95), a Case Study (EPI-2-95), and an Outbreak Study (EPI-3-95). A pilot test was conducted for a 2-month period. Problems were discussed, and errors were detected and corrected.

At a third national meeting, the simple conceptual model of SINAVE reform, formats, manuals, and training program was

an epidemiology bulletin, and a training plan.

A National Committee for Epidemiological Surveillance (CONAVE) was created through ministerial agreement to make surveillance statutory and compulsory in the National Health System.[4] CONAVE was conceived and designed according to the model of academic committees. With Mexico's complex health system, CONAVE has a unique value, because, for the first time, all organizations had been actively involved at SINAVE, and the Official Mexican Norm for Epidemiology Surveillance mandates that in-

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Representative pathogens identified in last 40 years (and counting….)

1972 Norovirus from diarrhea outbreak Norwalk Ohio 4 yrs. earlier
1973 Rotavirus Major cause of infantile diarrhea worldwide
1975 Parvovirus B19 Fifth disease; Aplastic
1976 *Cryptosporidium parvum* Acute enterocolitis
1977 Ebola virus Ebola hemorrhagic fever
1977 *Legionella pneumophila* Legionnaires' disease
1977 Hantaan virus Hemorrhagic fever with renal syndrome (HFRS)
1977 *Campylobacter sp.* Enteric pathogens distributed globally
1980 Human T-cell lymphoma leukemia lymphotropic virus-I (HTLV I)
1981 *Staphylococcus* Toxic shock syndrome with toxin tampon use
1982 *Escherichia coli*, O157:H7 hemolytic uremic syndrome
1982 HTLV II Hairy cell leukemia
1982 *Borrelia burgdorferi* Lyme disease
1983 Human immunodeficiency Syndrome-AIDS virus (HIV)
1983 *Helicobacter pylori* Gastric ulcer
1988 Human herpesvirus-6 (HHV-6) Roseola subitum
1989 *Ehrlichia chaffeensis* Human ehrlichiosis
1989 Hepatitis C Parentally transmitted non-A, non-B hepatitis
1990 Recognition that *Pneumocystis jiroveci* was unique from *P. carinii*
1991 Guanarito virus Venezuelan hemorrhagic fever
1991 *Mycoplasma penetrans* urogenital infection
1992 *Vibrio cholerae* New strain associated with O139 epidemic cholera
1992 *Bartonella henselae* Cat-scratch disease; bacillary angiomatosis
1992 *Tropheryma whippelii* Whipples Disease
1992 Barmah Forest (BF) virus – Arbovirus Australia
1993 Hantavirus Hantavirus pulmonary syndrome isolates
1994: Asian Taeniasis: Human Tapeworm infection
1994: Human herpesvirus 8=Kaposi's sarcoma-associated herpesvirus
1994 *Sabia virus* Brazilian hemorrhagic fever
1997: First Human outbreak of H5N1
1998: TT virus: a Transfusion Transmitted Hepatitis
1998: Nipah virus: Encephalitis
1999: *Anaplasma phagocytophilum* (Human Granulocytic Ehrlichiosis/Anaplasmosis)
2000: *Helicobacter canadensis* another cause of diarrhea
2001: Human metapneumovirus (hMPV): Resp infections
2002: *Corynebacterium appendicis:* appendicitis
2002: Dysgonomonas mossii :sepsis
2002: *Kytococcus schroeteri:* sepsis
2003: SARS - CoV
2003: "Bird flu" H5N1 new clad of birds & humans
2004: Human coronavirus NL63 (HCoV-NL63)
2005: *Porocephalus taiwana*: a new pathogenic pentastomid
2006: *Prevotella baroniae* septicemia and wound infection
2007: New Orya-Fever like agent: *Bartonella rochalimae* sp. Nov
2008 Lujo virus (Novel Arena virus of Africa)
2008 *Mycobacterium chimaera* (subtype of MAC)
2009 H1N1-2009 Pandemic
2009 *Wohlfahrtiimonas chitiniclastica* sepsis
2010 *Negativicoccus succinicivorans*
2011 Influenza A(H3N2)v virus
2012 Middle East Respiratory Syndrome (MERS- CoV)
2013 influenza A(H7N9)
2013 Severe fever with thrombocytopenia syndrome Virus (new bunyavirus)
2014 Avian influenza A H10N8

Epidemiological Surveillance: Mexico

- The Mexico Single Information System for Epidemiological Surveillance (SUIVE) created in 1981.
- SUIVE disseminates weekly bulletins detailing new cases of 142 diseases by subject, sex, and age group.
- The SUIVE Epidemiology Bulletin is the current bulletin for reporting morbidity data collected by National System of Epidemiological Surveillance (SINAVE).

Talking about epidemiological surveillance…..

PRO/AH/EDR> Rabies - Americas (44): USA, dog, skunk, raccoon, fox, human exp

RABIES - AMERICAS (44): USA, DOG, SKUNK, RACCOON, FOX, HUMAN EXPOSURE
****
A ProMED-mail post
<http://www.promedmail.org>
ProMED-mail is a program of the
International Society for Infectious Diseases
<http://www.isid.org>

In this post:
[1] South Dakota/North Dakota: puppy, possible human exposure
[2] North Carolina: fox, human exposure
[3] New York: raccoon, human exposure
[4] Massachusetts: skunk, human exposure
[5] South Carolina: puppy, human exposure

******
[1] South Dakota/North Dakota: puppy, possible human exposure
Date: Fri 30 Aug 2019
Source: Jamestown Sun [edited]
<https://www.jamestownsun.com/lifestyle/pets/4639568-After-puppy-tests-positive-for-rabies-health-departments-in-the-Dakotas-seek-owners-of-littermates>

Situational diagnosis of biosafety and biosecurity in LATAM

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Situational diagnosis: biosafety and biosecurity

Lack of:

a) Financial resources
b) Training
c) Personnel assigned to the "*biosafety and/or biosecurity*" activities
d) Interest in the topic
e) Opportunities to "*learn more about the topic*"

What is affecting us?

- Unknown outbreaks
- Terrorism
- Activities without risk assessment
- Corruption
- Unemployment
- Migration challenges
- Excessive use of GMOs
- Use of unknown technology
- Others……

What are governments doing right now?

How is communication transmitted to the scientists, policy makers, healthcare staff?

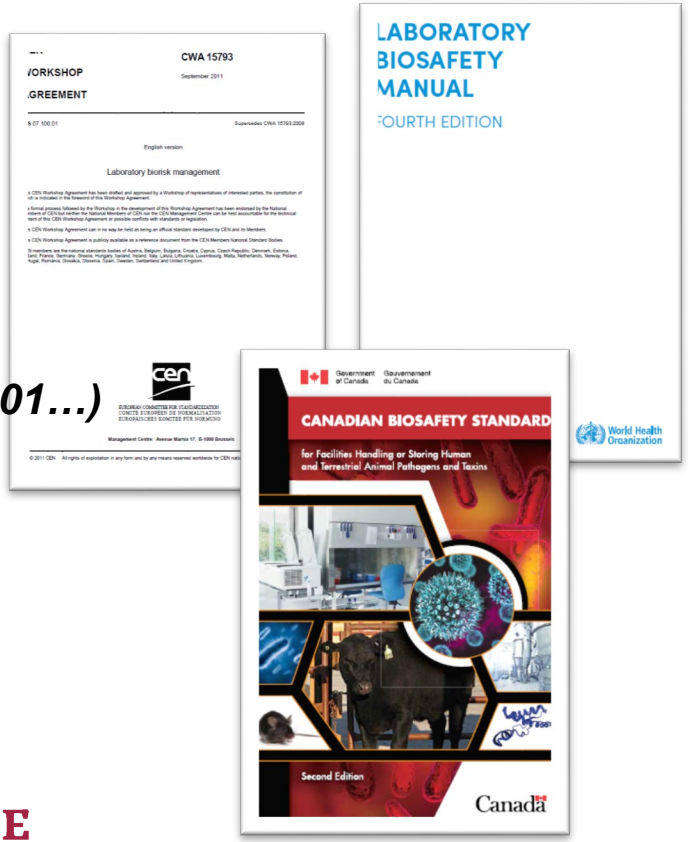
How are we facing the new changing environment?

The challenges that are facing….

- Limited support, risk assessment…..
- Lack of maintenance….
- ***"New Biosafety Regulations"***

(CWA 15793, WHO, BMBL, Canadian Standard, ISO 35001…)

- Integration of processes
- Language, cultural barriers, professional background ...



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Understanding the dilemma

Substitutions-Reductions (surrogate organism) *What's more difficult..*

Administrative controls *What we do not comply……*

Work practices and procedures *What we usually forget…*

Engineering controls *What we depend on…*

Personal protective equipment (PPE) *What we think is the most important….*

Activities and efforts on a National level for supporting the Epidemiological Surveillance: Collaborating Center for Laboratory Biosafety

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Impact of InDRE in the LATAM region…

- Regional experts in several topics (i.e., molecular biology, biosafety and biosecurity as well as virology).

- InDRE has 4 Collaborating Centers for WHO (Malaria, Arboviruses, Biosafety and Quality Assurance).

On a national level: CC-WHO for Lab Biosafety

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The first situational diagnosis… 2014

Status of the Public Health Laboratories Network in 2013

70%	• Evidence of a biosafety manual, the implementation and documented in the Quality System of the lab
60%	• Biological safety datasheets elaborated (25%) • Biological inventories updated
60%	• Evidence of a “biosafety responsible in the lab with formal authority • Institutional Biosafety Commitee
45%	• Defined biosafety objectives and biological risk management policy (documented and communicated)
45%	• Presence of Biosafety Guidelines and its communication to the lab staff
45%	• Evidence of the “risk communication” (signals and hazard identification)
45%	• Biosafety inspections
20%	• Risk assessment using Bio-RAM software or any other methodology
20%	• Biological Risk Managemente Audits
0%	• Risk mitigation based on hazard identification • Despite they apply actions and have documented SOPs

Event	Place/Date	Results obtained
Biosafety and Biosecurity Workshop 3 courses	LESP Veracruz 2008, 2009 y 2010 CDC y EWIDS	23 LESP 10 InDRE
Biological Risk Management Workshop 3 courses	Mexico City May 2011; WHO/PAHO October 2011; CDC/EWIDS June 2012; InDRE	38 LESP 3 InDRE
Infectious Substance Shipping Certification Course (IATA/PAHO)	InDRE November 2011 WHO/PAHO	15 LESP 8 InDRE
Biosafety and Biosecurity Basics in the Laboratory	InDRE November 2011 WHO/PAHO	15 LESP 8 InDRE
Other training: **Maintenance of Laboratory Equipment**	InDRE, February 2011	31 LESP, Maintenance responsibles

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The result…
2016

Current Status of the Public Health Laboratories Network

90%	• Evidence of a biosafety manual, the implementation and documented in the Quality System of the lab
90%	• Biological safety datasheets • Biological inventories updated
90%	• Evidence of a “biosafety responsible in the lab with formal authority • Institutional Biosafety Commitee
90%	• Defined biosafety objectives and biological risk management policy (documented and communicated)
90%	• Presence of Biosafety Guidelines and its communication to the lab staff
90%	• Evidence of the “risk communication” (signals and hazard identification)
75%	• Biosafety inspections
85%	• Risk assessment using Bio-RAM software or any other methodology
100%	• Biological Risk Managemente Audits included in the Q.S. inspections
90%	• Risk mitigation based on hazard identification

Facing the challenge of new emerging diseases: National Strategy for Detecting Non-circulating Lyssaviruses in the National Public Health Laboratory Network (RNLSP)

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Rabies

- In North America, rabies persists in several terrestrial meso-carnivore species and bats.
- Specific variants of the rabies virus are adapted to species as well as specific geographic areas.
- The wildlife species most commonly confirmed with rabies include skunks, foxes, coyotes, and bats.

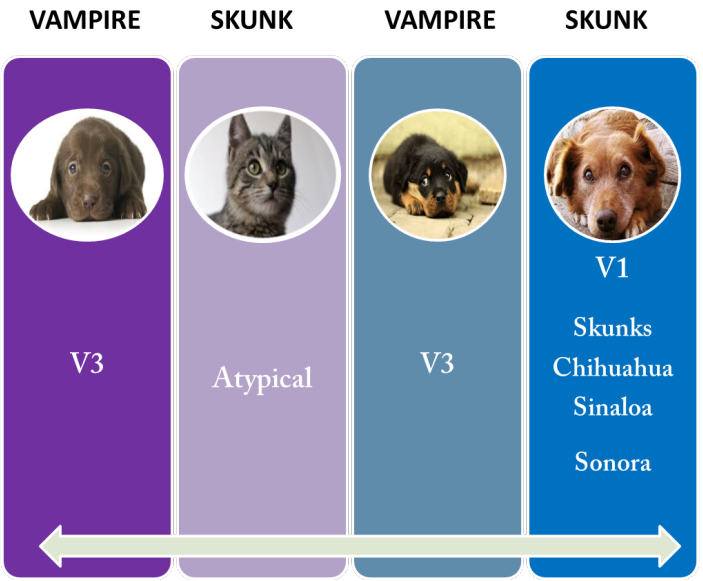
Rabies transmission by vampire bats (*Desmodus rotundus*) is an important Public Health and economic concern in Mexico and Latin America

Rabies virus in Mexico

- No human cases transmitted by dogs since 2006…
- Last canine case was in 2017...

In 2017:

- *75% of the positive cases diagnosed were puppies or kitten….
- Confirmed cases were non-vaccinated animals…
- *All cases were related with wild rabies virus cycle

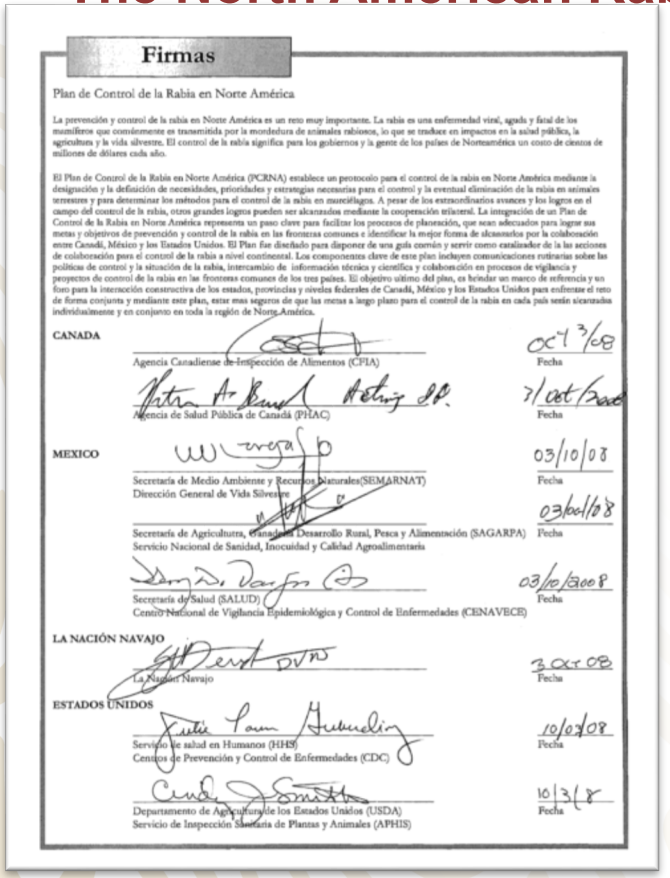


The North American Rabies Management Plan (NARMP)

- NARMP establishes a protocol for rabies management in North America by assessing and defining the needs, priorities, and strategies.

- This represents a key strategy in facilitating a planning processes by which mutual border rabies control and prevention goals and objectives can be identified and better met among Canada, Mexico, and the United States.

The North American Rabies Management Plan (NARMP)



Firmas

Plan de Control de la Rabia en Norte América

La prevención y control de la rabia en Norte América es un reto muy importante. La rabia es una enfermedad viral, aguda y fatal de los mamíferos que comúnmente es transmitida por la mordedura de animales rabiosos, lo que se traduce en impactos en la salud pública, la agricultura y la vida silvestre. El control de la rabia significa para los gobiernos y la gente de los países de Norteamérica un costo de cientos de millones de dólares cada año.

El Plan de Control de la Rabia en Norte América (PCRNA) establece un protocolo para el control de la rabia en Norte América mediante la designación y la definición de necesidades, prioridades y estrategias necesarias para el control y la eventual eliminación de la rabia en animales terrestres y para determinar los métodos para el control de la rabia en murciélagos. A pesar de los extraordinarios avances y los logros en el campo del control de la rabia, otros grandes logros pueden ser alcanzados mediante la cooperación trilateral. La integración de un Plan de Control de la Rabia en Norte América representa un paso clave para facilitar los procesos de planeación, que sean adecuados para lograr sus metas y objetivos de prevención y control de la rabia en las fronteras comunes e identificar la mejor forma de alcanzarlos por la colaboración entre Canadá, México y los Estados Unidos. El Plan fue diseñado para disponer de una guía común y servir como catalizador de la las acciones de colaboración para el control de la rabia a nivel continental. Los componentes clave de este plan incluyen comunicaciones rutinarias sobre las políticas de control y la situación de la rabia, intercambio de información técnica y científica y colaboración en procesos de vigilancia y proyectos de control de la rabia en las fronteras comunes de los tres países. El objetivo último del plan, es brindar un marco de referencia y un foro para la interacción constructiva de los estados, provincias y niveles federales de Canadá, México y los Estados Unidos para enfrentar el reto de forma conjunta y mediante este plan, estar mas seguros de que las metas a largo plazo para el control de la rabia en cada país serán alcanzadas individualmente y en conjunto en toda la región de Norte América.

CANADA

Agencia Canadiense de Inspección de Alimentos (CFIA) — Fecha: Oct 3/08

Agencia de Salud Pública de Canadá (PHAC) — Fecha: 7/Oct/08

MEXICO

Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT) — Fecha: 03/10/08

Dirección General de Vida Silvestre — Fecha: 03/oct/08

Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación (SAGARPA) — Fecha
Servicio Nacional de Sanidad, Inocuidad y Calidad Agroalimentaria

Secretaría de Salud (SALUD) — Fecha: 03/10/2008
Centro Nacional de Vigilancia Epidemiológica y Control de Enfermedades (CENAVECE)

LA NACIÓN NAVAJO

La Nación Navajo — Fecha: 3 Oct 08

ESTADOS UNIDOS

Servicio de salud en Humanos (HHS) — Fecha: 10/07/08
Centros de Prevención y Control de Enfermedades (CDC)

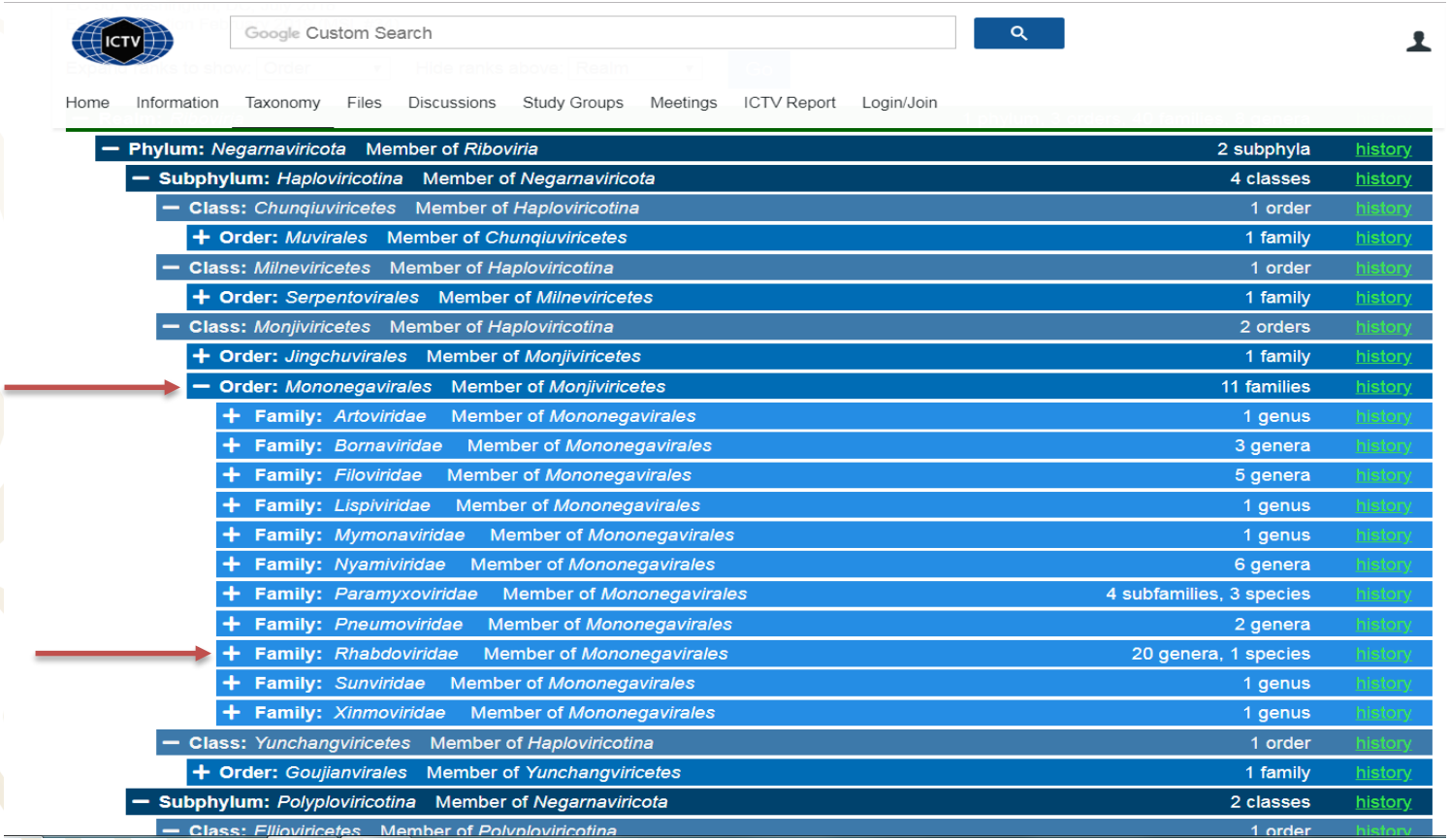
Departamento de Agricultura de los Estados Unidos (USDA) — Fecha: 10/3/8
Servicio de Inspección Sanitaria de Plantas y Animales (APHIS)

Plan goal:

Provide a framework and forum for constructive interaction among the states and provinces and federal levels of CAN, U.S.A., and MEX to address challenges jointly, and ensure that long-term rabies management goals are met.

The North American Rabies Management Plan (NARMP)

Taxonomy of Lyssaviruses



Source: ICTV Mayo 2019 https://talk.ictvonline.org/taxonomy/

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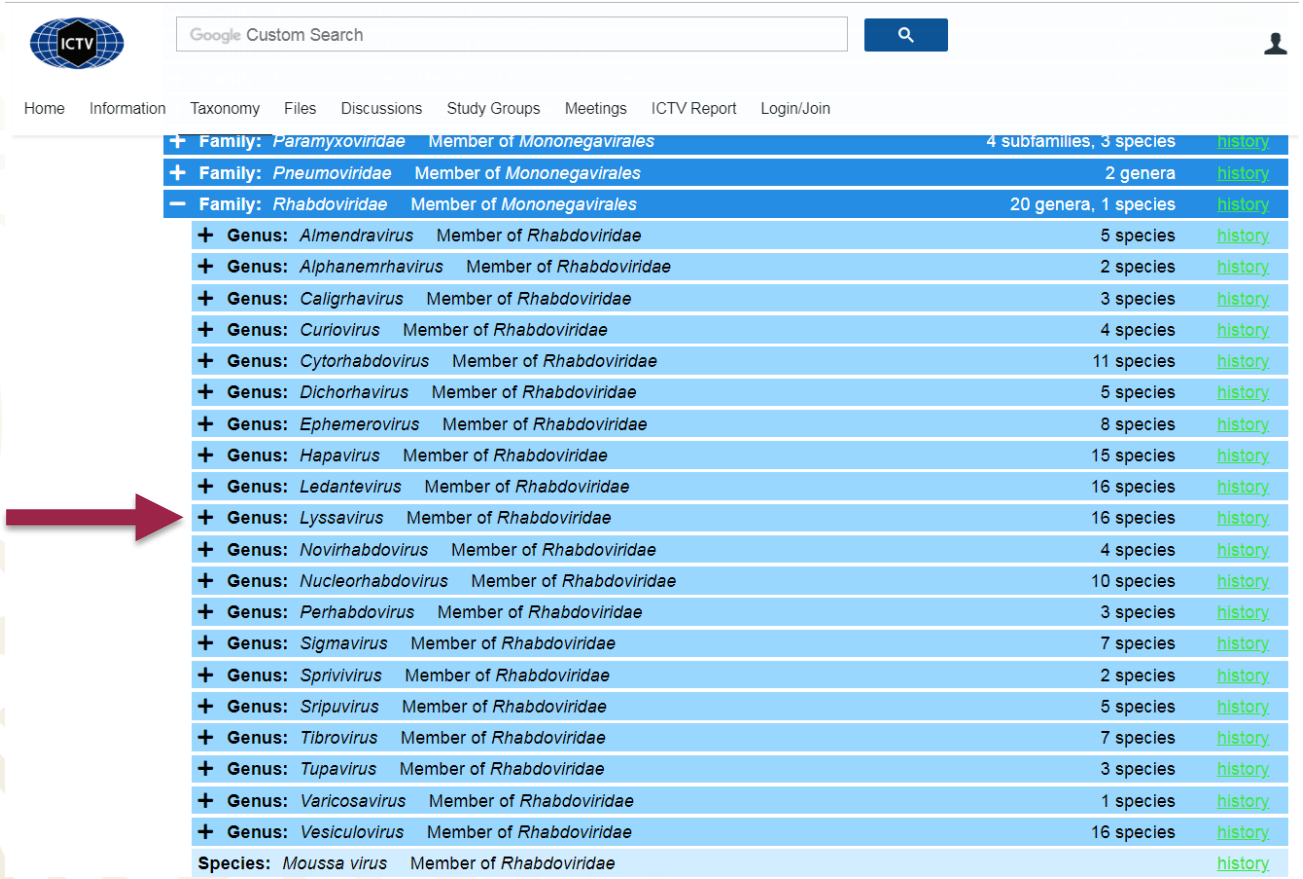
Taxonomy of Lyssaviruses (cont.)



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Home Information Taxonomy Files Discussions Study Groups Meetings ICTV Report Login/Join

+ **Family:** *Paramyxoviridae* Member of *Mononegavirales*	4 subfamilies, 3 species	history
+ **Family:** *Pneumoviridae* Member of *Mononegavirales*	2 genera	history
− **Family:** *Rhabdoviridae* Member of *Mononegavirales*	20 genera, 1 species	history
+ **Genus:** *Almendravirus* Member of *Rhabdoviridae*	5 species	history
+ **Genus:** *Alphanemrhavirus* Member of *Rhabdoviridae*	2 species	history
+ **Genus:** *Caligrhavirus* Member of *Rhabdoviridae*	3 species	history
+ **Genus:** *Curiovirus* Member of *Rhabdoviridae*	4 species	history
+ **Genus:** *Cytorhabdovirus* Member of *Rhabdoviridae*	11 species	history
+ **Genus:** *Dichorhavirus* Member of *Rhabdoviridae*	5 species	history
+ **Genus:** *Ephemerovirus* Member of *Rhabdoviridae*	8 species	history
+ **Genus:** *Hapavirus* Member of *Rhabdoviridae*	15 species	history
+ **Genus:** *Ledantevirus* Member of *Rhabdoviridae*	16 species	history
+ **Genus:** *Lyssavirus* Member of *Rhabdoviridae*	16 species	history
+ **Genus:** *Novirhabdovirus* Member of *Rhabdoviridae*	4 species	history
+ **Genus:** *Nucleorhabdovirus* Member of *Rhabdoviridae*	10 species	history
+ **Genus:** *Perhabdovirus* Member of *Rhabdoviridae*	3 species	history
+ **Genus:** *Sigmavirus* Member of *Rhabdoviridae*	7 species	history
+ **Genus:** *Sprivivirus* Member of *Rhabdoviridae*	2 species	history
+ **Genus:** *Sripuvirus* Member of *Rhabdoviridae*	5 species	history
+ **Genus:** *Tibrovirus* Member of *Rhabdoviridae*	7 species	history
+ **Genus:** *Tupavirus* Member of *Rhabdoviridae*	3 species	history
+ **Genus:** *Varicosavirus* Member of *Rhabdoviridae*	1 species	history
+ **Genus:** *Vesiculovirus* Member of *Rhabdoviridae*	16 species	history
Species: *Moussa virus* Member of *Rhabdoviridae*		history

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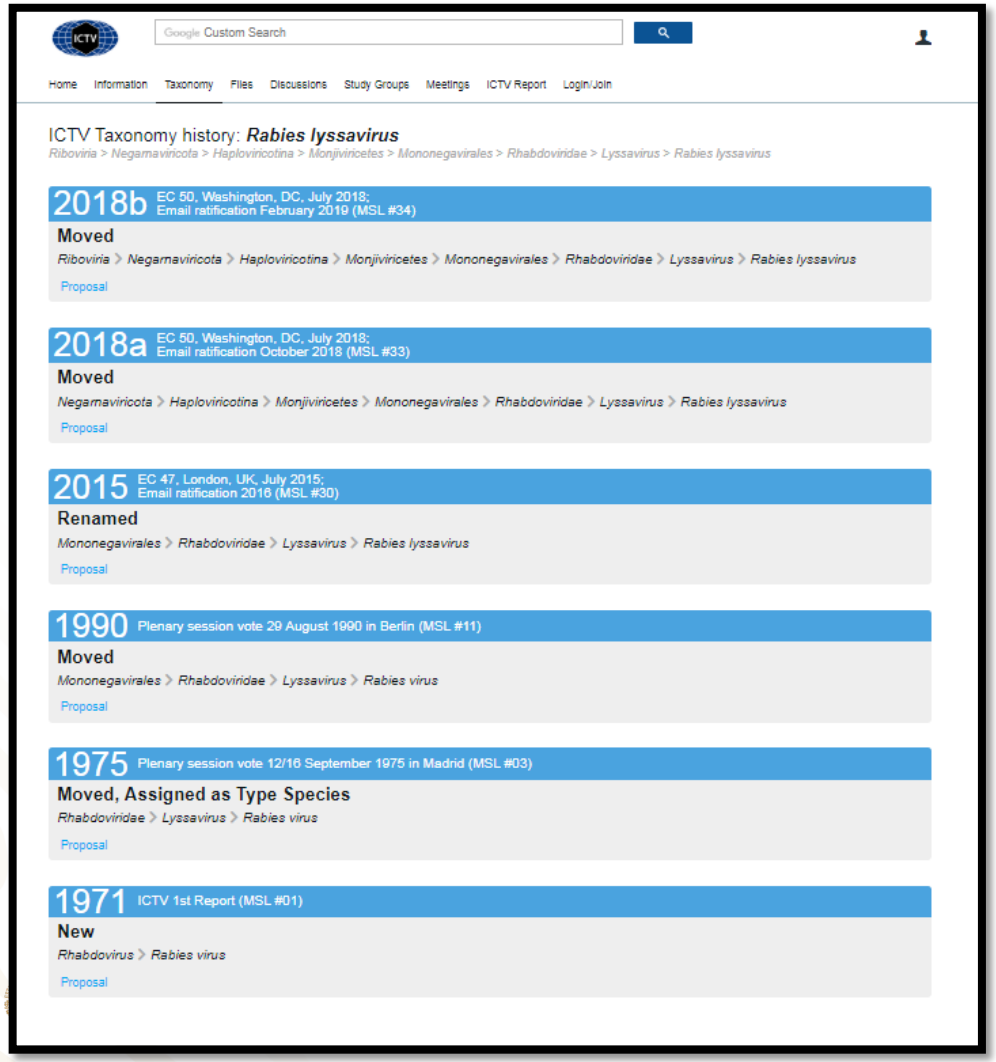
Source: ICTV Mayo 2019 https://talk.ictvonline.org/taxonomy/

New species submitted

Source: ICTV Mayo 2019 https://talk.ictvonline.org/taxonomy/



Evolution in the classification of Lyssaviruses

- **SEROTYPE (1970)**

Antibody cross reaction : Rabies, Lagos bat virus, Mokola virus, Duvenhage virus

- **PANEL OF MONOCLONAL ANTIBODIES (1978)**

Rabies virus antigenic variants in order to determine the most probable reservoir species

- **SEROGENOTYPE (1980)**

Rabies, Lagos bat virus , Mokola virus , Duvenhage virus, EBLV-1, EBLV-2, Australian bat lyssavirus.

- **SPECIES (2003)**

16 identified species officially (2019)

Genus *Lyssavirus*

Virus Taxonomy: 2018b Release

EC 50, Washington, DC, July 2018
Email ratification February 2019 (MSL #34)

− **Genus:** *Lyssavirus*
Species: *Aravan lyssavirus*
Species: *Australian bat lyssavirus*
Species: *Bokeloh bat lyssavirus*
Species: *Duvenhage lyssavirus*
Species: *European bat 1 lyssavirus*
Species: *European bat 2 lyssavirus*
Species: *Gannoruwa bat lyssavirus*
Species: *Ikoma lyssavirus*
Species: *Irkut lyssavirus*
Species: *Khujand lyssavirus*
Species: *Lagos bat lyssavirus*
Species: *Lleida bat lyssavirus*
Species: *Mokola lyssavirus*
Species: *Rabies lyssavirus*
Species: *Shimoni bat lyssavirus*
Species: *West Caucasian bat lyssavirus*

Derivation of names

Lyssavirus: from *Lyssa*, the Greek goddess of madness, rage, and frenzy.

Related, unclassified viruses

Virus name	Accession number	Virus abbreviation
Taiwan bat lyssavirus	MF472710	TBLV
Kotalahti bat lyssavirus	MF960865	KBLV

Virus names and virus abbreviations are not official ICTV designations.

Source: ICTV Mayo 2019 https://talk.ictvonline.org/taxonomy/

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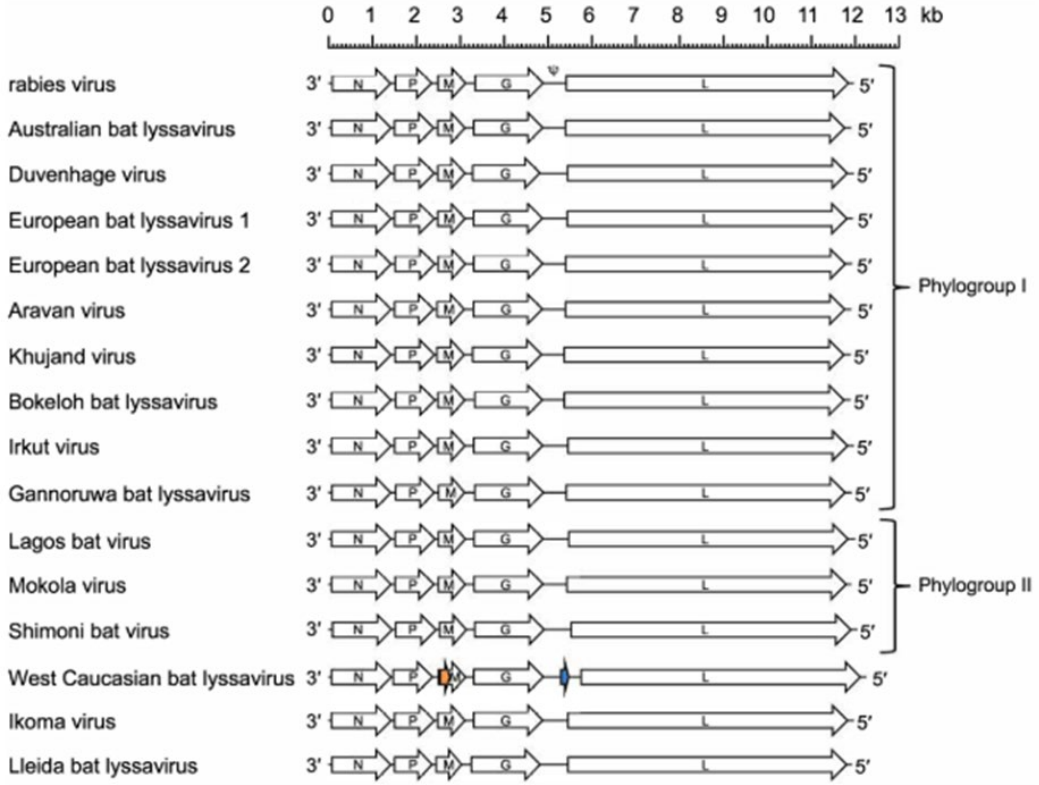
Genomic Organization of the *Lyssaviruses*



- N, P, M, G and L represent the ORFs that code for structural proteins.
- Genomes have untranslated regions in the *G genes*; In the West Caucasus Bat Lyssavirus (WCBL), this region ~ 700 nt contains an ORF of 180nt (in blue) that encodes a possible 7.1 kDa protein.
- The West Caucasus Bat Lyssavirus also has an alternative ORF of 228 nt (orange), which begins near the beginning of the M gene, which encodes a putative protein of 8.4 kDa. It is not known if these proteins are expressed in infected cells.

Source: ICTV Mayo 2019: https://talk.ictvonline.org/ictv-reports/ictv_online_report/negative-sense-rna-viruses/mononegavirales/w/rhabdoviridae/795/genus-lyssavirus

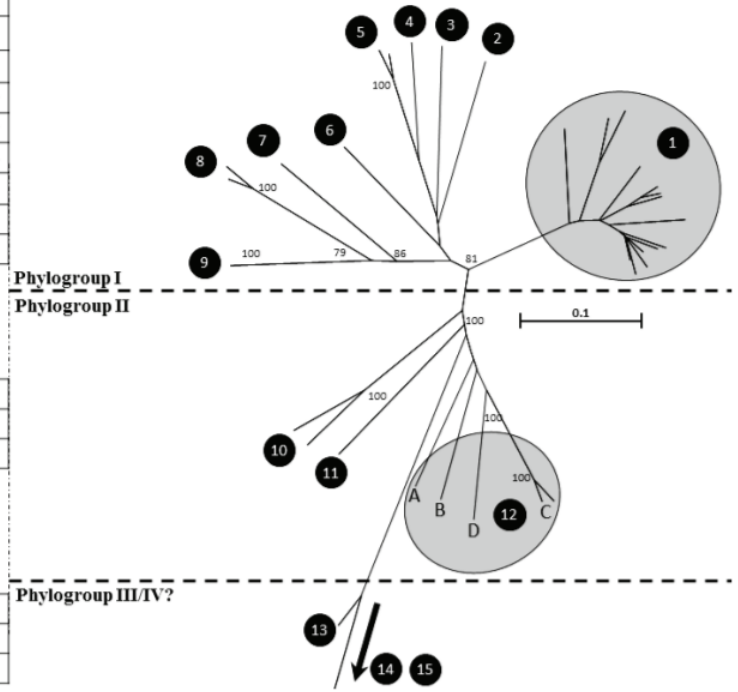
New species

Rabies virus (RABV) (1865)
Lagos bat lyssavirus (LBV) (1956)
Mokola virus(MOKV) (1974)
Duvenhage virus (DUVV) (1971)
European bat lyssavirus 1 [EBLV-1] (1968)
European bat lyssavirus 2 [EBLV-2] (1986)
Australian bat lyssavirus (ABLV) (1996)
Aravan virus (ARAV) (2003)
Irkut virus (IRKV) (2003)
Khujand virus (KHUV) (2003)
West Caucasian Bat Virus (WCBV) (2005)
Shimoni virus (SHIBV (2009)
Bokeloh bat lyssavirus (BBLV) (2010)
Ikoma lyssavirus (IKOV) (2012)
Lleida bat lyssavirus (LLEBV) (2012)
Gannoruwa bat lyssavirus (GBLV) (2016)
Taiwan bat lyssavirus (TWBLV) (2016/2017)
Kotalahti bat lyssavirus (KBLV) (2017)

Dr. Iván Kuzmin

PHYLOGROUPS

No.	Virus	Distribution
1	RABV	Global
2	ARAV	Eurasian
3	KHUV	Eurasian
4	BBLV	European
5	EBLV-2	Europe
6	ABLV	Australia
7	IRKV	Eurasian
8	EBLV-1	European
9	DUVV	African
10	MOKV	African
11	SHIBV	African
12	LBV	African
13	WCBV	Eurasian
14	IKOV	African
15	LLEBV	European



Source: Lyssaviruses and Bats: Emergence and Zoonotic Threat. ***Viruses*** *2014, 6, 2974-2990; doi:10.3390/v6082974*

Relationship between Lyssaviruses and bats species

Geographical distribution	Lyssavirus species	Bat species most commonly associated with lyssavirus infection	Common name	Transmission from bats implicated in human fatalities
The Americas	Rabies virus (RABV)	*Eptesicus fuscus*	Big brown bat	Yes
		Tadarida brasiliensis	Mexican/Brazilian free-tail bat	Yes
		Lasionycteris noctivagens	Silver-haired bat	Yes
		Perimyotis subflavus	Tri-coloured bat	Yes
		Desmodus rotundus	Vampire bat	Yes
Africa	Lagos Bat Virus (LBV)	*Eidolon helvum*	Straw coluored fruit bat	No
		Rousettus aegyptiacus	Egyptian fruit bat	No
		Epomorphorus wahlbergi	Wahlberg's epauletted fruit bat	No
	Shimoni Bat Virus (SHIBV)	*Hipposideros commersoni*	Commerson's leaf-nosed bat	No
	Duvenhage virus (DUVV)	*Miniopterus sp?*	Undefined	Yes
		Nycteris thebaica	Egyptian slit-faced bat	Yes
Eurasia	European Bat Lyssavirus type 1 (EBLV-1)	*Eptesicus serotinus*	Serotine bat	Yes
	European Bat Lyssavirus type 2 (EBLV-2)	*Myotis daubentonii*	Daubenton's bat	Yes
	Bokeloh Bat Lyssavirus (BBLV)	*Myotis nattereri*	Natterer's bat	No
	Aravan virus (ARAV)	*Myotis blythi*	Lesser mouse-eared bat	No
	Irkut Virus (IRKV)	*Murina leucogaster*	Greater tube-nosed bat	Yes
	Khujand Virus (KHUV)	*Myotis mystacinus*	Whiskered bat	No
	West Caucasian Bat Virus (WCBV)	*Miniopterus schreibersii*	Common bent-winged bat	No
	Lleida Bat Lyssavirus (LLEBV) *	*Miniopterus schreibersii*	Common bent-winged bat	No
Australasia	Australian Bat Lyssavirus (ABLV)	*Pteropus alecto*	Black flying fox and related sp.	Yes
		Saccolaimus flaviventris	Yellow-bellied sheath-tailed bat	Yes

** Genetic data only reported to LLEBV*

However……

What to do when a non endemic *Lyssavirus* can be potentially introduced into a different region?

Available online at www.sciencedirect.com
SciVerse ScienceDirect

Current Opinion in Virology

NCBI Resources How To Sign in to NCBI

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US National Library of Medicine
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these same issues are also relevant to viruses, as extant obligate intracellular micro-parasites, especially in terms of emerging infectious diseases. Among animal viruses, the *Rhabdoviridae* present classical examples to study the interactions of such biodiversity and disease emergence, especially regarding neglected zoonoses. Rhabdoviruses represent a widespread, diverse array of single-stranded,

biological or surveillance parameters? Do certain lyssaviruses possess any greater intrinsic public health or applied veterinary impact, compared to others?

On the ancestral emergence of lyssaviruses

The majority of rhabdoviruses are associated with arthropods, predominantly insects [9,10]. These include viruses

Current Opinion in Virology 2011, 1:662–670 www.sciencedirect.com

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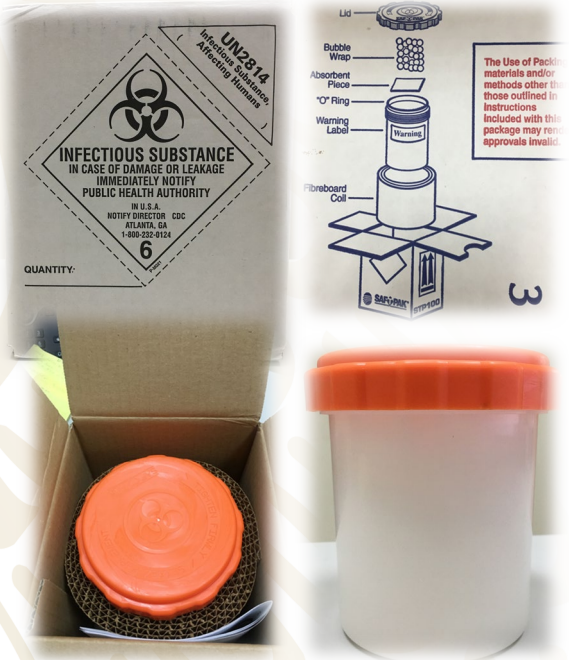
Actions implemented:

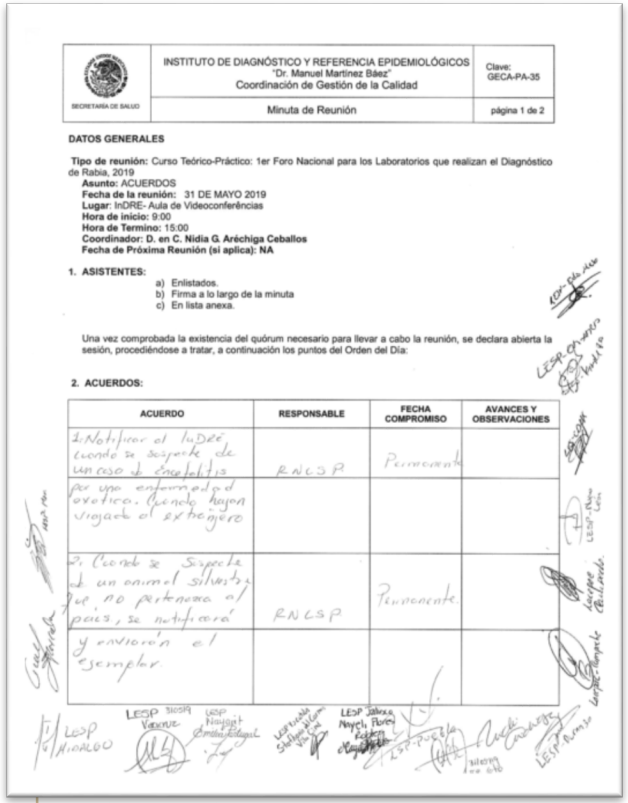
- A strategic measure for increasing Rabies and other Lyssaviruses surveillance in the country and action plan for the containment of these pathogens was developed in the country……

Purposes of the action plan

- Provide timely response…..
- Guarantee the development of activities under the highest standards of quality and safety.
- Provide advice and support to specific response groups….

Building the Future:
Agreement with the Rabies Lab Network 2018-2019





INSTITUTO DE DIAGNÓSTICO Y REFERENCIA EPIDEMIOLÓGICOS "Dr. Manuel Martínez Báez"
Coordinación de Gestión de la Calidad
Clave: GECA-PA-35
SECRETARÍA DE SALUD
Minuta de Reunión
página 1 de 2

DATOS GENERALES

Tipo de reunión: Curso Teórico-Práctico: 1er Foro Nacional para los Laboratorios que realizan el Diagnóstico de Rabia, 2019
Asunto: ACUERDOS
Fecha de la reunión: 31 DE MAYO 2019
Lugar: InDRE- Aula de Videoconferências
Hora de inicio: 9:00
Hora de Termino: 15:00
Coordinador: D. en C. Nidia G. Aréchiga Ceballos
Fecha de Próxima Reunión (si aplica): NA

1. ASISTENTES:
a) Enlistados.
b) Firma a lo largo de la minuta
c) En lista anexa.

Una vez comprobada la existencia del quórum necesario para llevar a cabo la reunión, se declara abierta la sesión, procediéndose a tratar, a continuación los puntos del Orden del Día:

2. ACUERDOS:

ACUERDO	RESPONSABLE	FECHA COMPROMISO	AVANCES Y OBSERVACIONES
1. Notificar al InDRE cuando se sospeche de un caso de encefalitis por una enfermedad exotica. Cuando hayan viajado al extranjero	RNLSP	Permanente	
2. Cuando se sospeche de un animal silvestre que no pertenezca al país, se notificará y enviarán el ejemplar	RNLSP	Permanente	

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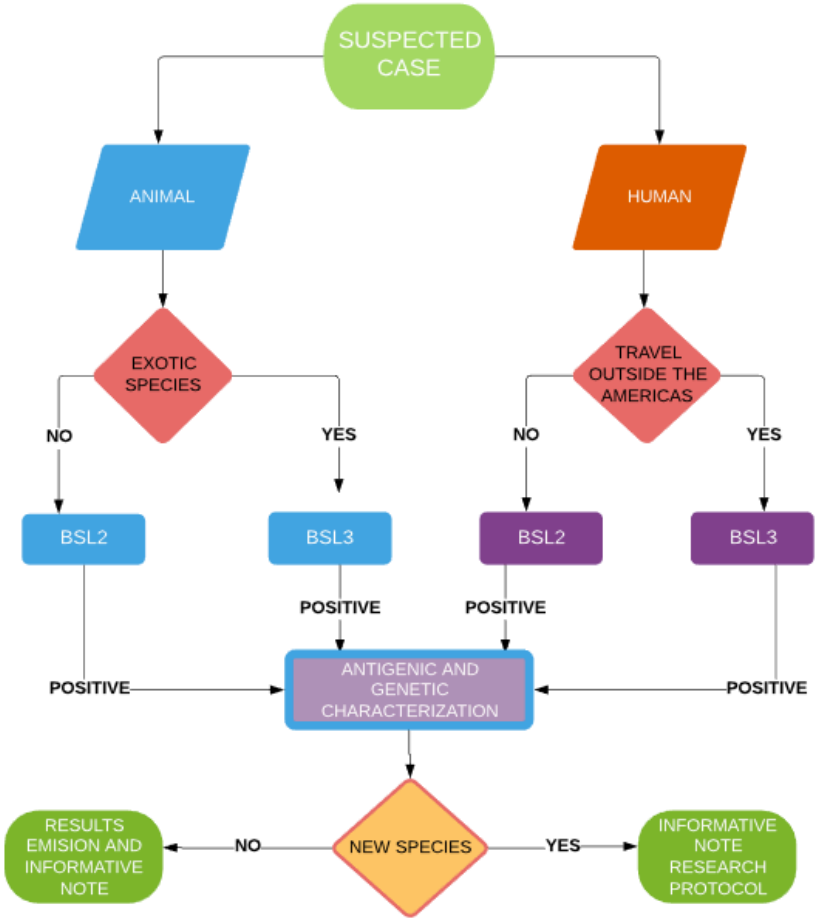
What to do against a non-circulating Lyssavirus in the region?



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Importance of the containment lab (CL) for the epidemiological surveillance

- It has a unique and innovative design for the safe and secure handling of high-risk pathogens….
- It has a defined installed capacity for a large Public Health emergency response….
- “Adaptability of the facilities” that can be used for diagnostic/research purposes.

Diagnosis at the CL

ER based on:

1.- Activities, frequency, complexity and time required…..

2.- Special requirements (i.e., vaccination).

3.- Special situations (i.e., epidemiological emergencies).

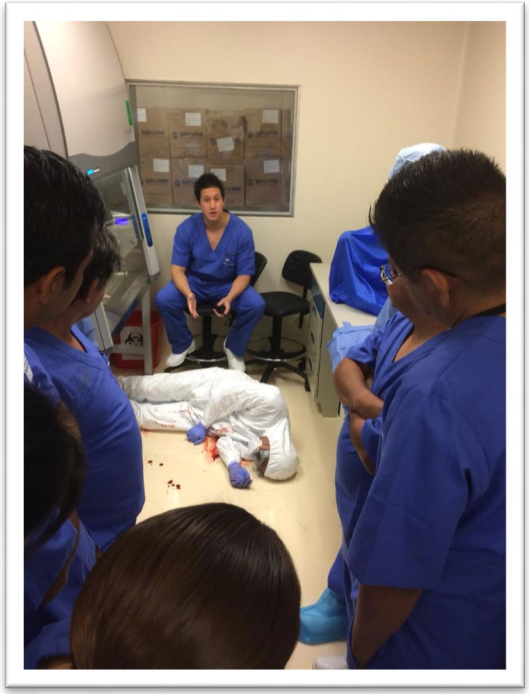
Table 1. Risk assessment for the use of containment facilities at InDRE by lab

Laboratory	Status
Viral pathogens	
Arboviruses and HF	
Rabies	
Poliovirus	
Respiratory viruses	
Febrile Exhantematic viruses	
Special pathogens	

High Priority **Medium Priority** **Low Priority**

What have we been doing in terms of biosafety and biosecurity for support the PH labs?

- Frequent training from 2008 to date….
- Specific emergency response drills for possible scenarios evolving containment lab…..
- More than 120 trained staff for working at the CL…..
- Audits, inspections and risk communication….



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Additional measures

- National cooperation with other agencies….
- Strategic communication with international reference centers….
- Trained and certified shippers for the safe transport of Infectious Substances

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Concluding remarks (International Level)

What we need to do:

- Improve the exchange of information on epidemiologic events...
- Promote collaborative responses...
- Facilitate the international cooperation

Concluding remarks (National Level)

- Successful transfer of technology
- Specific protocols based on WHO recommendations and other specialized centers (i.e., CDC, PHAC).

Concluding remarks (cont.)

- More than 25 guidelines for different diseases in the country.
- Emergency preparedness and response protocols (i.e., Ebola outbreak National Response Plan since 2014).
- Strong Quality Assurance processes (ISO 9001:2015, ISO 15189:2012 as well as, CWA 15793 and CWA 16335 standards).
- Experience and training (basic and specific).

Success depends on a TEAM……

General Direction of Epidemiology

Direction of Diagnosis and Reference
Direction of Services and Technical Support

Department of Virology
Department of Bacteriology
Department of Parasitology
Department of Molecular Biology
Department of Emerging Diseases
Department of Sample Control and Services

RNLSP

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All is about emerging and re-emerging infectious diseases/pathogens……

“Sooner or later everything old is new again”……

Rabies Laboratory
nidia.arechiga@salud.gob.mx
Tel: 5062-1600 Ext: 59359

Biosafety Level 3 Laboratory Coordination
luis.ochoa@salud.gob.mx
Tel: 5062-1600 Ext: 59578 y 59372

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EMILIANO ZAPATA

Thank you for your attention

Merci de votre attention

2019

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