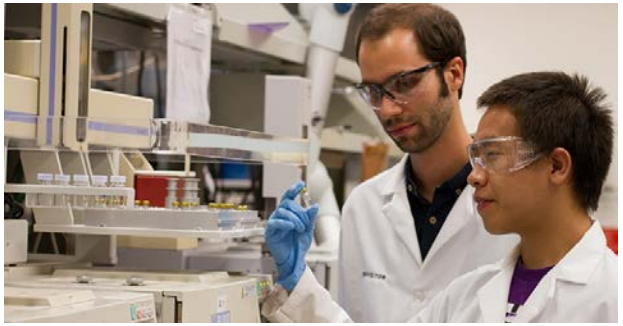
Environmental Health and Safety

Enhancing biosafety and biosecurity across international borders



Irene Mendoza, Catherine Mancini, Luis Alberto Ochoa Carrera and David Gillum

May 2018

Presenters

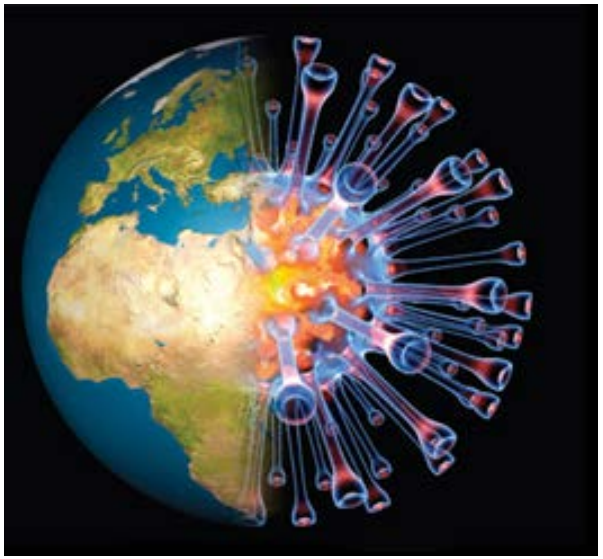
Catherine Mancini
Biosafety Specialist Senior
CDC Alternate Responsible Official

Irene Mendoza, MS, RBP
Associate Biosafety Officer
CDC Alternate Responsible Official

Arizona State University

Biological pathogens

- A threat anywhere is a threat everywhere
- Infectious diseases know no borders
- Pathogens do not discriminate
- Infectious agents will continue to emerge and reemerge from nature or bioterrorism



http://www.oneillinstituteblog.

https://www.belfercenter.org/publication

Front Public Health. 2017; 5: 148

Ebola outbreaks

Ebola virus

- Human, NHP vectors
- BSL-4 pathogen, highest containment required

December 2013 - Patient zero identified in Guinea

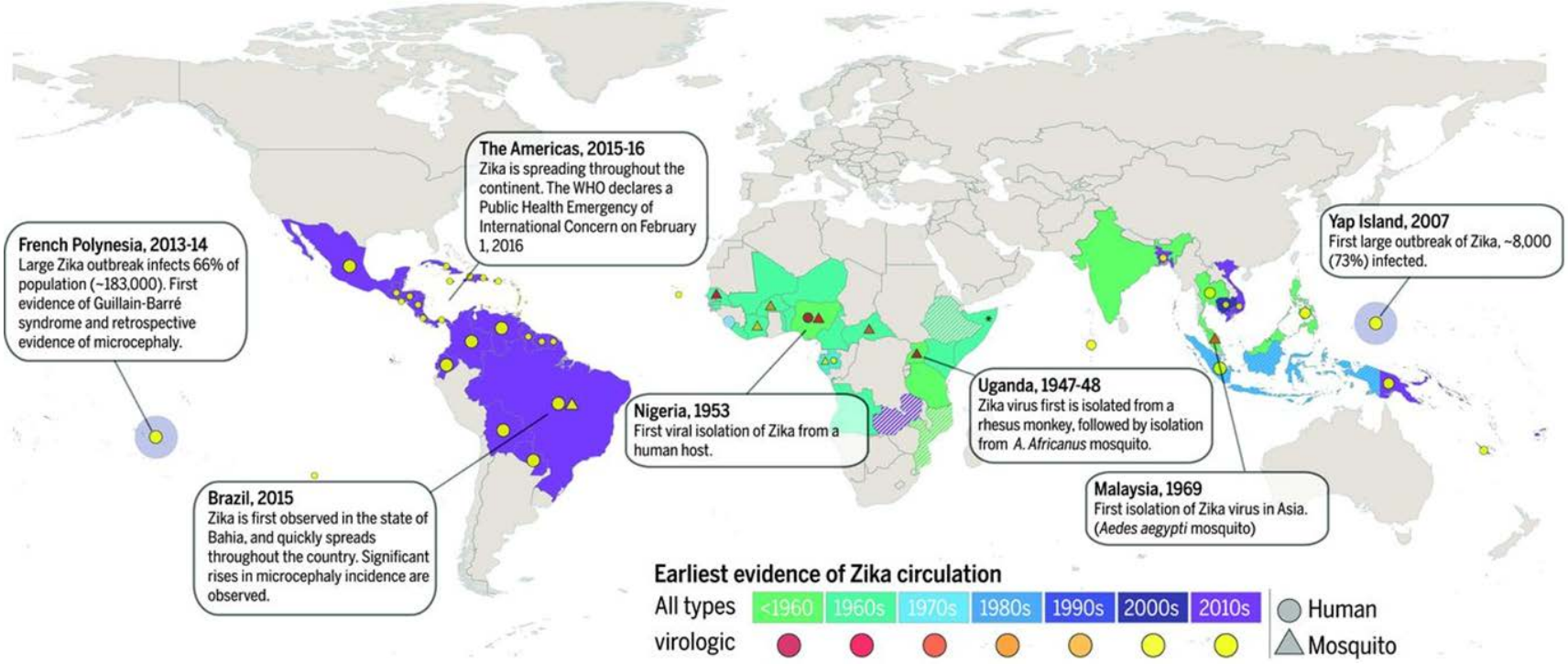
October 1, 2014 - US patient with disease announced (deceased October 8)

April 2018 - Democratic Republic of Congo

http://www.bbc.com/news/world-africa-28755033

Zika outbreaks

Current and potential distribution of ZIKA virus



March 2015 - Brazil
October 2015 - Colombia, El Salvador, Guatemala
January 2016 – Hawaii, US

Zika virus

- Mosquito vector

Justin Lessler et al. Science 2016;353:aaf8160

US and Mexico border statistics

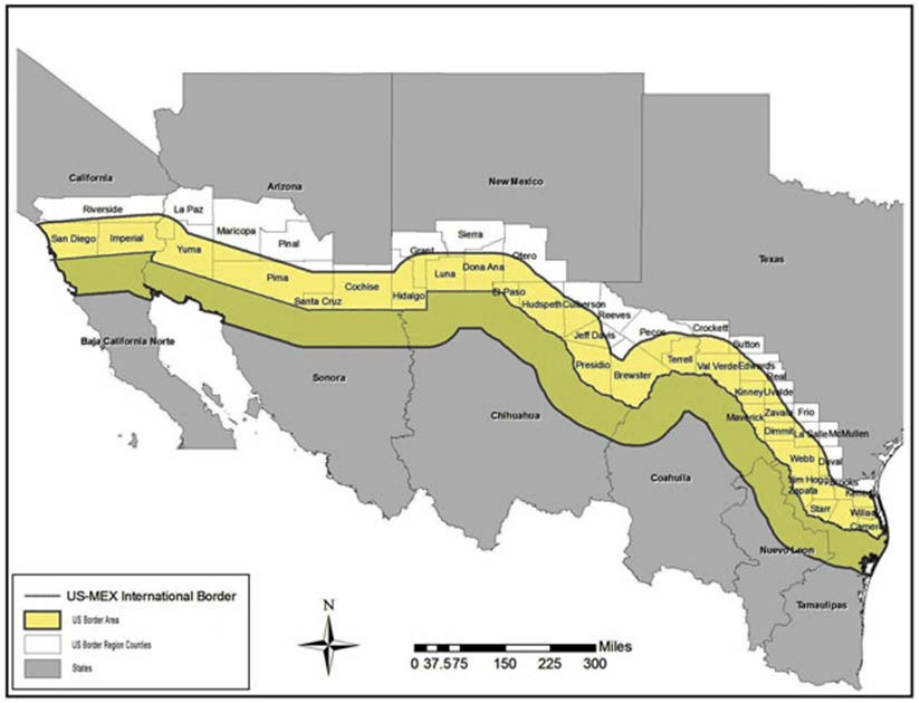
- 1,954 miles of border (30 miles maritime)
- 35 million US tourists visit Mexico each year (including 700,000 medical tourists)
- 15 million Mexico tourists visit the US each year
- Mexico is the largest supplier of agricultural products to the US

https://ustr.gov/countries-regions/americas/mexico

US and Mexico border interface

Common interests:

- Epidemiological surveillance
- Technology transfer
- Economic importance
- Preservation of natural resources



Regulations and guidance

	US	Mexico
CDC Biological Select Agent and Toxin Regulations	✓	
NIH Guidelines for Research Involving Recombinant or Synthetic Nucleic Acid Molecules	✓	
Convention on Biological Diversity		✓
Biological Weapons Convention	✓	✓
Transport of Infectious Substances Guidelines	✓ (DOT/IATA)	✓ (WHO/IATA)
Emerging Technologies Regulations		

ABSA

The American Biological Safety Association (ABSA International)

- Founded in 1984 to promote biosafety as a scientific discipline
- Serves the growing needs of biosafety professionals throughout the world
- More than 20 participating countries
- Website: **absa.org**

ABSA INTERNATIONAL

ABSA (cont.)

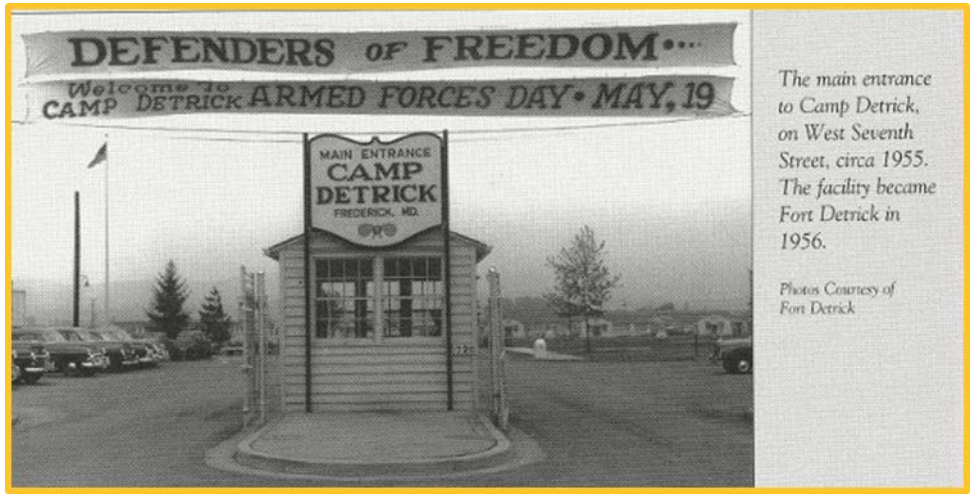
First biological safety conference

April 18, 1955 at Camp Detrick, Frederick, Maryland

14 representatives from:

- Camp Detrick (now Fort Detrick)
- Pine Bluff Arsenal, Arkansas
- Dugway Proving Grounds, Utah

Shared knowledge and experiences regarding biosafety, chemical, radiological, and industrial safety issues found at the three principal U.S. Army biological warfare laboratories.



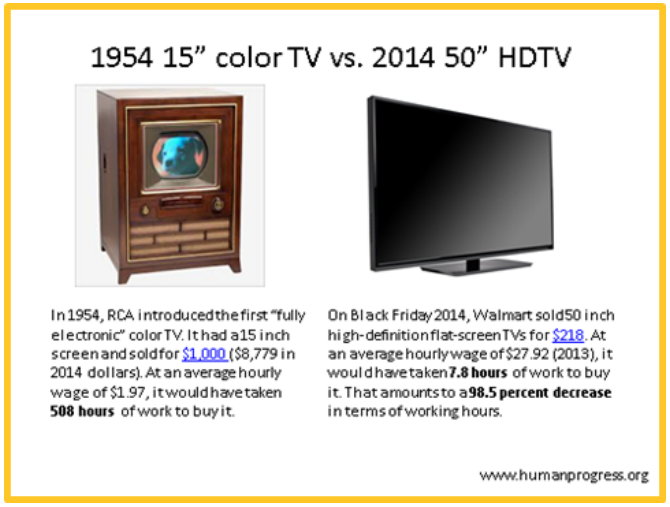
The main entrance to Camp Detrick, on West Seventh Street, circa 1955. The facility became Fort Detrick in 1956.

Photos Courtesy of Fort Detrick

Biosafety hot topics

1950s

- Class II biosafety cabinets (BSCs)
- Disinfection
- Paraformaldehyde
- Lab design criteria and air sampling



2010s

- Biological and physical containment to maintain the safety of the workers, general public, and the environment
- Synthetic biology, gene editing, and gene drives
- Dual Use Research of Concern (DURC)
- Gain of function
- Do-it-yourself (DIY) Biology
- Biosecurity
- New mechanisms for inspection or enforcement
- The balance between ethics, the freedom of inquiry, the right to publish, public health, and national security
- Research across national boundaries

Arizona Biosafety Alliance (AZBA)

Co-founded in 2013 by:

- David Gillum, ASU Chief of Staff for Environmental Health and Safety
- Kathleen Kennedy, Translational Genomics Research Institute (TGen), Manager of Environmental Health and Safety

Website: **azbiosafety.org**

AZBA™
ARIZONA BIOSAFETY ALLIANCE

ASU and AmexBio initiatives

ASU in Mexico Program

“Strengthen the relationship with Mexico and other Latin American countries to leverage the capabilities of ASU and those of the Mexican partners to expand the benefits of education and advance solutions that improve our local and global communities.”

Webiste: **https://mexico.asu.edu/**

ASU and AmexBio goals

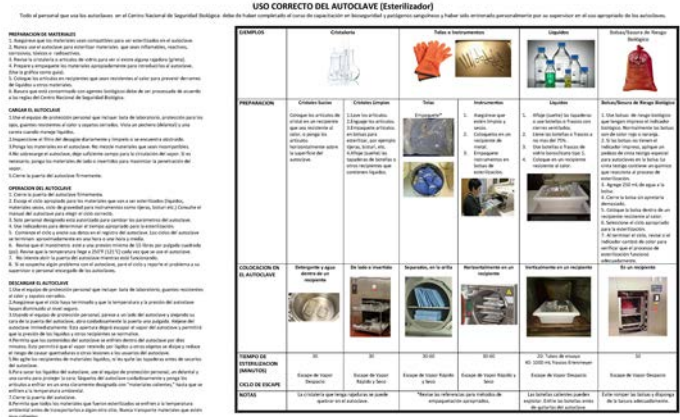
- Strengthen biosafety and biosecurity across the border
- Share best practices, training, research collaborations, and information on emerging biological technologies
- Develop a compliance infrastructure to address emerging technologies
- Attract collaborators and students to ASU and university programs in Mexico

ASU

AMEXBIO
Asociación Mexicana de Bioseguridad A. C.

ASU and AmexBio achievements

- Keynote lectures at AmexBio conferences (2015-2018)
- Introductory synthetic biology course (2015)
- Intermediate synthetic biology course (2016)
- ASU researcher presentations: Dr. Maldonado-Ortiz
- Safety posters



Arizona biosecurity workshops

2016 and 2017: Sponsored by ASU, AZBA and FBI

- First of its kind international workshop
- Bridge gaps in knowledge between policy experts and professionals managing biosecurity risks
- Define biosecurity as it relates with biosafety

Speakers from:

- ASU, AZBA, and Federal Bureau of Investigations
- Centers for Disease Control
- NIH Office of Science Policy
- Native American Tribal Nations
- AmexBio

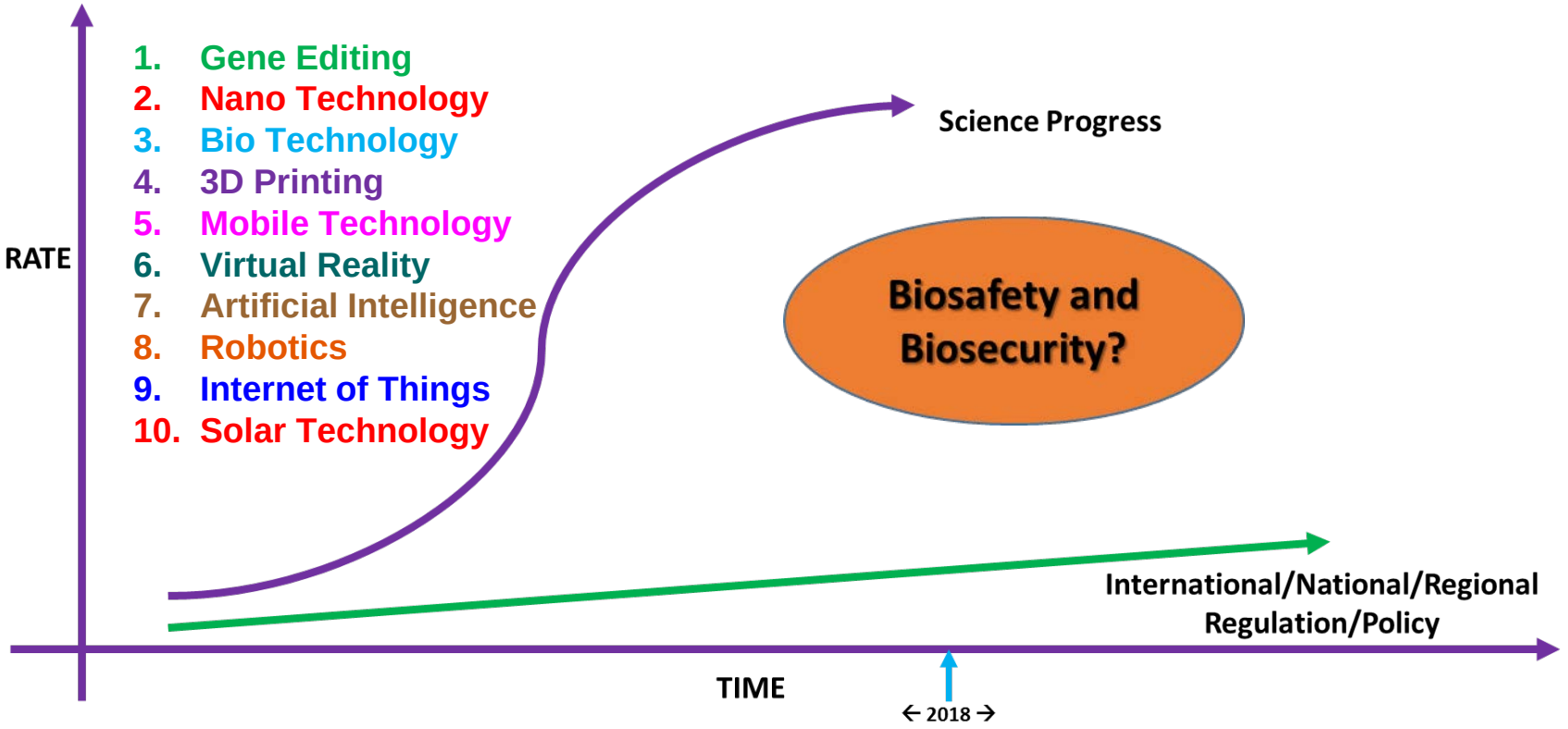
Website: **https://www.asu.edu/ehs/biosafety/ASU-Biosecurity-Workshop-2017.pdf**

Why ASU and AmexBio?

Shared transnational threats:

- Infectious disease emergence
- Hazardous materials transport
- Environmental impacts
- Drug trafficking and corruption
- Unemployment and poverty
- Migration challenges
- Emerging technologies
- Lack of communication

Why ASU and AmexBio?



Modified from: Biosecurity: Responsibility of the research and security communities (So, 2017)

Possible threats to US and Mexico

- Unknown outbreaks
- Bioterrorism
- Inappropriate waste disposal
- Intentional release of GMOs
- Protection of native seeds, plants, and water sources
- Loss of tourism from biological-related hazards

iGEM Foundation

International Genetically Engineered Machine (iGEM) Foundation

- **iGEM Competition** - an international team competition of synthetic biology students
- **Labs Program** – resources for academic labs
- **Registry of Standard Biological Parts** - a growing collection of genetic parts to use for building biological systems

http://igem.org

iGEM Competition

2018

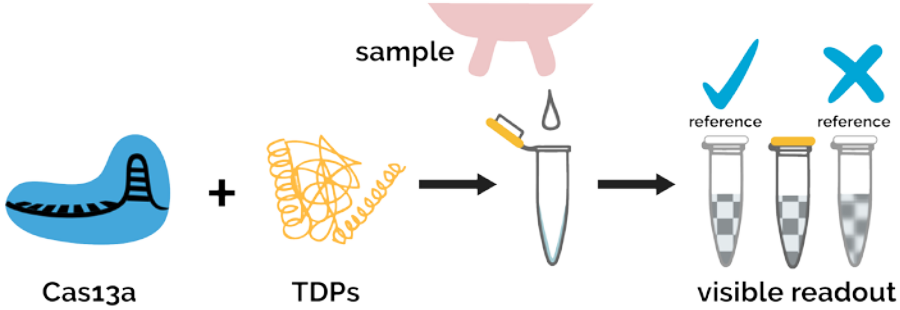
344 teams

- 80 from US
- 4 from Mexico
- 11 from Latin America

2017

337 teams

- 73 from US
- 3 from Mexico
- 12 from Latin America



TU Delft: Tool to test if antibiotic-resistant bacteria are present

http://igem.org

Future goals

Develop international governance strategies for:

- Recombinant and synthetic nucleic acid research
- Highly pathogenic agents
- Gene drives

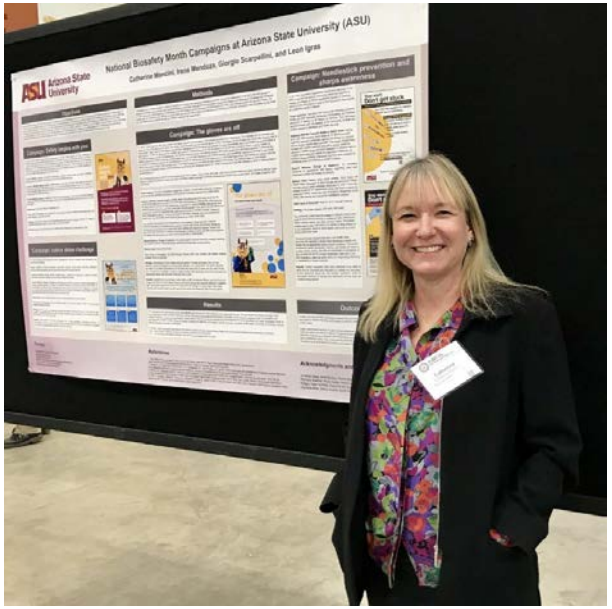
ASU and AmexBio collaboration with universities in Mexico:

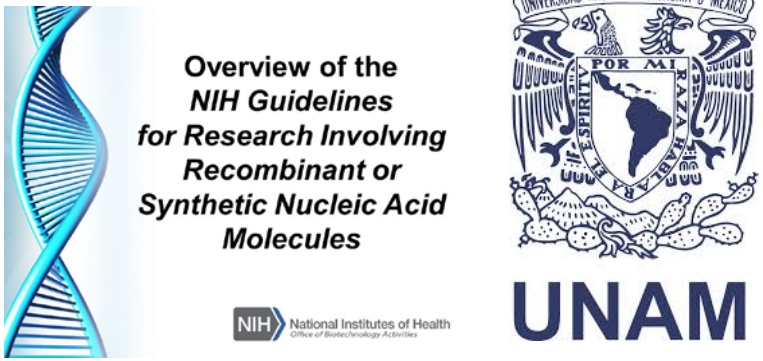
- Offer biosafety and biosecurity courses and degrees

AZBA and AmexBio partnerships:

- Invite speakers and recruit members

Expand efforts to Central and South America as well as Canada





Front Public Health. 2017; 5: 148 http://archive.defense.gov/

How can you help?

1. Design and promote community engagement opportunities for students and the public
2. Create international biosafety and biosecurity course materials and resources
3. Provide scholarships, fellowships, and internships to students from Mexico, Central, and South America
4. Collaborate on biosafety and biosecurity research and publications
5. Present at AZBA and AmexBio (and join as members)
6. Join us in sponsoring the Third Annual Arizona Biosecurity Workshop in December 2018 at ASU

Thank you!

ASU EHS

Leon Igras

David Gillum

Irene Mendoza

Giorgio Scarpellini

Cathie Mancini

AmexBio

Luis Alberto Ochoa

ASU Biodesign

Juan Maldonado Ortiz