# SESSION 2: ADDRESSING CLIMATE CHANGE CHALLENGES

## PANEL 2.1: Adaptation: Climate smart agriculture, water cycle and emergency preparedness

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Friedrich Johann Schmoll is the Head of the Division of Animal Health and Head of the Institute for Veterinary Disease Control at the Austrian Agency for Health und Food Safety (AGES) under the authority of which the biosafety level 3 laboratory (BSL3) has been built and is currently being operated in Mödling, Austria, hosting some of the IAEA activities

# Influences of climate change on emerging and re-emerging animal and zoonotic diseases;

# and the role of nuclear technology in this context

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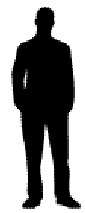
# climate change

## animal and zoonotic diseases;

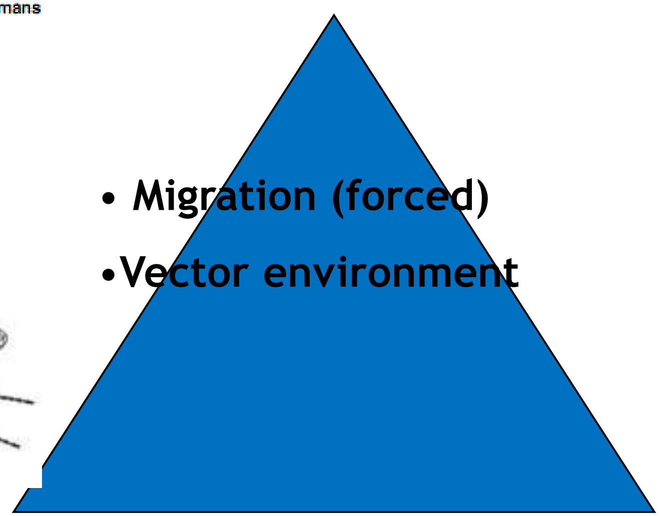
- Climate change provides more suitable environments for infectious diseases
- allowe disease-causing bacteria, viruses, and fungi to move into new areas where they may harm wild life and domestic species, as well as humans
- Pathogens can invade new areas and find new susceptible species as the climate warms and/or the winters get milder
- Insect-borne diseases are now present in temperate areas where the vector insects were non existent in the past  e.g. trypanosomosis, anaplasmosis
- Humans are also at an increased risk from insect-born diseases such as malaria, dengue, and yellow fever

# Vector Borne Disease (VBD)

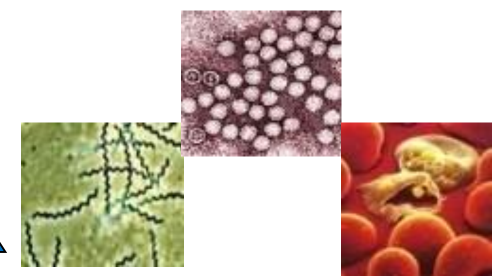
## 3 elements must co-exist for the occurence of VBD




**Susceptible population**



- Migration (forced)
- Vector environment



**Vector:** most often arthropods

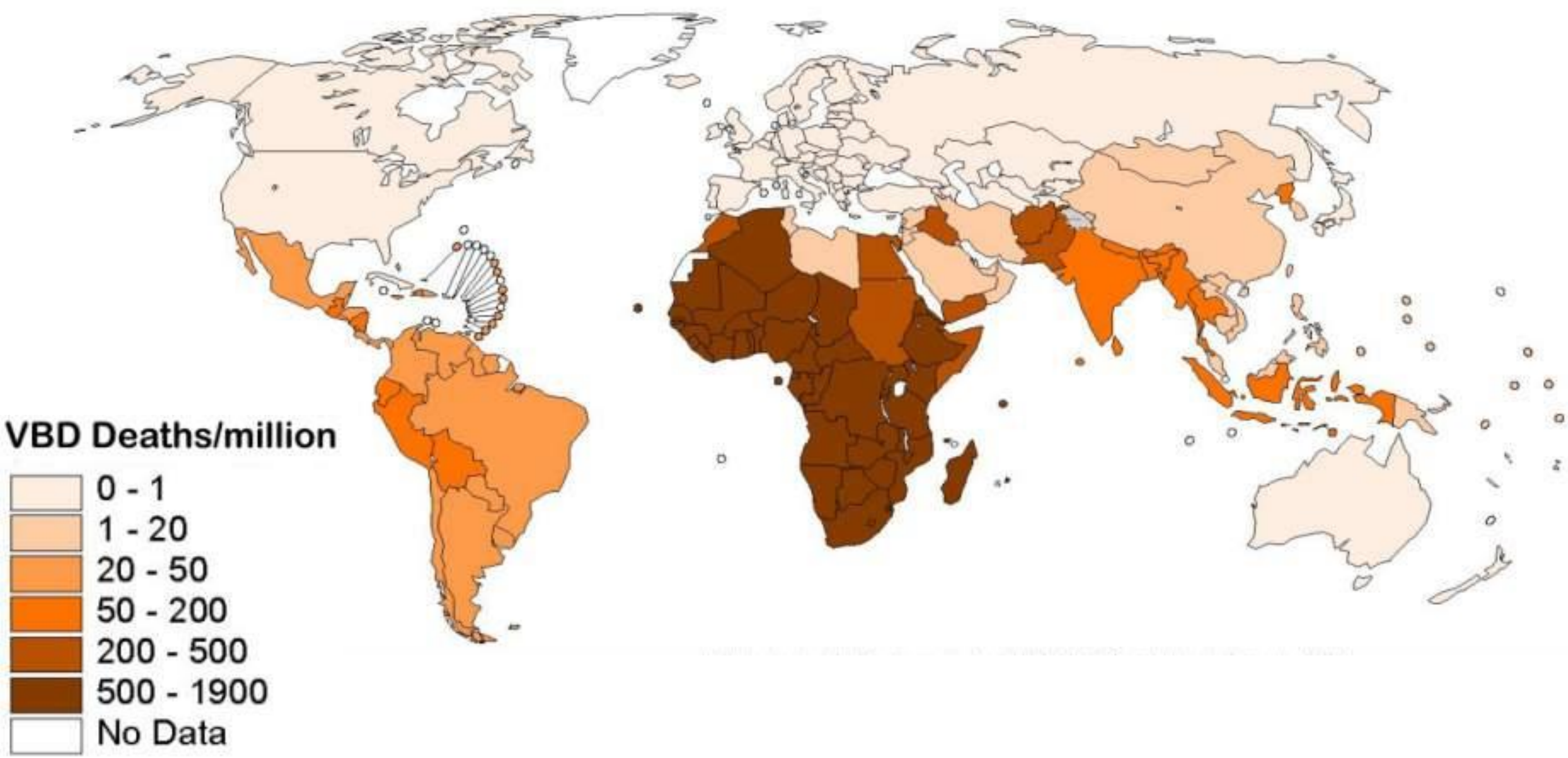
- Survival, lifespan
- Reproduction/breeding patterns
- Biting behavior

**Pathogen:**

- Survival
- Transmission
- Replication in host

# Vector Born Disease

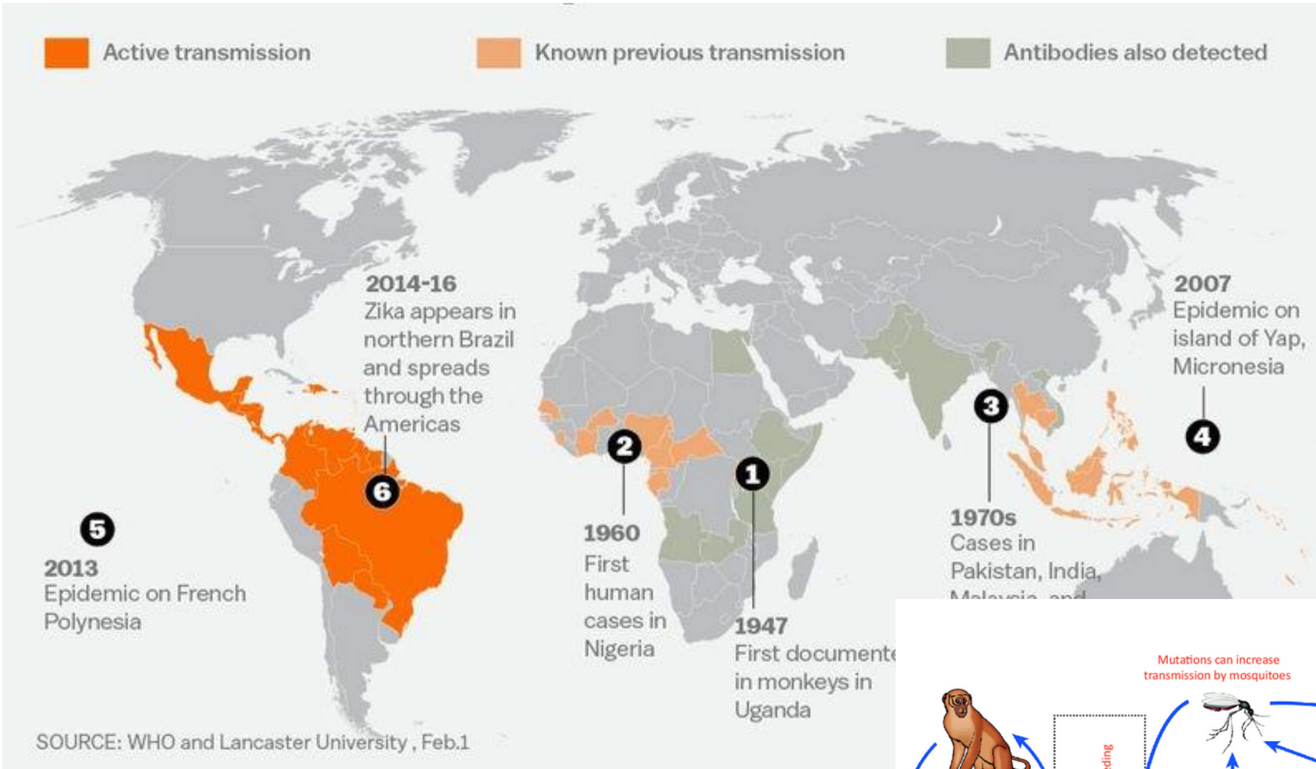
## Mortality Distribution

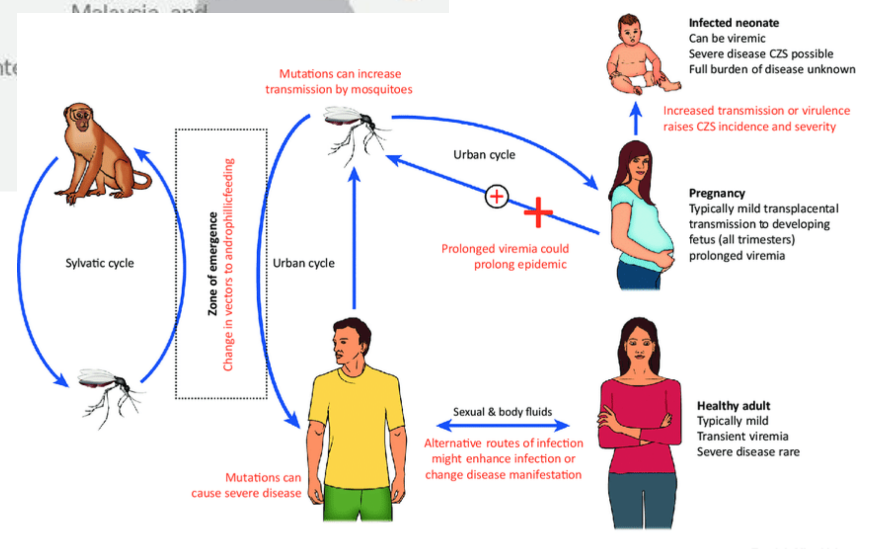



WHO, VBDs collectively account for more than 1.5 million human deaths per year (Hill et al., 2005).

# Zika Virus

## Spread



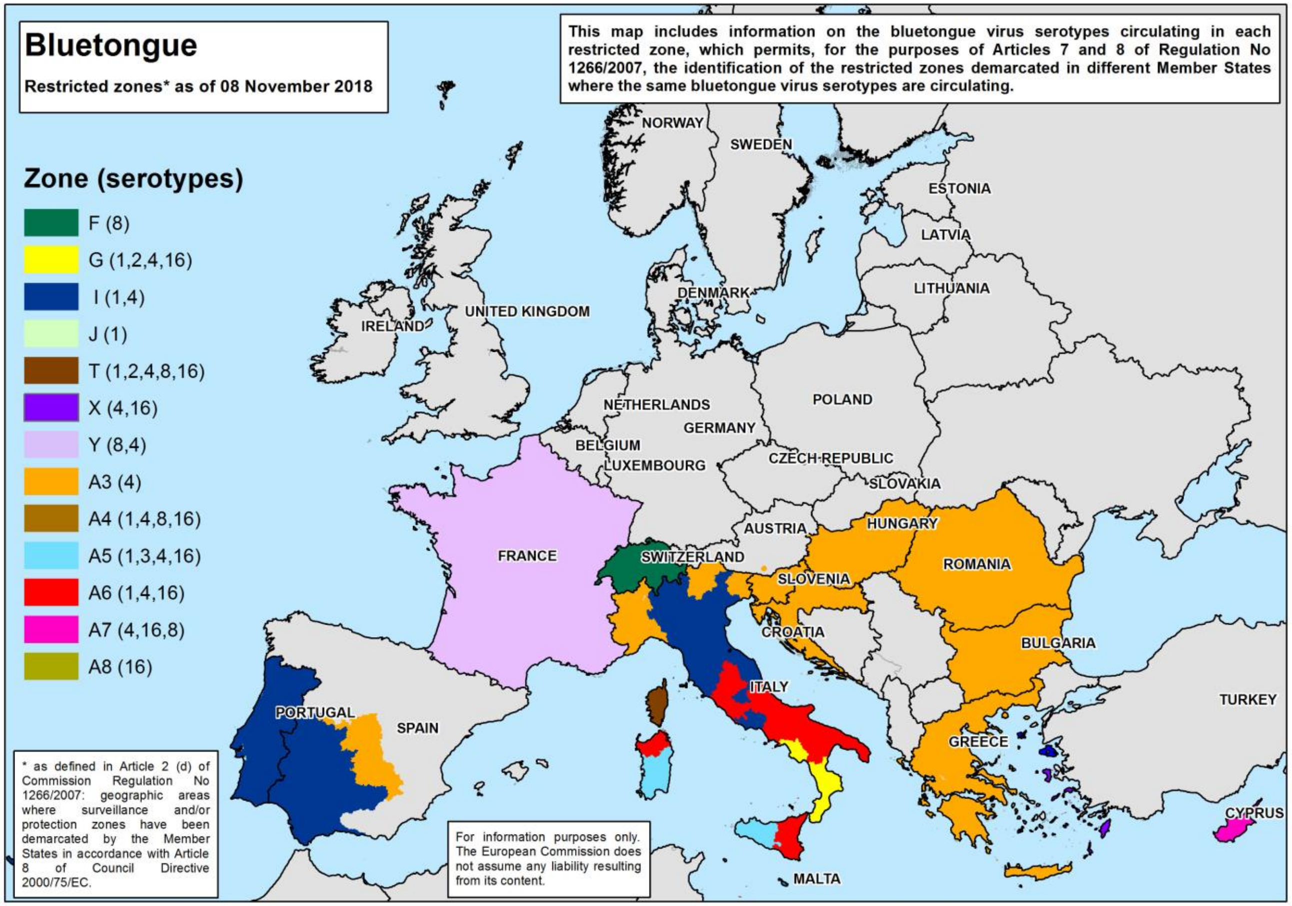
# Bluetongue (Ruminant)

## biting midge: Culicoides imicola

*Culicoides* biting midge

1st description 1905 in South Africa

Source: DEFRA



# Bluetongue: Austrian vector monitoring

**for declaring seasonal vector-free period** (Brugger et al., 2016

- Start of the seasonal vector-free period
  - as of the beginning of December, and/or
  - after 6 consecutive days with frost ($T_{min} < 0°$ C)
- Ending of the seasonal vector-free period
  - Catches with one *Culicoides imicola* or more than 5 (parous) *Culicoides obsoletus* and/or
  - after 7 consecutive days with mean daily temperature > 10° C and so the beginning of the vector activity can be expected.

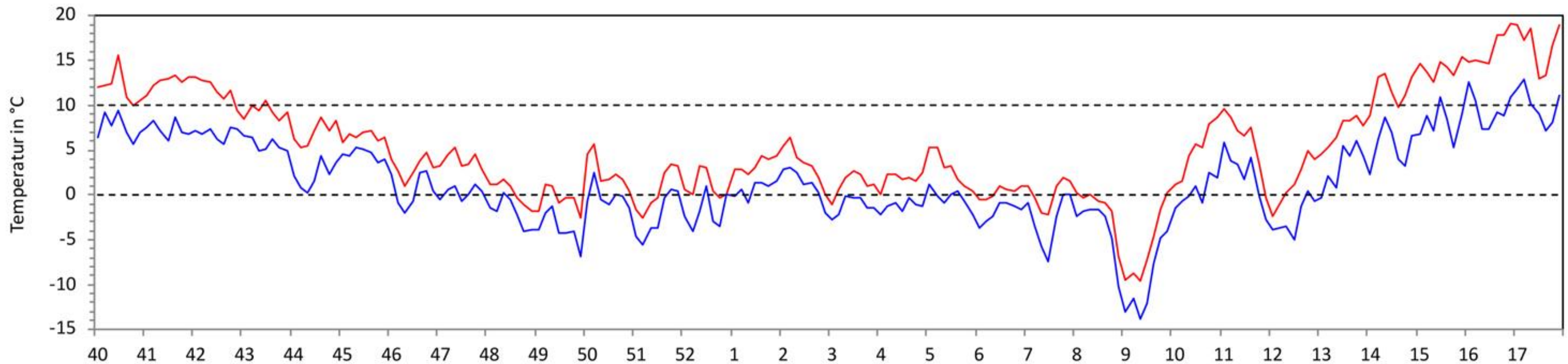
# Vector monitoring 2017/18 Bluetongue: Austrian

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Vektorfreier Zeitraum 1.12.2017 bis 30.4.2018 | | | | | | | | | | | |
| | Oktober | | | | November | | | | | Dez. | Jän. | Feb. | März | | | | April | | | | |
| **Standort** | **KW 40** | **KW 41** | **KW 42** | **KW 43** | **KW 44** | **KW 45** | **KW 46** | **KW 47** | **KW 48** | **KW 49** | **KW 2** | **KW 7** | **KW 10** | **KW 11** | **KW 12** | **KW 13** | **KW 14** | **KW15** | **KW16** | **KW 17** |
| Wien | 5/28 | 21/11 | 7/6 | 9/6 | 0/0 | 0/1 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 2/0 | 36/2 |
| Innsbruck | 2/0 | 3/5 | 5/2 | 0/1 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 |
| Linz | 0/0 | 1/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 1/0 |
| Mödling | 10/8 | 23/19 | 2/3 | 0/0 | 0/5 | 0/4 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 7/1 | 65/5 |
| Kagelsberg | 10/31 | 0/2 | 0/2 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 3/0 | 0/0 | 50/1 |
| Grafendorf | >50/>50 | >50/>50 | >50/>50 | >50/>50 | 1/9 | >10/>50 | 0/0 | 0/0 | 0/1 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 1/0 | 14/0 | 158/3 | 1/1 |
| Grünbach | 0/0 | 1/0 | 0/2 | 0/1 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 1/0 | 5/0 | 102/24 |
| Hohenzell | 0/0 | 11/8 | 0/3 | 0/2 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 1/0 | 0/0 | >50/>10 |
| St. Veit an der Glan | >50/>50 | >50/>50 | 24/47 | 10/20 | >20/>50 | >20/>50 | 0/2 | 0/20 | na/na | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 6/1 | 178/0 | >50/>10 |

Anzahl nullipare/pare Gnitzen
na ... keine Probe

keine Gnitzen
nullipare Gnitzen

< 5 pare Gnitzen
≥ 5 pare Gnitzen




Tagesmitteltemperatur bzw. Temperaturminimum (gemittelt über die Stationen Wien, Graz, Innsbruck, Klagenfurt, Linz)

# the role of nuclear technology in context emerging and re-emerging animal and zoonotic diseases?

# Cooperation: IAEA – AGES (AT)

## Our goals: health, food security, food safety

AGES

Austrian Agency for Health & Food Safety

IAEA

Joint FAO/IAEA Programme

Nuclear Techniques in Food and Agriculture

**to contribute to sustainable food security and safety by use of nuclear techniques and biotechnology**

Austria

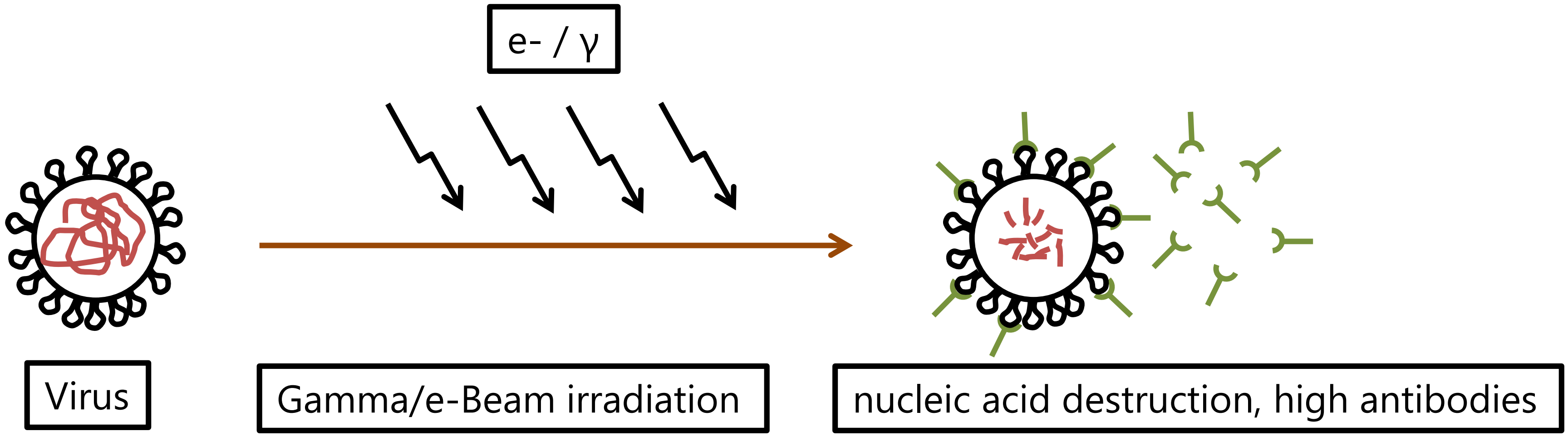
Center for Biosafety (L3+)

# Cooperation: IAEA – AGES (AT)

## Our goals: health, food security, food safety

- rapid diagnostic techniques
  - developing and validating early and rapid diagnostic techniques: ELISA, PCR, real time PCR and sequencing
  1. African Swine Fever, Lumpy skin Disease, Avian Influenca, ...

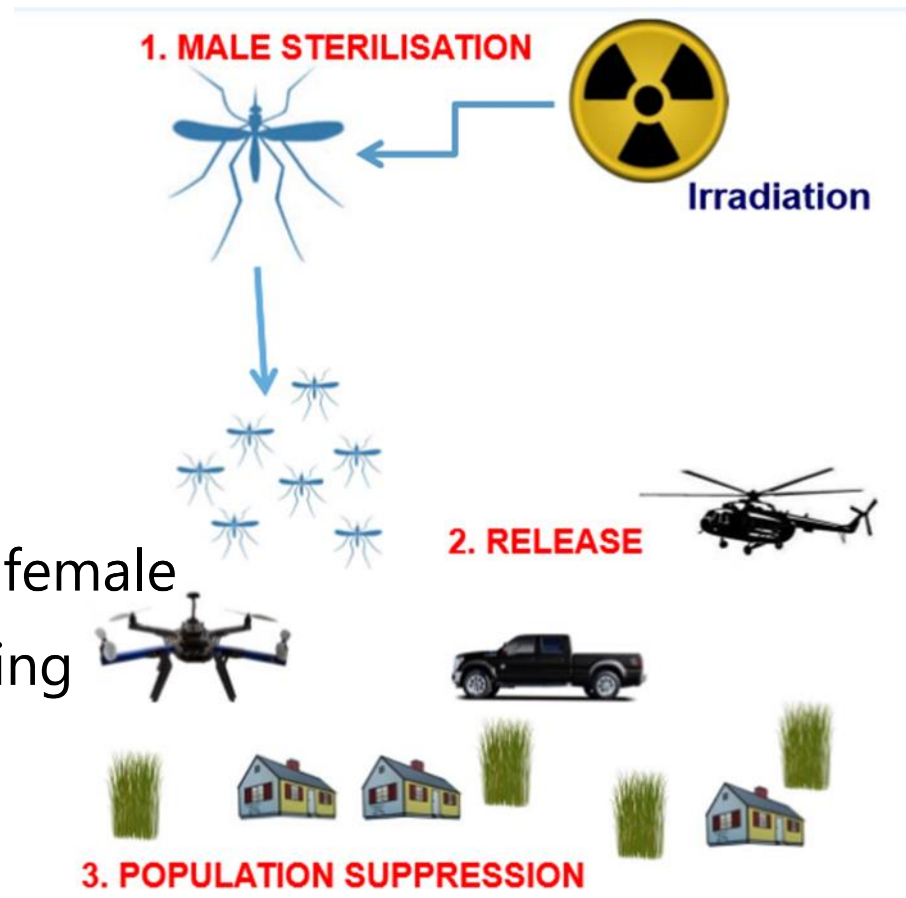
- irradiation of pathogens for vaccine production



# Sterile Insect Technique - Mosquitoes

## Insect pest controle

- The SIT Package:
  - Mass rearing
  - Sex seperation, males
  - Sterilisation by irradiation
  - Packing, Transport
  - Release




- Mating sterile male with wild female
- Matings result in no offspring

# Successful Uses of SIT to Manage Insect Pests


Pink Bollworm in USA
eradication

False Codling Moth in
South Africa
suppression

Mediterranean fruit fly
in various countries
Prevention,
suppression,
eradication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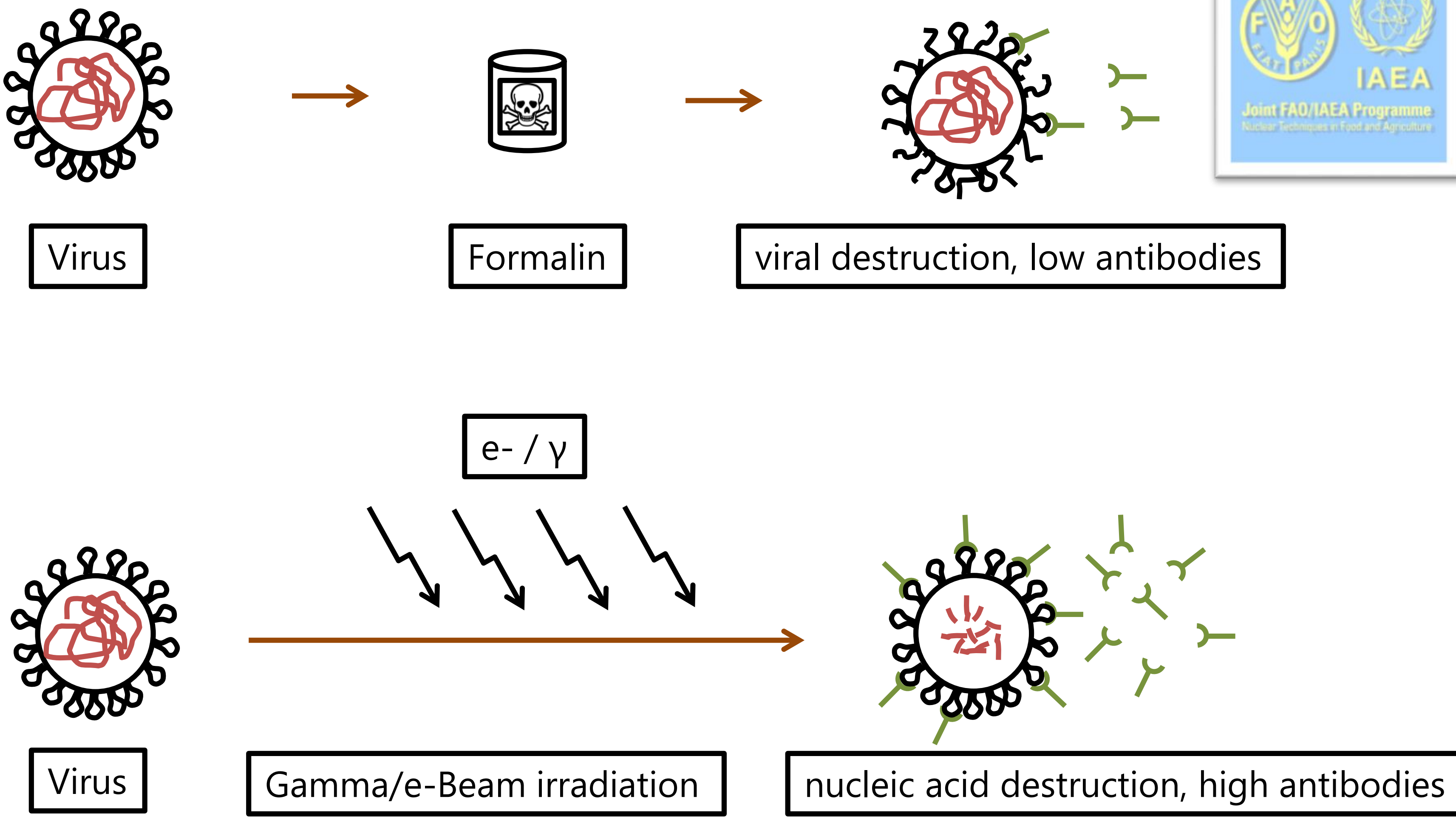
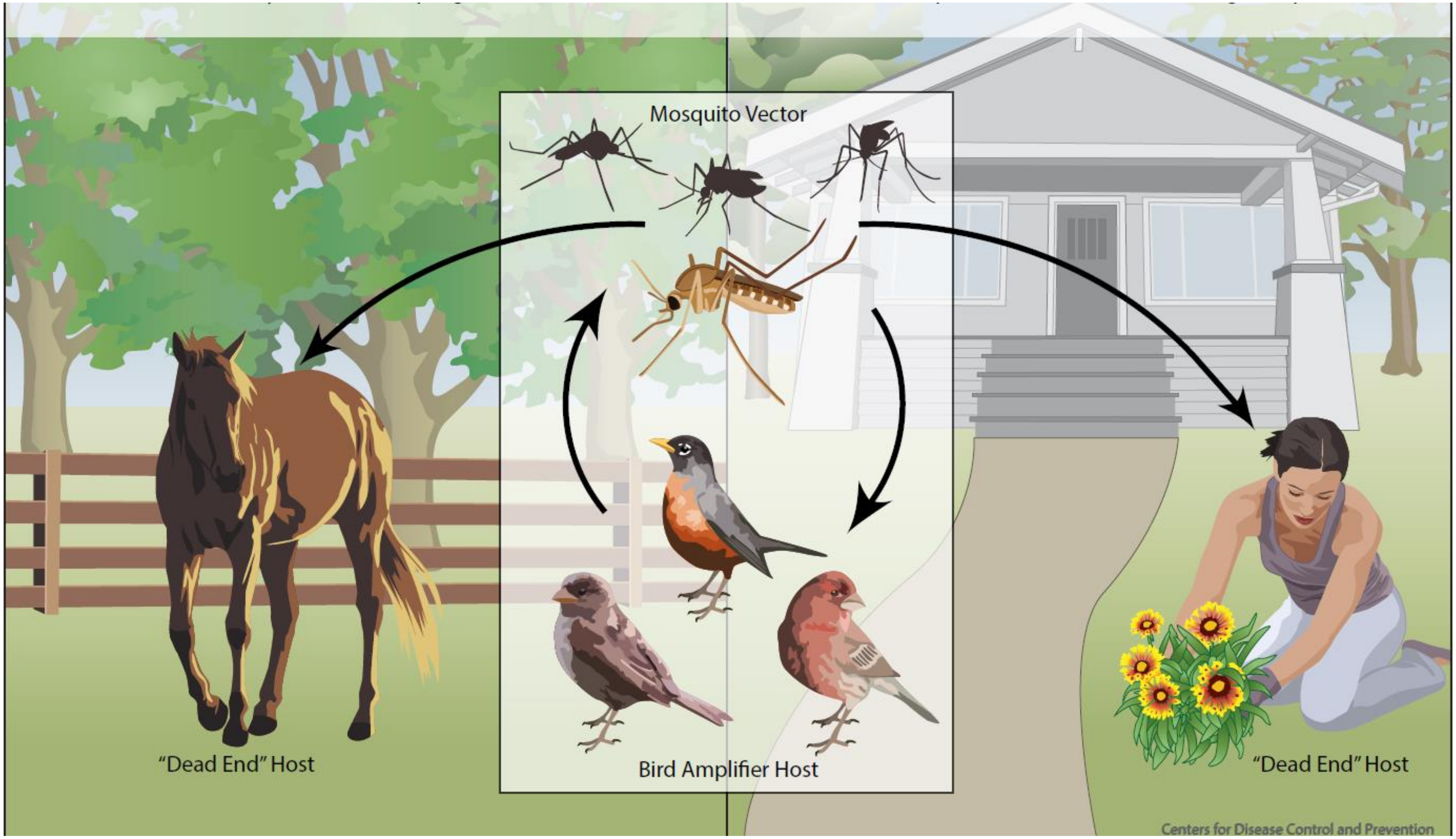
# Irradiated Vaccine – killed Vaccine

## Gamma- / e-Beam Irradiation



# West Nile Virus

## Transmission Cycle

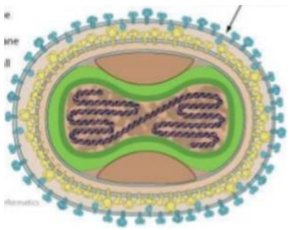


# West Nile Fever

## Geographical shift between 2015 and 2018


**2015-2016**


**2017-2018**

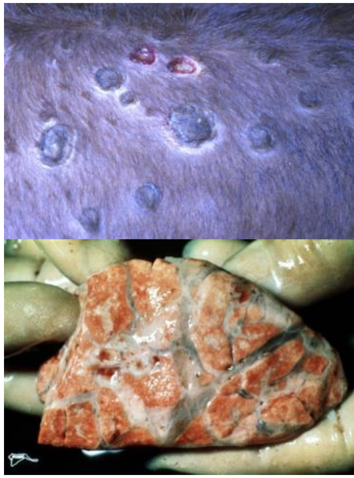


Caused by a virus from the family Poxviridae, genus Capripoxvirus
It is one of the biggest viruses

# Lumpky Skin Disease

## Transmission

- Direct contact
- Vector arthropods (mechanical
- Secretions / excretions



Skin and lung lesions
(Credit: Noah's Arkive, PIADC)

*Mosquitoes (Aedes aegypti)*

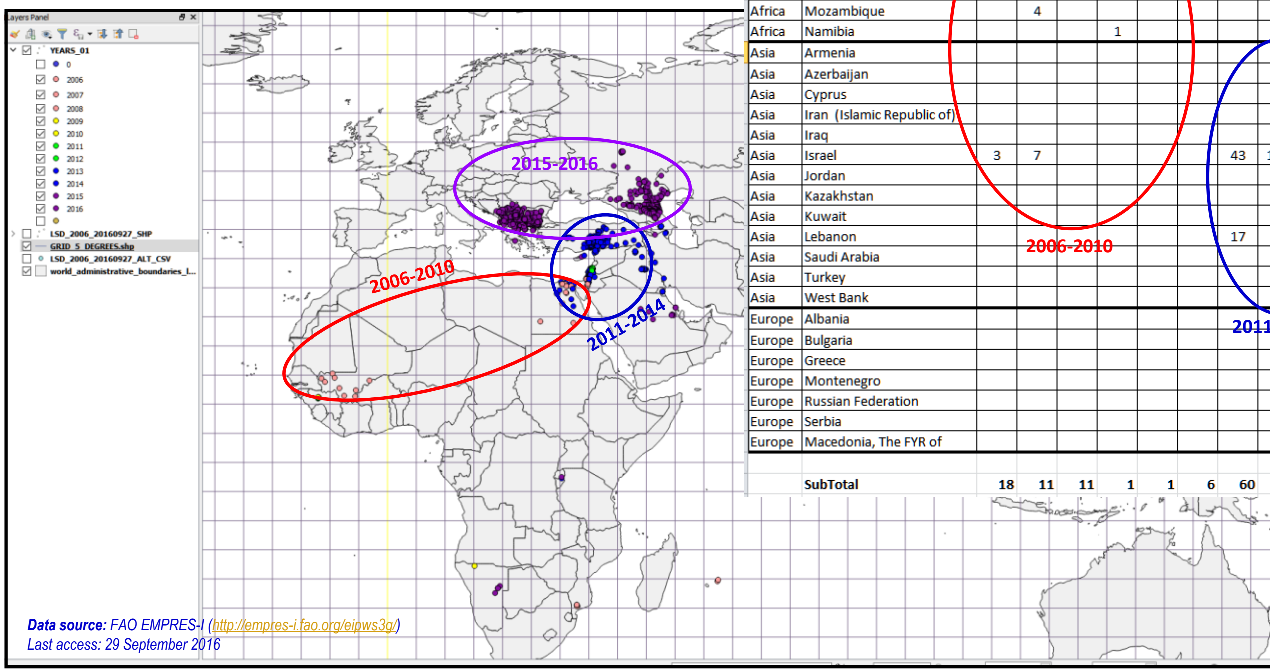
*Ticks, multiple species*
*(Ixodes, Ripicephalus, Hyaloma*, etc)

*Mosquitoes (Culex)*

*Stable fly (Stomoxys calcitrans)*

# Lumpky skin disease distribution

## January 2006 – September 2016




***Data source:*** *FAO EMPRES-I (http://empres-i.fao.org/eipws3g/)*
*Last access: 29 September 2016*

| Region | Row Labels | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | SubTotal | SubTotal (Region) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Africa | Burundi | | | | | | | | 1 | | | 1 | **2** | | |
| Africa | Egypt | 15 | | | | | | | 6 | 6 | | | **27** | | |
| Africa | Guinea | | | | | 1 | 6 | | | | | | **7** | | |
| Africa | Mali | | | 9 | | | | | | | | | **9** | | |
| Africa | Mauritius | | | 2 | | | | | | | | | **2** | | |
| Africa | Mozambique | | 4 | | | | | | | | | | **4** | | |
| Africa | Namibia | | | | 1 | | | | | | | 5 | **6** | **57** | 3% |
| Asia | Armenia | | | | | | | | | | 1 | | **1** | | |
| Asia | Azerbaijan | | | | | | | | | 16 | | | **16** | | |
| Asia | Cyprus | | | | | | | | | 1 | 1 | | **2** | | |
| Asia | Iran (Islamic Republic of) | | | | | | | | | 5 | | | **5** | | |
| Asia | Iraq | | | | | | | | 20 | 8 | | | **28** | | |
| Asia | Israel | 3 | 7 | | | | | 43 | 170 | | | | **223** | | |
| Asia | Jordan | | | | | | | | 2 | | | | **2** | | |
| Asia | Kazakhstan | | | | | | | | | | | 1 | **1** | | |
| Asia | Kuwait | | | | | | | | | 1 | 4 | | **5** | | |
| Asia | Lebanon | | | | | | | 17 | 17 | | | | **34** | | |
| Asia | Saudi Arabia | | | | | | | | | | 5 | 5 | **10** | | |
| Asia | Turkey | | | | | | | | 18 | 219 | | | **237** | | |
| Asia | West Bank | | | | | | | | 49 | | | | **49** | **613** | 33% |
| Europe | Albania | | | | | | | | | | | 82 | **82** | | |
| Europe | Bulgaria | | | | | | | | | | | 202 | **202** | | |
| Europe | Greece | | | | | | | | | | 117 | 101 | **218** | | |
| Europe | Montenegro | | | | | | | | | | | 63 | **63** | | |
| Europe | Russian Federation | | | | | | | | | | 17 | 220 | **237** | | |
| Europe | Serbia | | | | | | | | | | | 219 | **219** | | |
| Europe | Macedonia, The FYR of | | | | | | | | | | | 181 | **181** | **1202** | 64% |
| | **SubTotal** | **18** | **11** | **11** | **1** | **1** | **6** | **60** | **283** | **256** | **145** | **1080** | **1872** | **1872** | **100%** |

2006-2010

2011-2014

2015-2016