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SECRETARÍA DE AGRICULTURA, GANADERÍA, DESARROLLO RURAL, PESCA Y ALIMENTACIÓN

SENASICA
SERVICIO NACIONAL DE SANIDAD, INOCUIDAD Y CALIDAD AGROALIMENTARIA

WGS at the National Service for Animal and Plant Health, Food Safety and Quality (SENASICA),

Mexico: Perspectives and Priorities

Washington D.C.
October 27, 2017

SENASICA
SERVICIO NACIONAL DE SANIDAD, INOCUIDAD Y CALIDAD AGROALIMENTARIA

- Regulates sanitary and phytosanitary standards
- Protects against exotic pests and diseases
- Fights against pest and diseases already present within Mexican territory
- Ensures food safety and quality
- Promotes agricultural and agri-food exports
- Promotes a culture of food safety

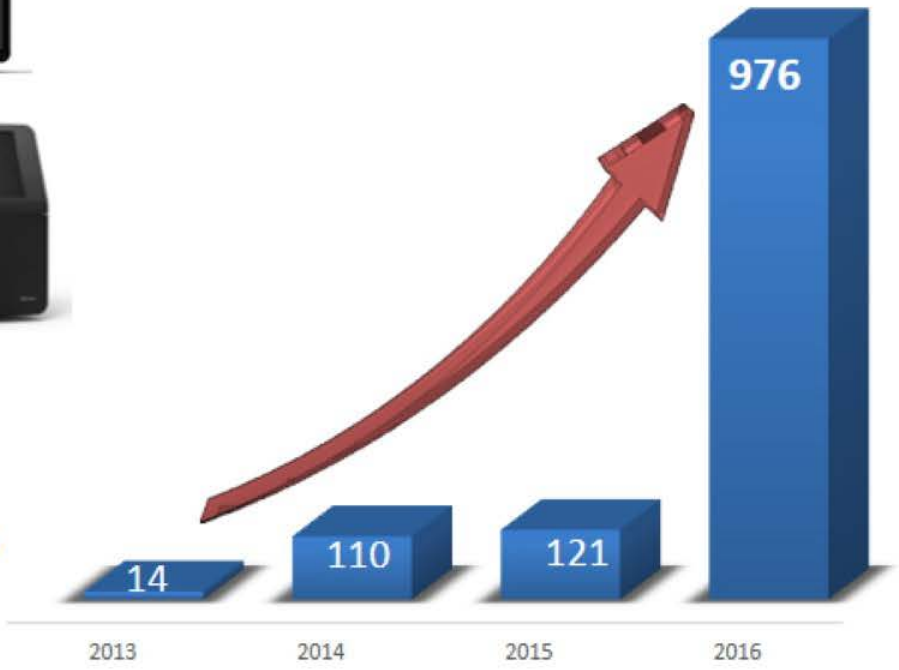
WHOLE GENOME SEQUENCING AT SENASICA

In 2013, SENASICA implemented Whole Genome Sequencing (WGS) for *Salmonella* characterization, isolated from fresh and minimally processed produce.

National Reference Center for Detection of Genetically Modified Organisms

WHOLE GENOME SEQUENCING AT SENASICA

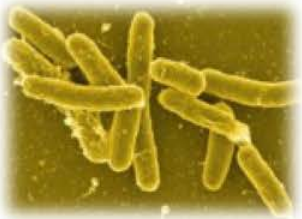
- Annual sequenced samples increased 70 fold between 2013 - 2016



- In 2015 SENASICA began the implementation of Illumina chemistry, whose is widely used worldwide

SAMPLES SOURCES

Federal Programs
Vegetal Produce



INSPECCIONADO Y APROBADO
TIF
SAGARPA MEXICO

Federal Programs
Animal Health

SENASICA

Ministry of Health
Federal Commission for the Protection from Sanitary Risk

Cofepris
Comisión Federal para la Protección contra Riesgos Sanitarios

Collaborative Projects with
Academia

UNAM

IPN

WGS GENERAL WORKFLOW

Sample/Isolate reception
SENASICA´s Pathogen Detection Laboratory

→

Isolation/ Conditioning

→

Isolate reception
Sequencing and Bioinformatics Unit

↓

DNA extraction

←

Sequencing

←

Bioinformatic Analysis

↓

Reports/ Database

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SEQUENCED SAMPLES SINCE 2013

Cofepris
Comisión Federal para la Protección contra Riesgos Sanitarios

Type of sample	Amount	Organisms
Quality Assurance	11	---
GMO	16	---
Proficiency Test (GMI, EQAS, GenomeTrakr)	74	*Salmonella*, *Listeria*, *E. coli*, *Staphylococcus*, *Shigella*, etc.
Academic Institutions (Collaborative Projects)	185	*Salmonella*, *Aeromonas*, *Enterococcus*, *E. coli*, etc.
SENASICA (Produce)	308	*Salmonella*, *Listeria*, *E. coli*, *Staphylococcus*, *Shigella*, etc.
SENASICA (Animal Health)	25	*Salmonella*
Federal Commission for the Protection from Sanitary Risk (COFEPRIS) (*Salmonella* Project & others)	1 412	*Salmonella*
TOTAL	2 031	

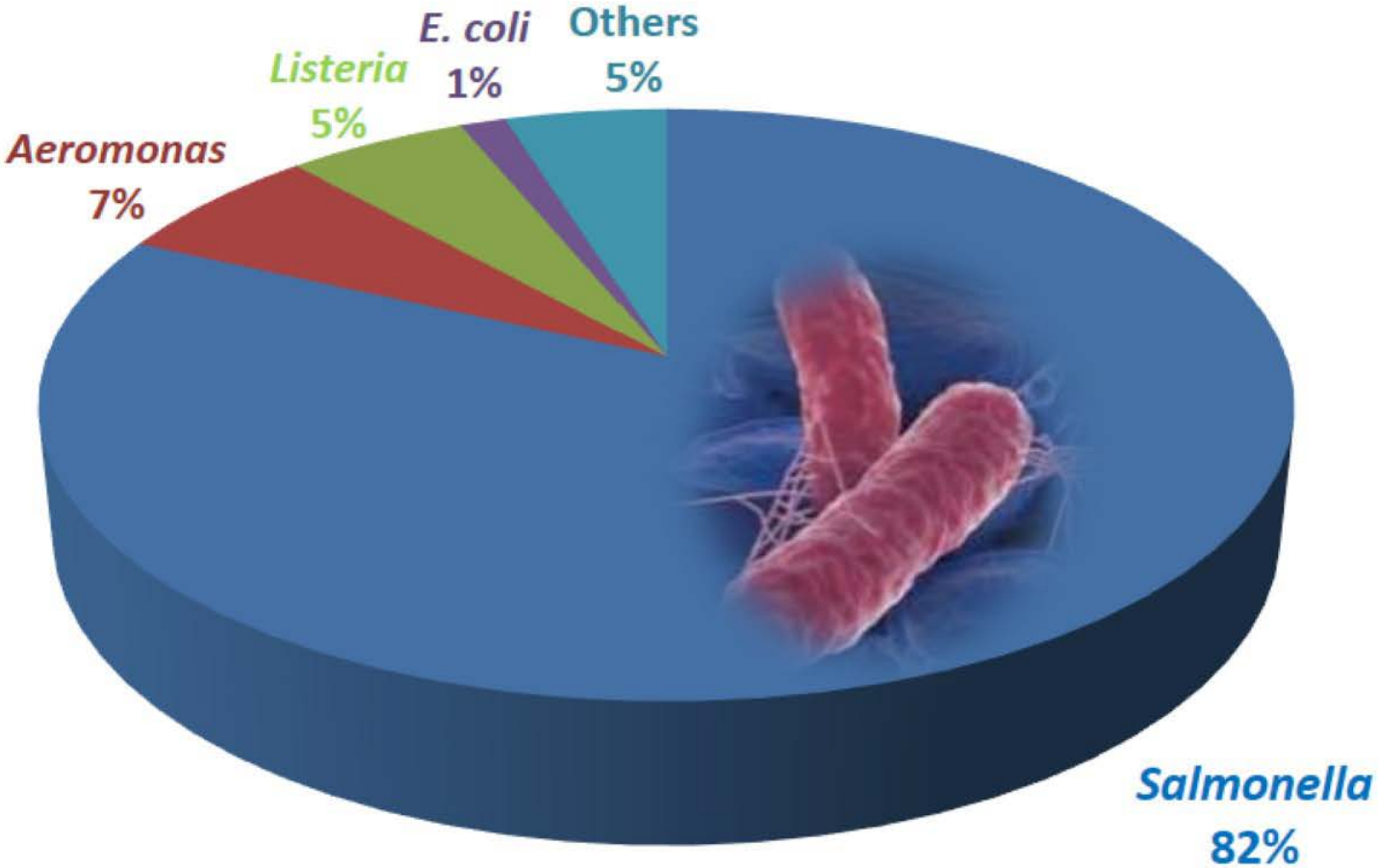
CENAM
CENTRO NACIONAL DE METROLOGÍA

IPN

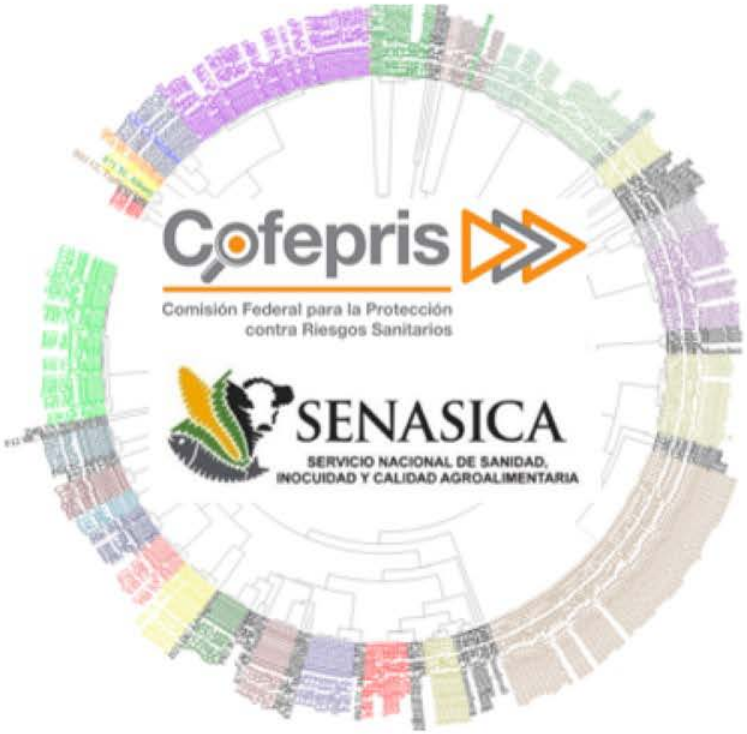
GMI
Global Microbial Identifier

SENASICA´S GENOMIC DATABASE

1,872 Isolates



SALMONELLA´S GENOMICS AND PHYLOGEOGRAPHY IN MEXICO (2015)



Objective

- Generate, manage and analyze genomic data to detect and characterize the phylogeographic distribution of *Salmonella* spp. strains isolated in Mexico.
- Become an important analysis tool used to better understand the effects and prevention of foodborne illnesses, as well as AMR genes detection.
- Isolation is performed by the **National Public Health Laboratory Network.**

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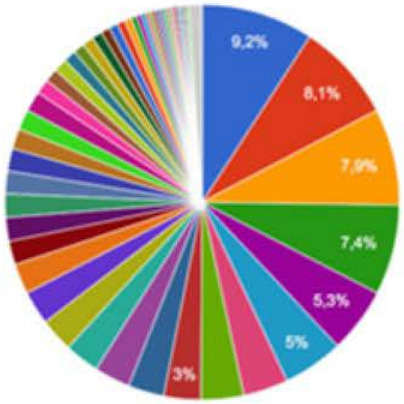
SALMONELLA´S GENOMICS AND PHYLOGEOGRAPHY IN MEXICO

Isolates sequenced to-date:

1,375

The main isolation source: processed animal products.

It has been identified 58 different serotypes



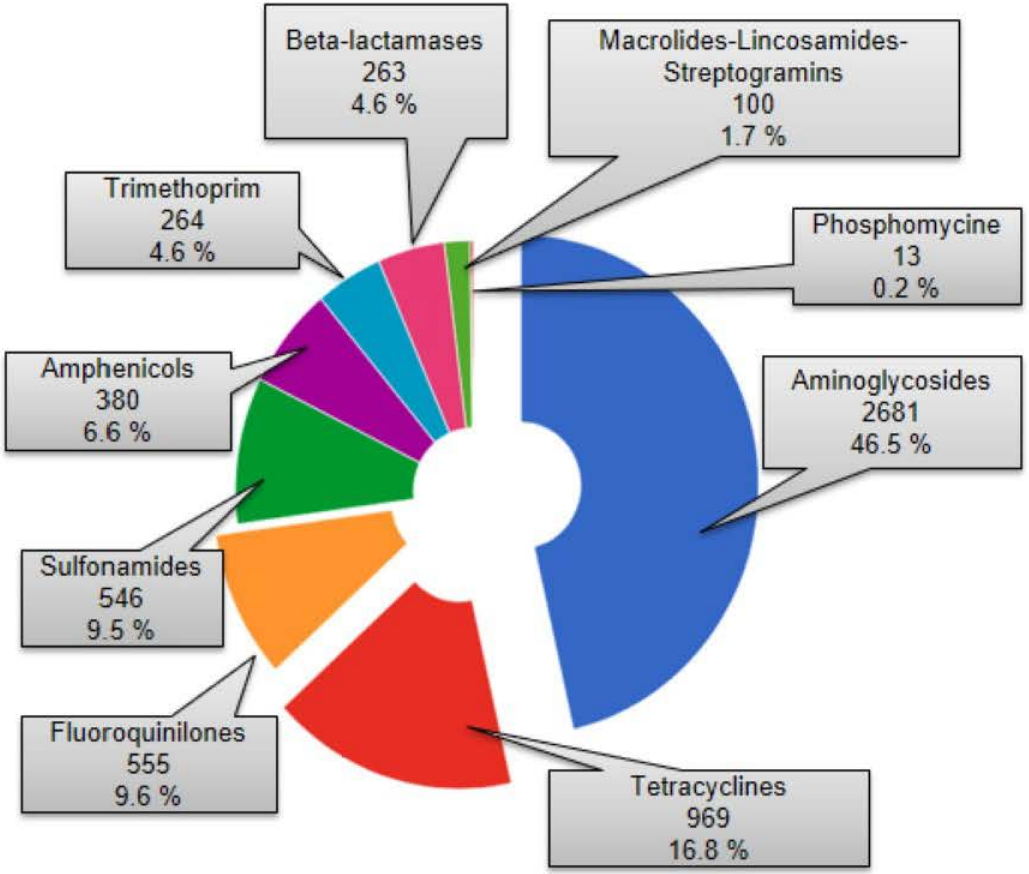
Top 5

- Salmonella Typhimurium
- Salmonella Anatum
- Salmonella Agona
- Salmonella Derby
- Salmonella Infantis

ANTIMICROBIAL RESISTANCE (AMR)

SENASICA has implemented pipelines for AMR genes detection in order to collaborate on the National Plan on AMR and strengthen the health and surveillance system to prevent and manage AMR in Mexico. Also to collaborate with partners to strengthen the evidence base and develop new responses to this global threat.

- From the 1,453 *Salmonella* strains, 4,451 AMR genes have been detected.
- No AMR genes have been detected in the following categories: Fusidic acid, Colistin, Glycopeptides, Nitromidazole and Oxazolidinones.



ANIMAL HEALTH

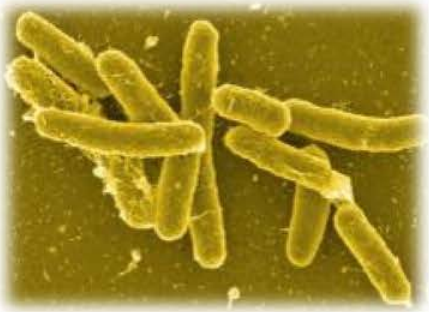
National Center for Diagnosis in Animal Health
National Plan on AMR

General Direction for Animal Health

National Center for Animal Health Assessment Services
Salmonella Monitoring Program in Raw Meat in Establishments Federal Inspection Type (TIF)

Sequenced isolates to-date:

25



9 different serotypes have been identified.

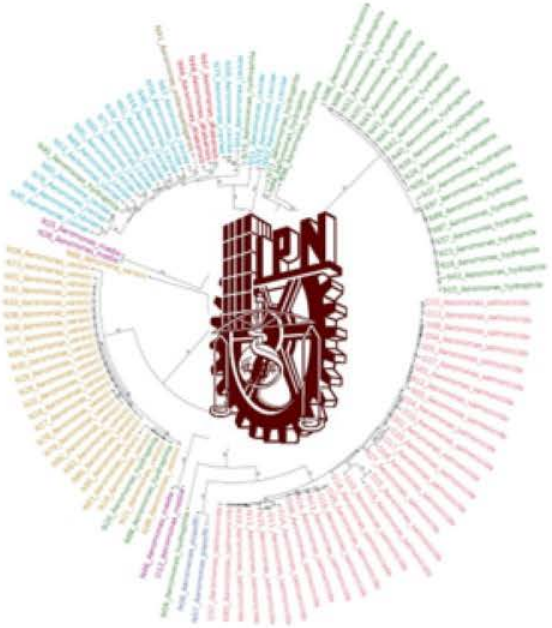
COLLABORATIVE PROJECTS WITH ACADEMIC INSTITUTIONS

National Autonomous University of Mexico (UNAM)

- Food isolates
- Amplicons

National Polytechnic Institute (IPN)

- *Aeromonas* isolates
- *Salmonella* isolates



Autonomous University of Sinaloa (UAS)

- Environmental isolates

INTERNATIONAL COLLABORATION

PulseNet™ America Latina y Caribe
Red Regional de Subtipificacion Molecular para la Vigilancia de las Enfermedades Transmitidas por Alimentos

- SENASICA belongs to the **PulseNet Latin America & the Caribbean Network** and to the **Mexican PulseNet Network**, integrated by the Institute of Epidemiological Diagnosis and Reference (InDRE) and the Federal Commission for the Protection from Sanitary Risk (COFEPRIS).

- During the 3rd GenomeTrakr International Conference SENASICA expressed its interest in becoming a member of the **GenomeTrakr Consortium** in order to strengthen the SENASICA-FDA Partnership.

GenomeTrakr

PERSPECTIVES ON THE USE OF WGS

- Assume and maintain leadership at national level as a Reference Laboratory on WGS.
- Establish and operate a National WGS Network that includes federal public health agencies.
- Increase collaboration with academic institutions to develop specific lines of research to meet the needs of the agricultural and agri-food sector.
- Incorporate SENASICA into Global Networks that use WGS to promote and ensure food safety.
- Strengthen the monitoring and surveillance of animal products, through the use of the WGS in the National Programs of the Establishments Federal Inspection Type (TIF), which will allow to have a genomic map of the identified pathogens.

FINAL REMARKS

- Food Safety and quality are strategic tools to increase the competitiveness of the Mexico's agricultural and agri-food products.

- SENASICA continues to develop new strategies and partnerships that allows us to better respond to food safety challenges.

- SENASICA is working with US government agencies as well as stakeholders from industry, trade, agriculture, and academia to enhance food safety in Mexico.

- SENASICA collaborates on a wide range of partnerships and has established formal arrangements with its US counterparts, designed to improve information sharing on emerging food safety threats and to work closer together when addressing product safety issues that may impact consumers in both countries.

ACKNOWLEDGMENTS

Sequencing and Bioinformatics

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Pathogen Detection Laboratory

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THANK YOU

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