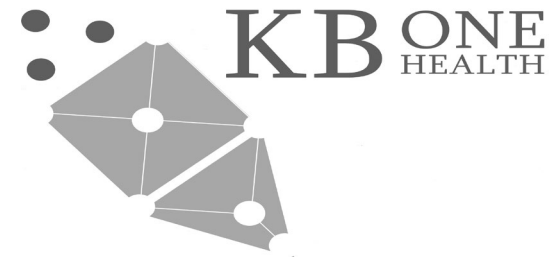


The Ten Egyptian Plagues: A Powerful Metaphor for Emergence of Epidemics

Michael Kosoy



When does plague start? What is the time of epidemics?

Plague epidemic is a process, not a static state

Sergei Meyen (the paleontologist):

- ✓ Time is a set of phases of individual variability ordered by nature
- ✓ Time represents quality (type) and only then quantity
- ✓ Time is a change of a biological object
- ✓ The change leaves "*footprints*", which can be used for the reconstruction

Nilton Bonder (the Brazilian rabbi):

- ✓ Time can only be measured through transformation of the form
- ✓ Time is a function of purpose
- ✓ Time is nothing more than a direction

Ten stages (phases) "*in the beginning*" of Plague:

- 1) environmental disruption
- 2) change of ecological niche for keystone animal species
- 3) presence of vectors for transmission of the infection
- 4) critical rate of mixture of wild animals and their ectoparasites
- 5) epizooties among animals
- 6) microbial evolution leading to specific pathogenesis
- 7) climate change
- 8) invasion of alien species
- 9) social disturbance
- 10) manifested epidemics

Plague 1.

ENVIRONMENTAL CATASTROPHE

Bloody waters (DAM)

Exodus 7-21:

*“The **fish-life that was in the River died**
and the River became foul”*



A river in Siberia has turned red

<https://www.npr.org/sections/thetwo-way/2016/09/08/493139519/a-siberian-river-has-mysteriously-turned-blood-red>

Plague 2.

CHANGE OF ECOLOGICAL NICHE

Frogs (TZEFARDEA)

Exodus 8-2:

“The frog- infestation ascended and covered the land...”



A migration of frogs before the earthquake in Sichuan province, China

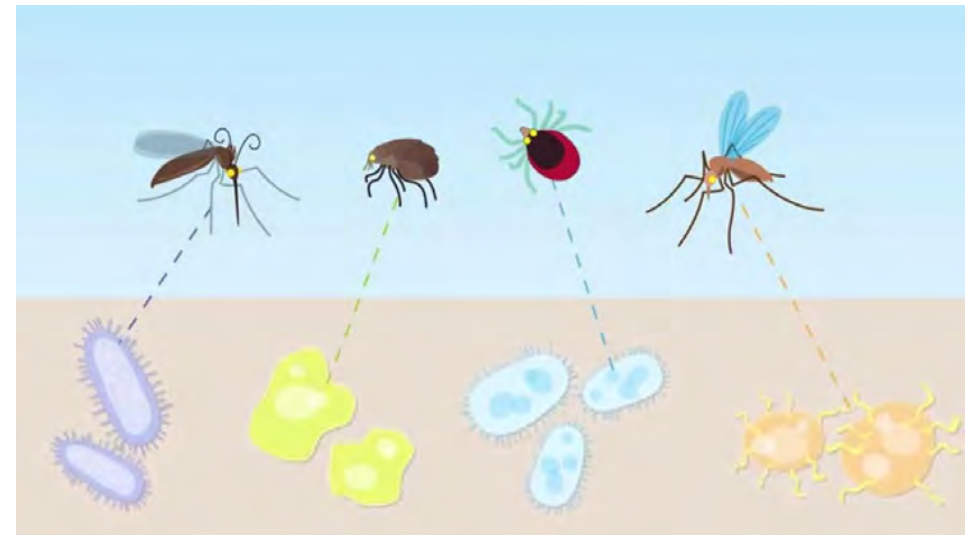
Plague 3.

VECTORS OF INFECTION

Pest insects (KINIM)

Exodus 8-13:

*“The lice -infestation was on man and beast;
all the dust of the land became lice”*



Plague 4.

CHANGE OF BIODIVERSITY

Mixture of beasts (AROV)

Exodus 8-20:

*“A severe swarm of wild beasts came ...
throughout the land of Egypt”*



Plague 5.

EPIZOOTIES AMONG ANIMALS

Pestilence (DEVER)

Exodus 9-6:

“All the livestock of Egypt died”



Cattle dead from viral infection in South Africa

Plague 6.

EVOLUTION OF PATHOGENESIS

Boils (SHEKHIN)

Exodus 9-9:

*“It became **boils and blisters, erupting on man and beast**”*



Plague tissue necrosis

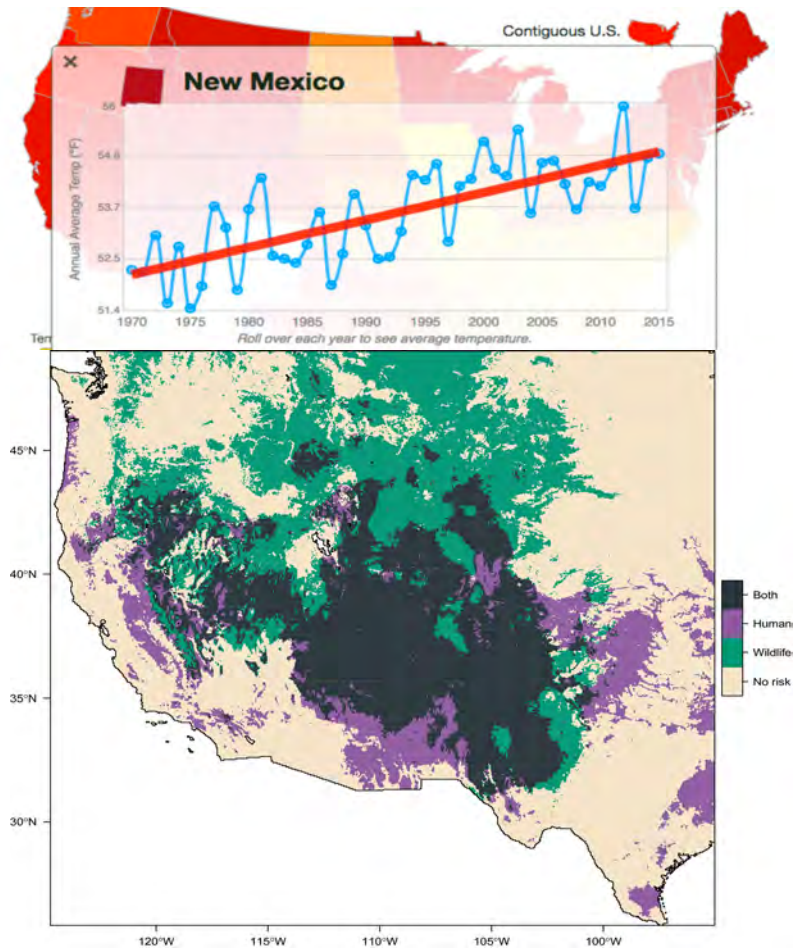
Plague 7.

CLIMATE CHANGE

Hail (BARAD)

Exodus 9-17:

“Rain a very heavy hail, such as had never been in Egypt”



Plague 8.

INVASION OF VECTORS

Locust (ARBEH)

Exodus 10-14:

“The locust-swarm ascended over the entire land of Egypt and it rested in the entire border of Egypt”



Locust swarm (Saudi Arabia, 2019)

Plague 9.

MENTAL BLINDNESS / SOCIETAL COLLAPSE

Darkness (CHOSHEKH)

Exodus 10-22:

*“A thick darkness throughout the land of Egypt...
No man could see his brother”*



“Emotional plague is characterized by infectious, destructive emotional reactions, and like other plagues may be crippling and deadly...” (Peter Crist 2008)

Plague 10.

EPIDEMIC: DEATH OF IMMUNOLOGICALLY
NAÏVE INDIVIDUALS

Death of the firstborns (MAKAT BECHOROT)

Exodus 12-30:

“There was not a house where there was no corpse”



The 1918 flu epidemic killed as many as 10% of all young adults in the world



Take-Home Lessons from the Story

- ✓ An epidemic is not just separate cases of disease caused by a specific pathogen. Plague is the chain of developing stages that leads to massive epidemics.
- ✓ Modern research on the evolution of zoonotic diseases considers specific parameters of manifested epidemics, whereas the Ten Plagues story provides an unprecedented picture of plague development in total complexity.
- ✓ The plague narratives provided in Exodus are very precise in illustrating the essence of epidemic stages.
- ✓ Reading the story of Ten Plagues can help to grasp the nature and meaning of the emergence of epidemics.