Final Report for PGTF Project on Rift Valley Fever

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Participants from Afghanistan, Egypt, Tunisia, Algeria, Palestinian State, Turkey and Jordan at JUST

Executive Summary

Under the patronage of the Dean of Research at Jordan University of Science and Technology, **Professor Gassahan Tashtoush** (above pic middle), with the presence of the Secretary Assistance to General Secretary of the Ministry of

Agriculture (above left), **Dr. Ibrahim Tayme**, with the presence of the Chief Veterinary Officer, Dr. Mahmoud Hanatleh, a three days' workshop was conducted about Rift Valley Fever between June 9-11, 2019 in Irbid Jordan. More than thirty scientists from Egypt, Algeria, Tunisia, Afghanistan, Turkey, Palestinian Authority and Jordan participated in this workshop either as speakers or participants. Veterinarians and animal scientists from the academia, private sector and national institutions and the Ministry of Agricultures from the participating countries were also involved actively in this activity. Graduate students and laboratory researchers from JUST attended and participated in this workshop. An overview of the emergence of the Rift Valley Disease (RVD) and its spread from Africa to Arab Peninsula (Yamen and Saudi Arabia) and its potentiality of spreading to other countries where the vector present was also discussed. A special session was given to the diagnostic capacities, sampling, transportation of samples, storage of samples, biosafety and risk reduction was conducted. Participation from the National Center for Agricultural Research and Extension was actively involved. Participants also from the above mentioned countries gave the current status of RVF in their countries while some gave also about their neighboring countries, like Afghanistan, Pakistan and Iran.

A graduate student currently is enrolled at JUST to do his Master thesis on RVF in Jordan.

A training workshop for a group of sheep and goats in Mafraq governorate was also conducted to raise awareness and enhance education. A brochure containing informative information was also prepared and will be distributed to the participating countries and organizations of interest to the RVF disease.

An official opening ceremony was conducted and speeches from representative of the participating countries were delivered regarding the appreciation of the networking and cooperation between countries in the region. All recommended organizing similar training workshops in the future.

In the following sections, we will report the main themes and concepts presented by the speakers.

Egypt:

The speakers from Egypt emphasized the following points:

Rift Valley Fever: An arthropod borne zoonotic disease

Prof. Dr. / Mohammad A. Nossair

Animal Hygiene and Zoonoses Department

Faculty of Veterinary Medicine, Alexandria University

Rift Valley fever (RVF) is a viral zoonosis that primarily affects animals but can also infect humans. The disease was first reported among livestock in Kenya around 1915, but the virus was not isolated until 1931.RVF virus has caused serious epidemics among sheep and cattle in the east and West Africa, led to death of great numbers of lambs. Outbreaks of RVF in animals can be prevented by a sustained program of animal vaccination. The majority of human infections result from contact with the blood or organs of infected animals. Also, they have resulted from the bites of infected mosquitoes. To date, no human-to-human transmission of RVF virus has been documented. The infected mosquitoes (Aedes and Culex) or other blood suckling insects are the main sources of infection. *Culexpipiens* is the main vector in Egypt. An outbreak has occurred in Egypt during the year of 2003 where; 148 cases including 27 deaths. The incubation period varies from 2 to 6 days. Those infected either experience no detectable symptoms or develop a mild form of the disease characterized by a feverish syndrome with sudden onset

of flu-like fever, muscle pain, joint pain and headache. A small percentage of patients develop a much more severe form of the disease. This usually appears as 1 or more of 3 distinct syndromes: ocular (eye) disease (0.5–2% of patients), meningoencephalitis (less than 1% of patients) and hemorrhagic fever (less than 1% of patients).

Prof. Dr. / Mohammad A. Nossair during his first and second presentations.

Epizitiological situation of Rift Valley Fever (RVF) in farm animals in Egypt

Tharwat Mohamed Elshemey, Professor of Infectious diseases of Domestic Animals, Faculty of Veterinary Medicine, Alexandria University

RVF is an arthropod-born acute viral disease of ruminant (sheep, goat and cattle) and human characterized clinically by abortion in pregnant ewes and cattle, high mortality in kids and lambs, and influenza like symptoms, temporary blindness and retinal damage in human.

RVF was first recorded in Egypt in 1977. Continued outbreaks of RVF among domestic ruminants, in 1977, 1978 and 1993, 1994, 1996, 1997, and 2003 indicate that the virus has become enzootic in Egypt.

Egypt is importing livestock and camels from the African Horn & Sudan for human consumption. The imported livestock and camels were usually not vaccinated against RVFV, but in rare occasions, the imported livestock were vaccinated but with unknown date of vaccination and the unvaccinated control contacts were unavailable for laboratory investigations.

The regulatory plan for livestock importation was to slaughter these animals upon their arrival for human consumption, some of these animals usually escaped slaughtering for breeding which led to introduction of RVFV from enzootic areas.

Vaccination with RVF live attenuated vaccines (Smithburn's strains) till 2008 plays important role in the persistence of endemicity of RVF in Egypt because it contaminates the environment and transmitted by insect vector beside continued importation of animals infected with RVF from the Sudan and African horn.

However, the vaccination programs for sheep, goat and cattle by killed vaccines only since 2008 which applied by Ministry of Agriculture have been limiting to great extent the possibilities of RVFV outbreaks in Egypt, but it should extend to cover all susceptible animals in Egypt.

To control the disease in Egypt, some investigators suggest the following measures: prevention of introduction of ruminants infected with RVF, especially camels, from countries where RVF is enzootic - annual vaccination of all ruminants (camels, cattle, buffaloes, sheep and goats) with an effective RVF vaccine - trials for control of insect vectors.

Under those circumstances, the use of inactivated RVFV vaccine is safe and effective in controlling RVFV especially when the vaccination programs are strictly applied and cover all domestic animals in Egypt.

Dr Tharwat M. Elshemey from Alexandria, Egypt, delivering his presentation and discussing vaccination program with colleagues from Palestine and Jordan.

Tunisia:

The speakers from Tunisia emphasized the following points:

Rift Valley Fever: Updated animal health situation in Tunisia and North Africa

Dr. SELMI Rachid
National school of veterinary Medecine, Sidi Thabet Tunisia

Abstract

The Rift Valley Fever (RVF) is an acute, re-emerging disease, due to a phlebovirus that mainly affects domestic and wild animals, but humans can also be infected. It is transmitted by different mosquito species particularly Aedes and Culex genera.

It causes wide economic losses. The RVF represent a threat for all countries in the Mediterranean basin. According to its geographic situation Tunisia is a zone at risk of RVF because it is subjected to a wide and continuous movement of live animals and/or their products particularly with the Lybian neighboring country suffering from a chronic politic and economic disorder. Millions of smalls ruminants and camels crossed the Saharan border line between Tunisia and Libya. These animals introduced to Tunisia were originated from Sudan, Chad and Niger. The problem that these animals were not slaughtered but raised, reproduced and sold with other local animals which may allow the diffusion of virus.

According to the bioclimatic stage, the geography of our country affords different bioclimatic stages (humid, semi-arid, arid and Saharan) allowing a wide ecological diversity. Besides susceptible animals existed throughout the national territories with considerable animal's densities. Different risk factors were involved in the RVF outbreak

including rainfall (62-167mm), the air temperature (28-32°c), the presence of a permanent and/or temporary waters, the altitude (<1500m) and finally the susceptible livestock densities.

The presence of oases, Sebkha of sijoumi, Chatt jrid and different river provides favorable conditions of the mosquito vector development. The recent overflow of Madjerda queen, after heavy rainfall in 2018 leads to the occurrence of Aedes albopictus for the first time in Tunisia 2018. This mosquito species existed in Italy, France, Morocco and Algeria and is incriminated in the transmission of the RVFv.
In Tunisia, mosquito species including Aedes (Ae. caspius and Ae. detritus) and Culex (Cx. pipiens and Cx. theileri) genus frequently found are considered important in the transmission and persistence of RVF (Gad et al., 1987). Culex genus was distributed throughout the national territories, however Aedes genus was limited to northern regions. In other Mediterranean regions, all mosquitos' species identified in Tunisia are present in other neighboring countries. Except Aedes aegepti was present in Egypt only, which may give argument for the occurrence and the maintaining of the infection in this country.

Until now, no official publication, notification, or declaration of FVR in Tunisia, Morocco, Algeria and Libya. The northern regions of the Maghreb are moderately suitable for RVF enzootics and highly suitable for RVF epizootics. RVF infection is poorly documented in Maghreb regions and the absence of notifications doesn't mean the absence of infection. (Arsevska et al., 2016).
Conclusion:

- Rift Valley fever outbreaks are regularly reported in East Africa and have also been reported in Mauritania
- Viral circulation exists
- Serological surveys are the best way for surveillance
- Notified human cases are cases of importation not indigenous cases

Dr. SELMI Rachid (left), and Dr. Imen OUERTANI (right) – TUNISIA, from Tunisia presenting his talk about RVF at JUST (Left). In the right picture, he is discussing with scientists from Turkey and Algeria.

Afghanistan, Iran and Pakistan:

Risk of Rift valley fever spread in Afghanistan, Pakistan and Iran

Assadullah Samadi, DVM, MVM Assistant Professor of Veterinary Epidemiology, Veterinary Science Faculty – Kabul University, Email: assad.samadi@gmail.com, JUST, Jordan, 10th June 2019,

Executive Summary

Rift Valley fever (RVF) is a transboundary zoonotic viral disease which can affect a variety of species, including ruminants and camels, causing high mortality in young animals and/or abortions in adults.

The RVF virus is endemic mainly in SubSaharan Africa, but it has also been seen in North Africa and some other locations. There are concerns that this virus might be spreading, after outbreaks were reported in Saudi Arabia and Yemen in 2000. RVF tends to occur in periodic epidemics, which typically occur after heavy rainfalls and may be devastating to domesticated livestock. RVF outbreaks in humans are preceded by epizootics in livestock, however, most of the major outbreaks have first been recognized in the human population, so it is a One Health issue with significant potential to emerge as a global concern. Many human cases are caused by occupational exposure to blood and tissues from infected animals, but mosquito-borne transmission can also occur .The most common form

of the disease is a self-limiting, flu-like illness, but sometime complication can occur and fatality rates are thought to be low (≤ 2%)

RVFV is an RNA virus in the genus Phlebovirus of the family Bunyaviridae. The virus is biologically transmitted to animals by mosquitoes, especially the species of Aedes and Culex. Sometime, biting insects may transmit the virus mechanically, Non-vector-borne transmission is not considered a major means of transmission in animals. Humans also can be infected by mosquito bites, but the majority of human cases are thought to result from handling the blood, tissues, secretions or excretions of infected animals, notably after abortion. This may be through handling, milking, slaughtering, butchering or necropsying such animals. Exposure to aerosols during slaughter of infected animals is thought to be a major risk factor. Consuming infected animal products like fresh meat, milk and urine is also a source of infection

There are more than 26 billion food producing animals worldwide which include about 1.47 billion cattle, 1.17 billion sheep, 1.00 billion goats, 22.7 billion chicken and 1.14 billion duck. Based on the last estimates, Afghanistan has a population of 35 million which 71% of them are living in rural areas. Total 28.3 million sheep, goat, cattle, camel, horses and donkeys are present in Afghanistan.

There is no any data available about the presence/absence of RVF in Afghanistan, Meanwhile, Wallace et al, 2002 stated that RVF is not known to occur in Afghanistan and there is little reason to suspect that it is present but It does not mean, that Afghanistan is free of RVF since The routine veterinary surveillance does not cover RVF

cases. It is worth to be mentioned that many infectious and zoonotic diseases including Brucellosis, Tuberculosis, Anthrax, Clostridial diseases, Q. Fever, CCPP & CBPP, FMD, PPR, S&GP, CCHF, Rabies, AI, Polio, AIDS and so many others in humans and animal populations are endemic in Afghanistan.

There is no any data available about RVR occurrence in Pakistan, but, presence of Aedes and Culex species are confirmed since long time in Pakistan. DENV that has been transmitted by Aedes species, is endemic to Pakistan. Antibodies and syndromic surveillance indicated the presence of RVF in India since long time. Meanwhile, it has been indicated by FAO (2003) that Pakistan and India may be considered potential extension zones for RVR.

Following the outbreak of RVF in Saudi Arabia in 2000, surveillance of both animal and human population in Iran increased until 2011. During this period 1206 ovine, 405 Caprine, 325 bovine and 28 camel samples were tested for RVFV in nine provinces in Iran. None of these samples tested IgG positive. Moreover, amongst 37 clinically suspected human cases of patients with RVF symptoms, none of these samples tested positive for RVFV. Again, from January 2016 to December 2016, Blood samples were collected from 288 ruminants (118 cattle, 142 sheep and 28 goats) in Kurdistan province (border of Iraq). The presence of RVFVspecific antibodies was investigated by cELISA and IIFA and five (1.74%) of total 288 animals which included two cattle of 118 (1.7%), and three sheep of 142 (2.11%) were positive by both test. It could indicate that virus may circulating in animal populations in the area.

It is concluded that infectious diseases are a never ending threat to human and animal populations. Vector borne diseases including RVF are continuously expanding their geographic distribution due to climate change, urbanization and other factors. The presence of amplifying hosts, vectors and favorable climate conditions in Afghanistan, Pakistan and Iran make these countries as risk-area zones for many arboviruses including RVFV. Vaccination of livestock animals, vector control and safe handling of infectious samples are important preventive measures. Continuous surveillance is needed to check any changes in the occurrence and prevalence of diseases for early response and control of such infection in human and animal populations.



Dr. Assadullah Samadi, DVM, MVM Assistant Professor of Veterinary at Kabul University.

Animal Health and Disease Control in Jordan with Reference to RVF

Dr. Mahmoud Hanatleh, CVO, Jordan

Dr. Hanatleh presented the number of animals in Jordan and the type of species. He also reported animal diseases and vaccination programs followed in Jordan

Animal Health Situation

Vaccination program

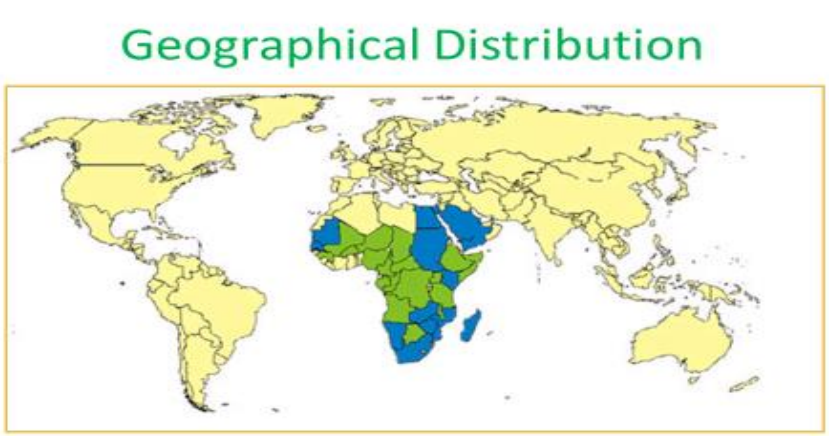
أعداد الحيوانات المحصنة ضد الأمراض المعدية والوبائية:

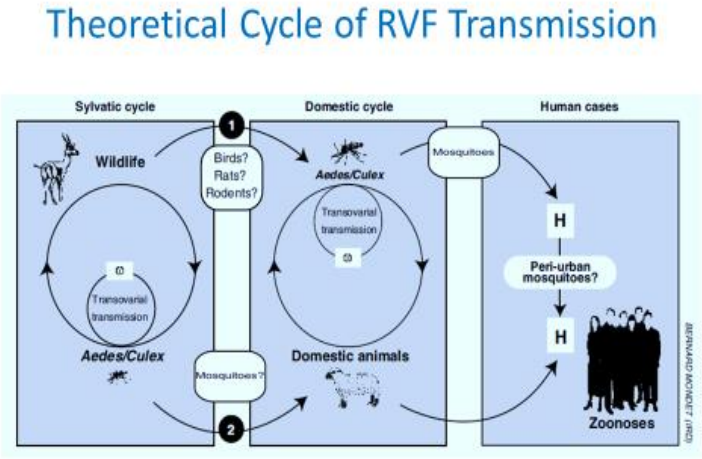
نوع الحيوان	أعداد الحيوانات المحصنة ضد الأمراض المعدية والوبائية						
	2012	٢٠١٣	٢٠١٤	٢٠١٥	٢٠١٦	٢٠١٧	٢٠١٨
ضان	5836733	٥٠٢٩٤٥٢	٥٦٦٥٣٩٧	٥٥١١٨٧١	٧٣٣٩٠٩٥	8150868	7760257
ماعز	1679207	١٤٦٨٢٥٧	١٥٦٩١٦٨	١٣٩٦١٤٩	١٨٣٠٢١٩	١٩٧٢٧٩٧	1883659
ابقار	76854	١٠٧٦٧٩	١١٣٢٨٦	١١٣٧٢٦	١١٨٠٥٣	112493	157145
جمال	1822	١٨٥٩	٨٦٣	٧٩٩	٧٥٠٨	2980	2942
خيول	664	٦١٢	٦٩٣	٤٦١	٩٧٦	832	1122
كلاب وقطط	4091	٢٤٩٣	١٤٩٨	١٧٣	٢٦٩	٦٢	76
المجموع	7599371	٦٦١٠٤٥٢	٧٣٥٠٩٠٥	7023179	٩٢٩٦٣٩٠	10667627	98399156

Clinical Presentation of RVF in Sheep and Goats

Dr. Sameeh AbuTarboush, Associate Professor at JUST.

- Acute febrile disease, aaffecting animals & humans, ccharacterized by hepatitis, high mortality and abortion in animals. Ruminants are amplifying hosts and ccauses influenza-like illness in humans and may lead to high economic loss.





- **Goats and Sheep**
- Goats less severely affected
  - Much lower morbidity and mortality
  - Fewer abortions
  - Less severe clinical signs
- Four Forms
  - Peracute
  - Acute
  - Subacute
  - Inapparent
  - **Peracute form:**
  - 90 – 100 % Abortion
  - 80 – 100 % of lambs less than 10 days die
  - Sudden death (hours after pyrexia)

- Collapse and death (only signs)
- Depression, weak to suck or stand
- Death 24 to 48 hours
- Fever, increased RR, and prostration
- **Acute form**
- Older Lambs (2-3 weeks old)
- Severe clinical signs
- Fever, increased RR, nasal discharges, vomiting?, abdominal pain
- Generalized lymphadenitis and gait abnormalities
- Recumbency, hemorrhagic diarrhea, abortion
- Death 24-48 hours (for 10 days)
- Mortality (10-60 %)
- Sick and recovering animals (jaundice)
- **Subacute:**
- More frequent in adult animals
- Fever for 1-5 days (40.5° - 42°C)
- Anorexia, injected conjunctiva, and vomiting
- Less severe than that seen in young animals
- Abortion, diarrhea, and colic
- Incoordination, weakness, recumbency
- Jaundice, weak, unthrifty for months
- Mortality 5-20%
- Differential diagnosis:

- Nairobi sheep disease – no hepatitis, not in newborn lambs
- Bluetongue – mouth and foot lesions (coronitis)
- Heartwater – serous fluids in body cavities; neurological signs
- Ephemeral fever – recumbency and rapid recovery
- Wesselbron – rare viral disease, less severe than RVF
- Toxoplasmosis, leptospirosis, brucellosis, Q fever, salmonellosis – basic diagnostic methods for differentiation
- Peste des petits ruminants – high mortality in lambs
- Foot-and-mouth disease – neonatal mortality and abortions in small ruminants

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Summary

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Turkey:

STUDIES ON Rift Valley Fever in Turkey

Dr. Şirin Gülsün ÇİZMECİ, Etlik Veterinary Control Central Research Institute, Viral Diagnosis Laboratory/ Ankara- TURKEY

Summary of the Presentation

Rift Valley fever (RVF) is a viral zoonosis that primarily affects animals but also has the capacity to infect humans. Infection can cause severe disease in both animals and humans. The disease also results in significant economic losses due to death and abortion among RVF-infected livestock. The investigation of Pestivirus and Rift Valley Fever Virus Infections in Aborted Ruminant Foetuses in the Black Sea Region in Turkey.

The first serological evidence for Rift Valley fever infection in the camel, goitered gazelle and Anatolian water buffaloes in Turkey. For the detection of RVFV, three tests were performed:

1. Detection of RVFV N-specific antibodies in human and animal sera by Indirect ELISA
2. Detection of antibodies to RVFV by immunoblot analysis (*Faburay et al., 2013*)
3. TaqMan real time RT-PCR analysis

RESULTS- in children:

- Of the 110 sera from children, 4 samples had OD values above the mean cut off value and representing a prevalence of 3.64%. Two of these ELISA positive samples and 5 more samples that had OD values just below the mean cut-off value also showed positive reactivity in the western blot indicating a seroprevalence of 6.3 % (7/110) for human sera.

Results in sheep and cattle:

- Amongst the 160 sheep sera, 6 samples had OD values above the mean cut off value and representing a prevalence of 3.75%.
- In addition to the 6 ELISA-positive sera, three additional samples, and with OD values just below cut-off and the positive control sheep serum showed clearly positive reactivity in western blot. This indicates a seroprevalence of 5.6% (9/200) for the cattle sera.
- A total of 200 cattle sera, 9 samples had OD values above the mean cut off value and representing a prevalence of 4.5%.
- In addition to the 9 ELISA-positive sera, two adtional samples, and with OD values just below cut-off and the positive control cattle serum showed clearly positive reactivity in western blot. This indicates a seroprevalence of 5.5% (11/200) for the cattle sera.

- No RVFV-RNA was detected by TaqMan real-ime RT-PCR assay, in human, cattle or sheep blood
- In this study, for the first time, the serological prevalence of RVFV in humans, cattle and sheep, in Turkey was described.
- Results of this study suggest the occurrence of low level circulation and transmission of RVFV in humans and livestock in Turkey during
- There is evidence that RVFV has the ability to spread from known endemic areas to new non-endemic territories.



Jordan

Dr. Aws Bataineh, Master student at the pathology laboratory and supervised by Dr. Nabil Hailat
Abortion is any pre-term loss of a fetus or embryo. It is one of the most prominent problems of small ruminant livestock in many countries including Jordan. Rift Valley fever (RVF) is an important human and animal mosquito-borne pathogen caused by RVF virus (RVFV). In addition to the economic losses in small ruminants breeding practice, many of the abortive agents are known to have zoonotic potential. There are global concerns about the transmission of RVF disease to Europe and the Americas because of the presence of insect vectors, which could lead to human infection and huge economic losses.

After reviewing and analyzing the results of a previous study that was conducted on the main causes of abortions in small ruminants in Jordan (Brucellosis, Chlamydiosis and Toxoplasmosis), we found that many cases were not diagnosed although they had pathological lesions, suggesting other causes of abortions. Therefore, one hundred small ruminant aborted fetuses will be collected and examined during a lambing/kidding season from northern Jordan to identify the gross and histopathological changes. Emphasis will be given to the changes seen in the liver for the purpose of investigating RVF and campylobacter using histopathology, IHC and PCR.

The causative agent of RVF is RVF virus (RVFV), it belongs to Bunyaviridae familyand Phlebovirus genus. All Bunyaviruses, including RVFV are segmented negative-sense, single stranded RNA. The genome segments are large (L), medium (M) and small (S), L segment encodes viral polymerase protein, M segment encodes glycoproteins (Gn and Gc) and nonstructural protein (NSm), while S segment encode nucleoprotein (N) and nonstructural protein (NSs).

RVFV has been isolated from many mosquito genera, Aedes mosquitoes as both primary enzootic reservoir and vector, While Culex, Anopheles, and Mansonia as secondary vectors. Aedes mosquitoes are able to transmit the virus to their offspring, thus maintained the virus in an enzootic cycle. Moreover, the virus was isolated from ticks, flies, and midges with unknown role in biological transmission.

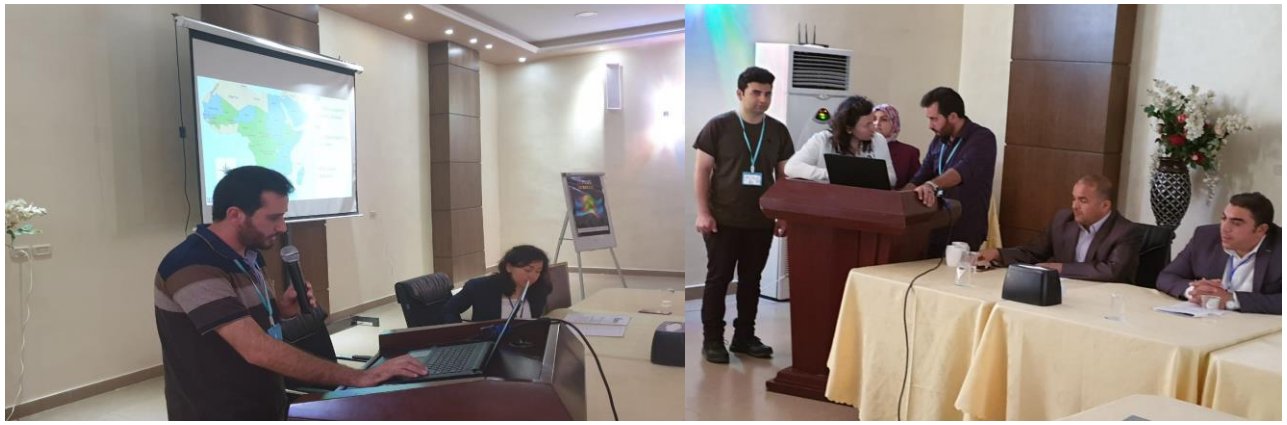
RVF occurrence depends on climate, because rainfall is the optimal environment for mosquito breeding. In 2010, an outbreak occurred in northern Mauritania after a period of unusually heavy rainfall.

The main gross findings are mottled liver, enlarged lymph nodes and splenic capsular hemorrhage. Since liver is the target organ of the virus, mottled appearance of the liver due to necrotic foci and hemorrhage is a characteristic lesion of RVF. The hepatic and splenic necrosis are the main histopathological findings of the disease.

The most severe form of the disease occurs in fetuses and very young animals. Mortality rates are 90% in lambs and kids; 30-50% in adult sheep and goats; 20% in calves; and 5-10% in adult cattle. While abortion rates are up to

100% in sheep and goat; and up to 85% in cattle. It seems that both mortality and abortion rates are higher in sheep and goats than in cattle. In general, sheep are more severely affected than goat with higher morbidity and mortality.

VNT is the best test according to sensitivity and specificity so it is the gold standard serological test. Indirect detection of the virus by antibodies is more reliable than the direct detection by virus isolation and Polymerase chain reaction (PCR) due to relatively short viremia period in animal hosts



Dr. Awes Bateinah, Master student from Jordan working on RVF in sheep and goats.

JORDAN

Rift Valley Fever in Saudi Arabia and in Yemen

Qusay W. AlKhateeb, MSc student, Jordan University of Science and Technology

Saudi Arabia:

- The epizootic had occurred in August 2000 to April 2001.
- 66% of the cases were in Jazan& 27% in Asir governorates.
- Human cases were 886 (in all regions), 683 (82%) were laboratory confirmed.
- 11,882 human cases with 164 deaths were reported [5-7].
- Case fatality rate was 14%.

- According to Breed (local breeds were more resistant)
- According to Age (young animals were more affected)
- According to Sex (abortion storms were observed) (Elfadil et al., 2004)

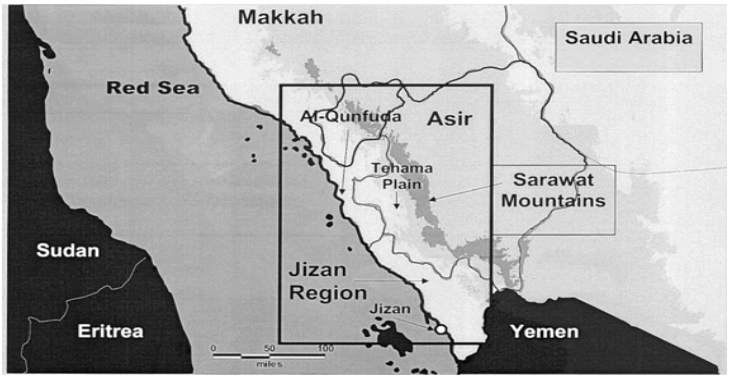


Figure (1) Areas affected by the Rift Valley fever epidemic in Saudi Arabia, 26 August 2000 through 22 September 2001.Clinical Infectious Diseases, Volume 37, Issue 8, 15 October 2003, Pages 1084–1092,https://doi.org/10.1086/378747OXFORD UNIVERSITY PRESS

*Risk Factors to RVF in KSA:

- Both mosquito bites & animals = 76%

- Mosquito bites only = 22%
- Animals only = 1%
- None of the above = 1%

• 62% reported abortion storms in animals

• 51% reported extraordinary animal deaths (Madani et al., 2003)

*Seroepidemiological active surveillance in KSA:

These data were being conducted annually in the rainy season:

In 2003 infection rate was zero, and in 2004 infection rate was 0.36%, and clinically affected herds were diagnosed!

In 2005 infection rate was zero, in 2006 infection rate was 0.28%, no clinically affected herds were diagnosed!

*Incidence of RVF in Jazan Measured by IgG in Sentinel Animals, 2011-2014:

- 2011: 7/244/year
- 2012: 12/237/year

- 2013: 12/225/year
- 2014: 10/213/year

* No IgM cases were diagnosed, and No clinical cases were diagnosed

*Rate of recent infection investigated sacrifice animals in Holy Mecca During Pilgrimage Season:

Out of 580 investigated sacrifice animals, 15 cases (2.59%) and 273 cases (47.06%) were positive for IgM and IgG ELISA testing, respectively. (Amr M. Mohamed et al, 2011)

Economic impact of RVF on Saudi Arabia:

- 20 million pastoralists in East Africa are highly reliant on sales of livestock to Saudi Arabia.
- About 10-15 million head of livestock are exported to Saudi Arabia annually.
- Small ruminants trade to Makkah estimated to be worth US$ 0.6-0.9 billion/year.
- Saudi Arabia banned importing livestock from East Africa after the 1997/1998 and 2006/2007 RVF outbreaks.

Disease Occurrence in Yemen:

- In 19 October, the Ministry of Public Health in Yemen has reported 653 suspected cases, including 80 deaths [WHO, 2000].
- In Yemen, reported 1,080 human cases and 141 deaths [Pepin M,2010], over 20,000 abortion animals and 620 dead [Abdo-Salem AS,2011].
- The Tihama coast was the most affected area in Yemen; Sa'adah, Hajjah and Al- Hodaidah governorates - An area characterized by « Wadis » (OIE, 2001).

Surveillance samples tested for RVF
2003 – 2011 according to OIE:

Rift Valley Fever Seroprevalence Annual Report in Yemen (OIE)									
	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total animals tested for IgM & IgG	360	N/A	2,912	772	4,108	482	912	183	23
Positive animals for IgM testing	0	N/A	0	0	10	0	0	8	10
Positive animals for IgG testing	52	N/A	2	8	86	0	0	0	0
Total Positive Animals for both tests	52	N/A	2	8	96	0	0	8	10

JORDAN

Dr. Mohammad Abdalla

Assistant Professor, faculty of Medicine, Jordan University of Science and Technology

My presentation is about human diseases caused by Rift Valley fever virus. I introduced briefly about structure of the virus. Then I gave an idea of pathogenesis, clinical sign and symptoms, diagnosis, treatment and infection prevention and control aspects of the disease caused by the virus.

Rift Valley Fever – DNA

- Mosquito-borne viral disease, affects both livestock and humans, listed as a neglected tropical disease, firstly emerged in the mid-19th century, Identified in the 1930s in the Rift Valley region of Kenya.
- Single-stranded and enveloped RNA virus, belongs to the Bunyavirales, consists of 3 segments, incubation period of 1-6 days, Infective period of 30 days.
- Signs and Symptoms of RVF in animals and humans.
- RVF virus transmitted via contact with the blood, bodily fluids, or tissues of RVF-infected livestock but less commonly, via bites from RVF-infected mosquitos.
- Life cycle of the RVF virus and epidemiology of RVF.
- RVF diagnosed in humans by histopathology, virus isolation, serology and molecular diagnosis and surveillance using RT-PCR and DNA sequencing.
- RT-PCR is currently being used to servile mosquito populations for RVF infection.
- RT-PCR can be used to detect RVF virus RNA in a single infected mosquito.
- The sensitivity of the RT-PCR assay is dependent on the sample source, nucleic acid extraction method, and thermal cycling conditions.
- DNA sequencing, All the 2008 isolates clustered in Lineage C while the remaining 2009 and 2010 isolates clustered in Lineage H.

Rift Valley Fever
Clinical signs and presentation

- Acute febrile disease, aaffecting animals & humans, ruminants are amplifying hosts.
- Characterized by hepatitis, high mortality and abortion in animals, causes influenza-like illness in humans, may lead to high economic loss.
- Animals affected include; Sheep, goats, Cattles, Camels, Dogs, Cats, Rodents and in apparent in Horses.
- Four Forms; Pre-acute , Acute, Subacute , In apparent.
- **Pre-acute Form:**
  90 – 100 % Abortion
  80 – 100 % of lambs less than 10 days die, Sudden death (hours after pyrexia).
- **Acute Form:**
  Mortality (10-60 %), Death 24-48 hours (for 10 days). **Subacute Form:** Mortality (5-20%), fever for 1-5 days (40.5° - 42°C). **In-apparent Form:** In older or resistant animals, abortion may occur. RVF in Camels: Mostly do not show clinical signs, mainly abortion and death in neonates. In dogs: abortion up to 100% and severe disease and death in puppies. Cats: death in kittens
- **Clinical pathology:** Leukopenia, thrombocytopenia, high liver enzymes (GLDH)

- **Differential Diagnosis:** bluetongue, Heart water, Ephemeral disease, Wesselbron, Toxoplasma, Peste des petit, FMD.

Dr. Mohammad Abdalla, presenting RVF in Humans, from JUST

JORDAN

Abortion In Sheep And Goat

Dr. Abdelsalam Talafha, DVM, Diplomate American College of Theriogenologists

- **Abortion:**
  Loss of conceptus anytime during gestation
  Most common during final 2 m
  Abortion rates: 5%

- **Causes of abortion:**
  - Infectious agents**:** Brucella, Chlamydophila abortus, Campylobacter species**,** Toxoplasma gondii, Bluetongue virus, Border disease virus**,** Akabane virus and **Rift Valley Fever.**
  - Stressors
  - Pharmaceuticals
  - Nutritional deficiencies
  - Toxic plants

- **Rift Valley Fever.**

- Peracute or acute arthropode (mosquitoes)-borne febrile disease, affect Sheep, goats, cattle.

- High mortality rates in neonates and abortion in pregnant animals

- Can affect humans: Severe influenza-like illness, hemorrhagic fever, encephalitis and occasionally death

- **Epidemiology: Most Recent Outbreak – Humans**:
  Mauritania – Sudan – Senegal – Somalia – Niger – Kenya – South Africa.

- **Etiology:**
  Phlebovirus (Bunyaviridae)
  1 serotype
  Stable at: (-60ºC to 23°C) (50-85% humidity)
  Inactivated:Lipid solvents – Detergents – Low pH.

- **Reservoir:** Mosquitoes.

- **Amplifying Hosts**: livestock and humans.

- **Host Range:** lambs, kids, puppies, kittens and mice.

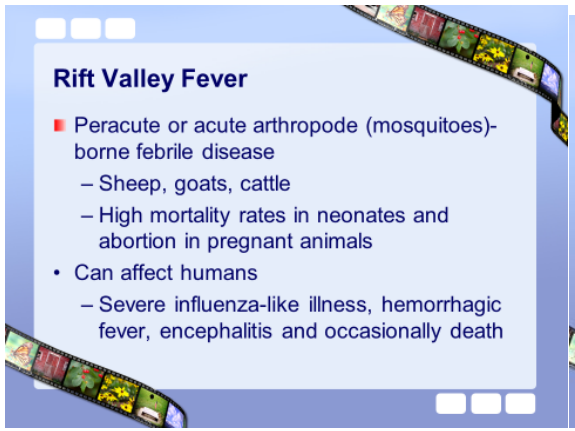
- **Incubation period:**
  12-72 hours in newborn animals
  24-72 hours in adult animals
  3-6 days in humans

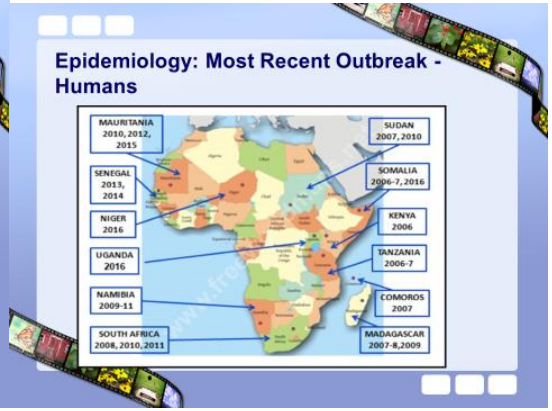
- **Morbidity:** Can be very high.

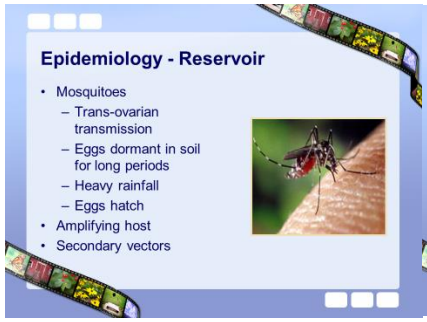
- **Mortality:**
  70-100% in newborn
  10-70% in older lambs

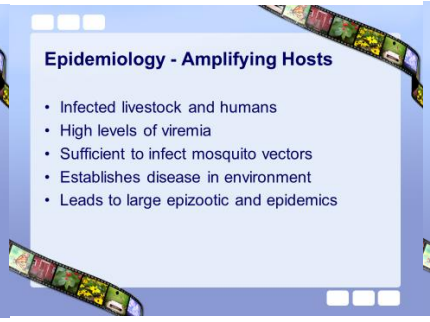
- **Abortion rate:**
  40-100%

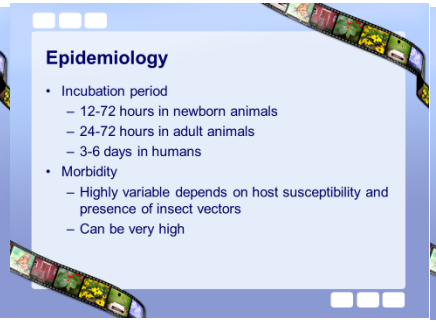
- **Clinical Signs**
- **Post Mortem Lesions**
- **Clinical Diagnosis**
- **Differential diagnosis**
- **Control & Prevention**







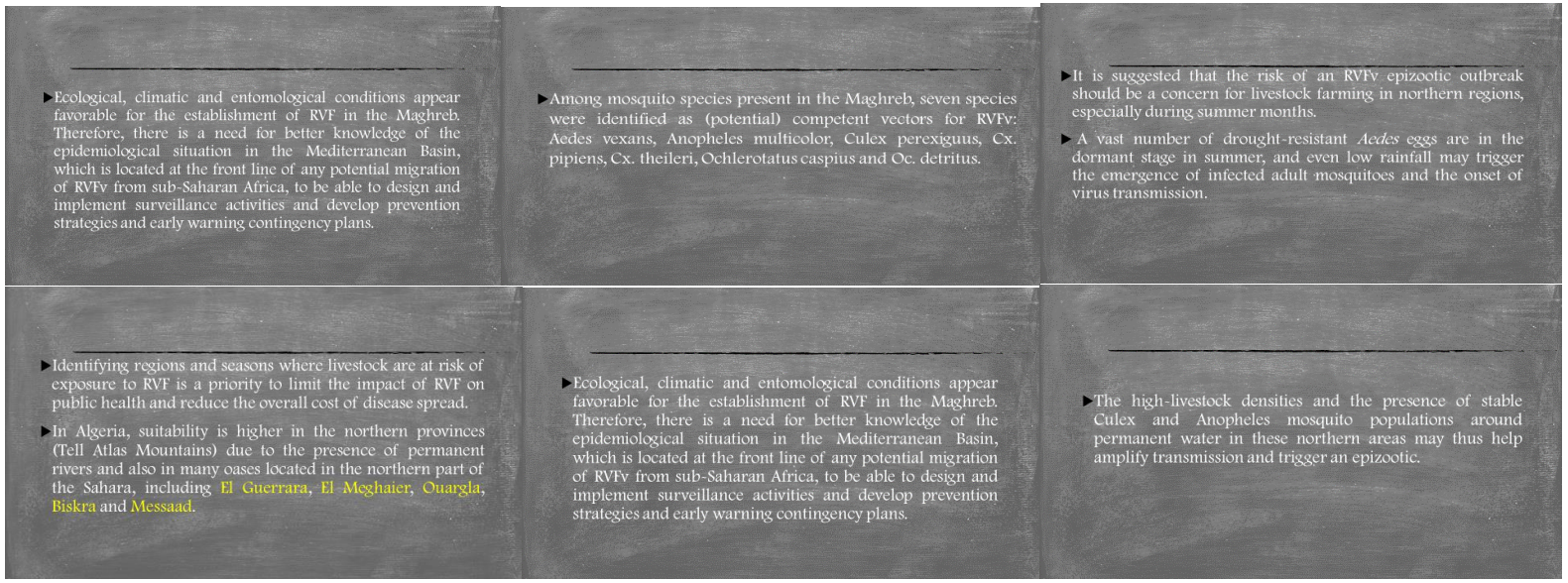




Dr. Abdelsalam Talafha, Professor of Theriogeneology at JUST.

ALGERIA

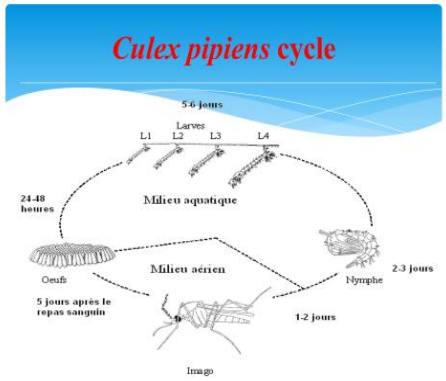
Risk factors for RVFv

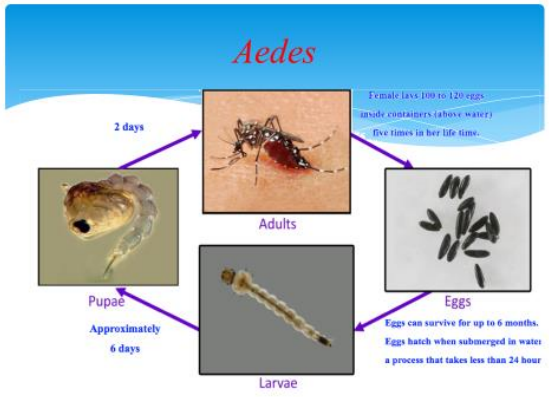


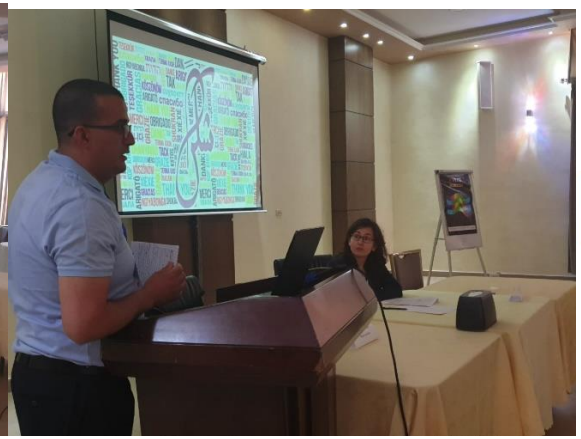
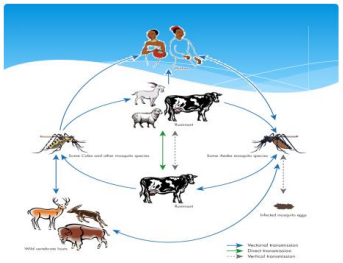
- In western Africa, a major RVF outbreak occurred, close to Algeria, in Mauritania and in Senegal in 1987 and resulted in 220 human deaths. Moreover, a recent study identified the Maghreb region as high-risk countries for RVF emergence.

- In Egypt, a notable human epidemic was reported in 1977 causing an estimated 600 deaths and significant livestock abortions and mortalities. This first report of RVF in Egypt may have been associated with introduction of the virus through livestock trade from the Horn of Africa and aggressive emergence of mosquitoes from the flooded Nile River (32). An additional 45 RVF cases were reported in farmers in Seedy Salim district, where up to 17 human deaths were confirmed in the Egyptian Kafr Al-Sheikh Governorate.

* *Aedes aegypti* was also predicted across West Morocco and Western Sahara, North Algeria and Tunisia, and across the Red Sea coast in Egypt and Sudan (Mahmoud et al., 2018).





Dr. Houari Hemida (left), Tiaret University, Algeria in animals, Dr. Selles Sidi Mohammed Ammar (right), Algeria in humans

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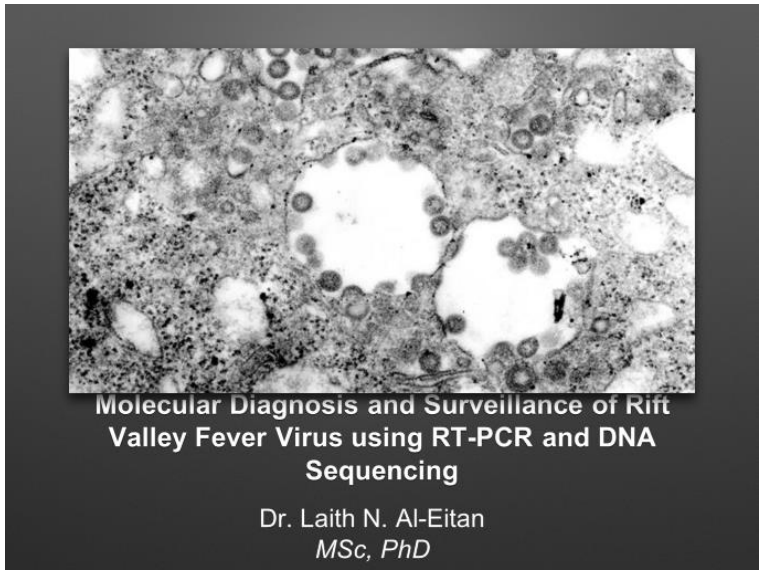
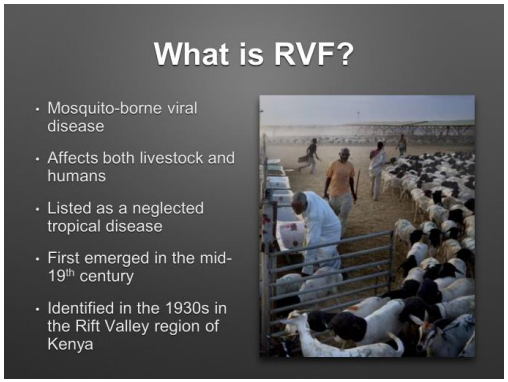
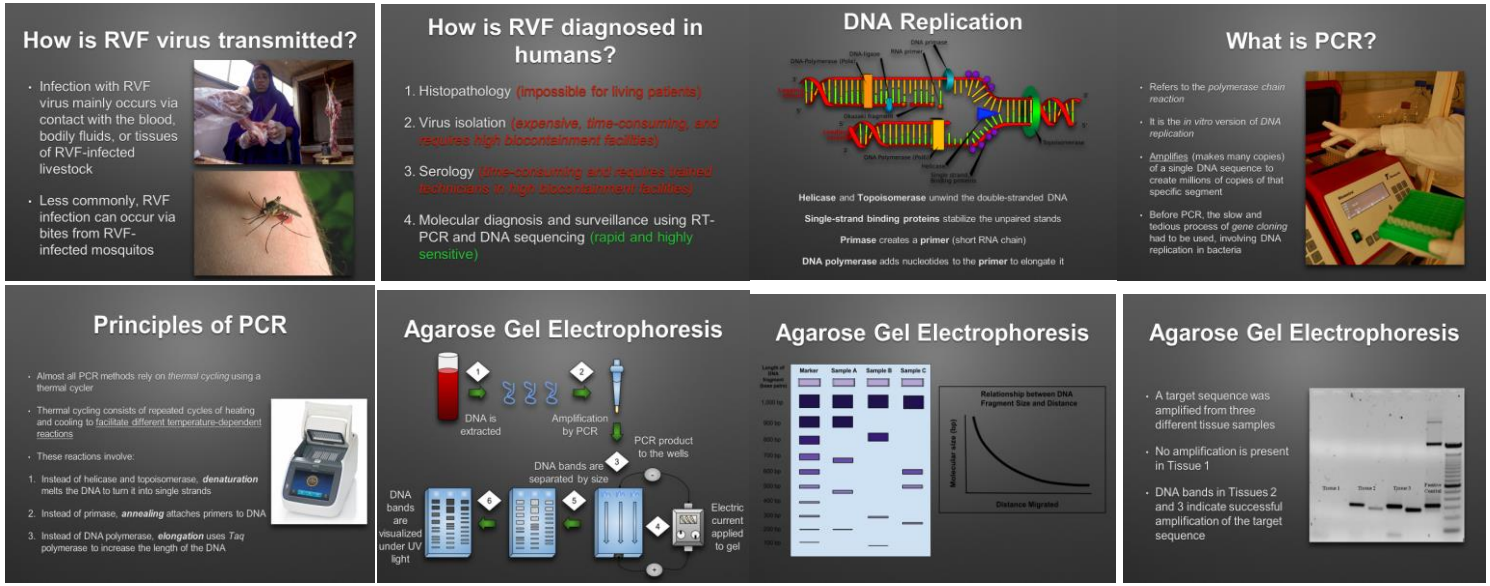




Dr. Laith Al-Eitan, from Biology department, at JUST gave two presentations regarding the Principles of PCR technology and how to use PCR for RVF diagnosis.



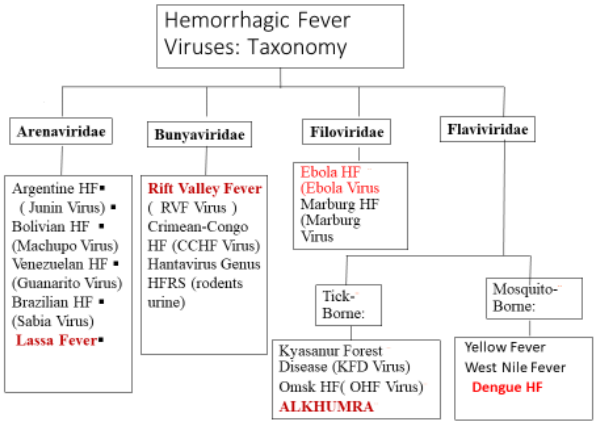
Dr Laith in the stage (in the middle) is uploading his presentation

JORDAN

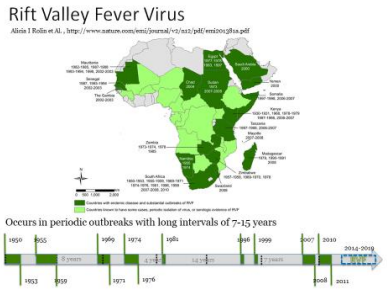
المركز الوطني للبحوث الزراعية
National Agricultural Research Center

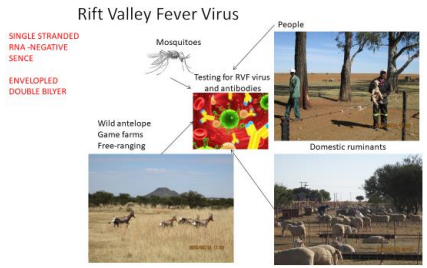
Lab Diagnosis For RVF & Lab Biosafety

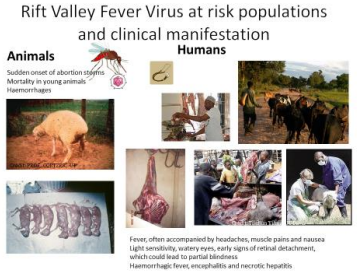
Ruba Alomari



“Enhancing diagnostic capacities and Increased Awareness of Rift Valley Fever Disease, in Cattle, Sheep and Goats in Egypt, Algeria, Tunisia, turkey, Afghanistan, The Palestinian Authority and Jordan.”







Biorisk assessment

As defined by Kaplan and Garrick, risk analysis consists of answering three specific questions:

- what can happen?
- what is the chance that it will happen?
- if it happens, what are the consequences?.

Biorisk assessment

- Pathogenicity of material – disease incidence and severity
- Routes of Transmission – parenteral, airborne or ingestion
- Agent Stability – ease of decontamination
- Infectious Dose – LD50
- Concentration – infectious organisms/vol. & working volume
- Origin of material - Wild Type, exotic, primary cells
- Availability of effective prophylaxis – Hep. B vaccine
- Medical surveillance – exposure management
- Skill level of staff

What is the Biosafety?

- Principles and practices employed to protect laboratory personnel and the environment from exposure or infection while working with living organisms, biological materials, or agents.

Laboratory Acquired Infections (LAI)

Bacterial:
76% from clinical labs
8% from research labs

Exposure:
60% acquired from inhalation

Other exposures include:
digestion, sharps, splashes, direct and indirect contact

- CLASSIFICATION OF BIOLOGICAL AGENT

RG 4	RG 3	RG 2	RG 1
Agents that are not associated with disease in healthy adult humans	Agents that are associated with human disease which is rarely serious and for which preventive or therapeutic interventions are *often* available	Agents that are associated with serious or lethal human disease for which preventive or therapeutic interventions *may be* available (high individual risk but low community risk)	Agents that are likely to cause serious or lethal human disease for which preventive or therapeutic interventions are *not usually* available (high individual risk and high community risk)

Increasing hazard to human health

Biorisk assessment

As defined by Kaplan and Garrick, risk analysis consists of answering three specific questions:

- what can happen?
- what is the chance that it will happen?
- if it happens, what are the consequences?.




Dr. Ruba Al-Omary, from the National Center for Agriculture Research

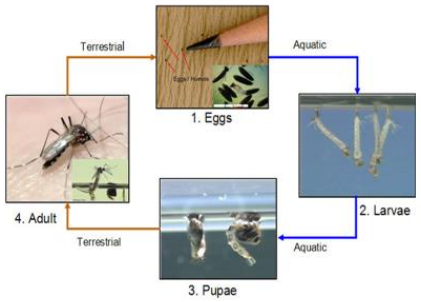
JORDAN

RVF Vector

MOSQUITOES

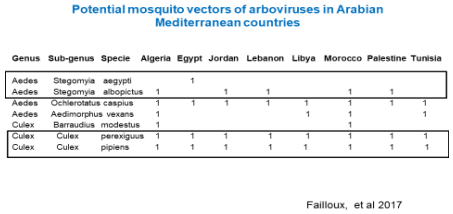
Dr. Rami M. Mukbel
Jordan University of Science and Technology

2019



Ecological Factors Affecting Mosquitoes

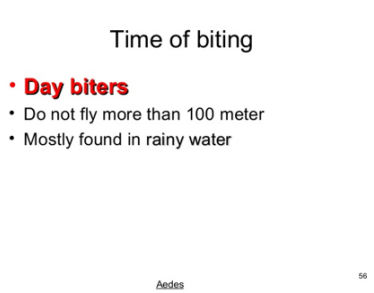
- **Temperature**
- Optimum rate of growth is between 25 °C and 30°C,
- In Africa when the mean temperature increased by a 0.5 °C the abundance of malaria vector raised by 30–100%
- *Aedes aegypti* flight activity optimizes at a temperature of around 21°C
- **Precipitation**
- Precipitation can affect the seasonal population density either by increasing or decreasing it according to the rainfall intensity, and its effect on breeding site typology.



Potential mosquito vectors of arboviruses in Arabian Mediterranean countries

Genus	Sub-genus	Specie	Algeria	Egypt	Jordan	Lebanon	Libya	Morocco	Palestine	Tunisia
Aedes	Stegomyia	aegypti		1						
Aedes	Stegomyia	albopictus	1		1	1		1	1	
Aedes	Ochlerotatus	caspius	1	1	1	1	1	1	1	1
Aedes	Aedimorphus	vexans	1				1	1		1
Culex	Barraudius	modestus	1					1		
Culex	Culex	perexiguus	1	1	1	1	1	1	1	1
Culex	Culex	pipiens	1	1	1	1	1	1	1	1

Failloux, et al 2017

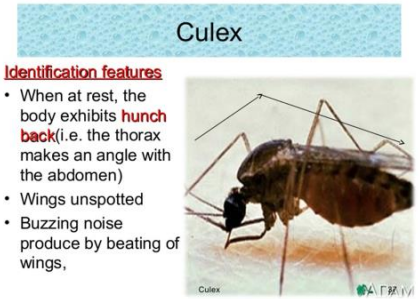


Time of biting

- **Day biters**
- Do not fly more than 100 meter
- Mostly found in rainy water

Aedes

56

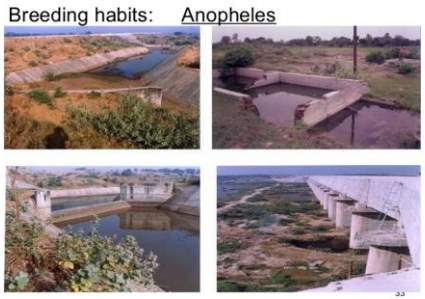


Culex

Identification features

- When at rest, the body exhibits hunch back(i.e. the thorax makes an angle with the abdomen)
- Wings unspotted
- Buzzing noise produce by beating of wings,

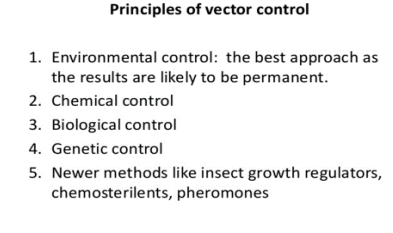
Culex



Breeding habits: Anopheles

33

Mosquito Surveillance



Principles of vector control

1. Environmental control: the best approach as the results are likely to be permanent.
2. Chemical control
3. Biological control
4. Genetic control
5. Newer methods like insect growth regulators, chemosterilents, pheromones

Dr Rami Mukbel, associate Prof of parasitology at JUST

Discussing the different types of vectors and their multiplication, habitats and breeding.

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Dr. Ekhlas Hailat from GHD/ EMPHNET discussed the vision, mission and values. She also discussed their working area and gave examples of public health programs, and their activities in the Field Epidemiology Training Program (FETPs). We Support Networking and Knowledge Exchange Platforms and Interactions on EpiShares

Countries Partnerships, Partnership and Global Engagement

She also discussed about zoonotic projects at GHD/ EMPHNET

- Brucellosis Seroprevalence among Workers in Slaughterhouses in Amman, Karak and Mafraq Governorates Jordan, 2015
- Strengthening brucellosis surveillance, diagnosis and control in Al- Mafraq

- Project Work plan
  - Evaluating the Impact of Enhanced Laboratory-based Surveillance of Animal and Human Brucellosis in Three Areas of Jordan
  - Strengthening brucellosis surveillance, diagnosis and control in IRAQ

- Biorisk Management BRM for Public and Animal Health Laboratories (Iraq), 2018
- Enhancing Brucellosis Surveillance in Pakistan, 2018- 2019
- Improving Diagnosis and Safe handling of Anthrax in Jordan
- New proposals, AI, BRM, Brucellosis, AMR, waste management…., waiting

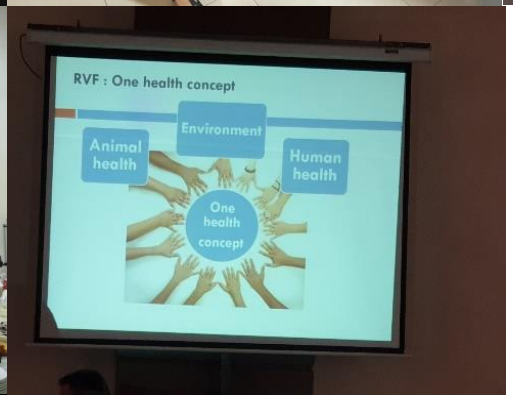
- Vector- borne diseases, CDC/ Atlanta

Dr. Ekhlas Hailat, from EMPHNET









RVF : One health concept
Environment
Animal health
Human health
One health concept

This is part of the ceremony of handing in the certificates to the participants, under the patronage of the Deanship of research at JUST.

Group photo with some of the participants; Algeria, Egypt, Turkey, Tunisia, Afghanistan, Palestinian State, and Jordan, 2019 at Jordan University of Science and Technology, Irbid-Jordan.