Pests & Diseases Challenging Animal’s Health in Drylands

ARC-OVR Perspectives

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International Virtual Expert Meeting on Promoting Sustainable Agricultural Development in Drylands (9th G20-Meeting of Agricultural Chief Scientists (MACS)-2020)
Strategic Objectives
Anticipation and mitigation of agricultural risks

Impact
Sustainable agricultural systems for agrarian transformation, food and nutrition security

Outcomes
- Enhanced resilience of agriculture through risk identification and mitigation
- A skilled and capable agriculture sector through innovation (knowledge, technologies, skills)

Hosts OIE Reference Diagnostic Laboratories for Africa
 Provides diagnostic analytical services to the industrialised and emerging agricultural sector aiming to mitigate the risk of domestic and wildlife animal diseases
 Develops new diagnostic test, which contributes to elevated trade in animals and animal’s products
 Develops new vaccine candidates for animal diseases that positively impact the agricultural sector
 Conducts and develops robust surveillance strategies in livestock and wildlife populations to provide an alert for impending and spill-over of pathogens from animals to humans
 Contributes to the skills development drive of in South Africa and the region
 Supports smallholder farmers mitigating disease and management risks
Drylands are characterized by socio-economic features which affect animal disease transmission dynamics including livelihood, demography, social organization, and health systems.

Animals contacts at the human-domestic animals-wildlife interfaces increases the risk of pathogen spill-over from wildlife. [i.e. transmission of bovine tuberculosis in Sub-Saharan Africa, vector-borne parasites from wildlife and zoonotic filarids from wild mammals (e.g., Onchocerca spp., Dipetalonema spp.and Loaina spp.).]

(Wilcox et al. (2019))
Diseases
- Transboundary animal diseases (i.e. Foot-and-mouth Disease, Highly pathogenic avian influenza)
- Vector-borne diseases (i.e. Rift Valley Fever, Bluetongue)

Pests

Climate change (i.e. Draught)

Environmental Degradation
- Land degradation
- Chemical and radioactive pollution
- Microbial pollution of soil and water

Sub-Saharan Africa experienced the greatest land degradation, with 13% of the global ongoing degradation (Sundström et al. (2014)).
Rapid spread of the H5N1 avian influenza (HPAI) virus in Africa
Foot-and-mouth disease is endemic in most sub-Saharan Africa negatively impacting international trades
Vector-borne zoonotic diseases such as Rift valley fever continue to affect parts of Africa, threatening to spread to the Middle East, the Gulf countries and southern Europe
Trypanosomosis and East Coast Fever are among the most devastating diseases in sub-Saharan Africa. They affect more than 500,000 people and kill more than 3 million animals each year.
Existing infectious disease widespread in Africa continue to be a major source of concern to the global community including:
- African Swine Fever
- *Peste des Petits* Ruminants
- Contagious Bovine Pleuropneumonia
- Classical Swine Fever
- Newcastle Disease
Babesiosis as emerging disease in a dryland setting

**Disease**
- Asiatic red water
- African red water

**Vectors (Blue ticks)**
- *Rhipicephalus microplus*
- *Rhipicephalus decoloratus*

**Parasite**
- *Babesia bovis*
- *Babesia bigemina*

**Table 2** Seroprevalence of *B. bovis* and *B. bigemina* infections in cattle from different provinces in South Africa.

<table>
<thead>
<tr>
<th>Provinces</th>
<th>Total</th>
<th><em>B. bovis</em></th>
<th>ELISA (+)</th>
<th>IFAT (+)</th>
<th><em>B. bigemina</em></th>
<th>ELISA (+)</th>
<th>IFAT (+)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limpopo</td>
<td>100</td>
<td>19 (19%)</td>
<td>20 (20%)</td>
<td></td>
<td>30 (30%)</td>
<td>36 (36%)</td>
<td></td>
</tr>
<tr>
<td>Mpumalanga</td>
<td>100</td>
<td>68 (68%)</td>
<td>73 (73%)</td>
<td></td>
<td>42 (42%)</td>
<td>49 (49%)</td>
<td></td>
</tr>
<tr>
<td>Gauteng</td>
<td>100</td>
<td>19 (19%)</td>
<td>21 (21%)</td>
<td></td>
<td>14 (14%)</td>
<td>17 (17%)</td>
<td></td>
</tr>
<tr>
<td>KwaZulu-Natal</td>
<td>96</td>
<td>55 (57.3%)</td>
<td>61 (63.5%)</td>
<td></td>
<td>44 (45.8%)</td>
<td>52 (54.2%)</td>
<td></td>
</tr>
<tr>
<td>Eastern Cape</td>
<td>100</td>
<td>42 (42%)</td>
<td>50 (50%)</td>
<td></td>
<td>32 (32%)</td>
<td>41 (41%)</td>
<td></td>
</tr>
<tr>
<td>Free State</td>
<td>70</td>
<td>21 (30%)</td>
<td>25 (35.7%)</td>
<td></td>
<td>24 (34.3%)</td>
<td>33 (47.1%)</td>
<td></td>
</tr>
<tr>
<td>Northern Cape</td>
<td>100</td>
<td>22 (22%)</td>
<td>26 (26%)</td>
<td></td>
<td>23 (23%)</td>
<td>26 (26%)</td>
<td></td>
</tr>
<tr>
<td>North West</td>
<td>53</td>
<td>8 (15.1%)</td>
<td>10 (18.9%)</td>
<td></td>
<td>7 (13.2%)</td>
<td>9 (16.9%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>719</td>
<td>254 (35.3%)</td>
<td>286 (39.8%)</td>
<td></td>
<td>216 (30%)</td>
<td>263 (36.6%)</td>
<td></td>
</tr>
</tbody>
</table>

**Terkawi et al (2011)**
Serological detection of *Babesia bovis* and *Babesia bigemina* in Northern Cape

**Nyangiwe et al. (2017)/ Horak et al. (2018)**
Range expansion of *Rhipicephalus microplus* in the Northern Cape

Sensitive serological and molecular diagnostics can serve as early detection systems
Develop diagnostic tools of epidemiological use
The sand tampan as disease vector

*Ornithodoros savignyi* – wide distribution across Africa, Middle East to India in semi-desert regions

Cause sand tampan toxicoses that kills livestock

Vector of human borreliosis: *Borrelia kalaharica*

Vector of Alkhurma hemorrhagic fever virus in Middle East

One species since 1955 – A species complex?

Bakkes et al. (2018) / Mans et al. (2019)

Recently described 3 new species from this complex in South Africa: *Ornithodoros kalahariensis, Ornithodoros noorsveldensis, Ornithodoros pavimentosus* (resurrected)

Implications for disease vector status still needs to be elucidated

Basic tick taxonomy remains relevant to the understanding of tick-borne diseases

Maintain the Gertrud Theiler Tick Museum as National Collection and focus for basic research on tick taxonomy
Poisonous plants are normally the first to appear after dry season.

Poisonous plants are drought resistant when grazing is scarce during adverse conditions.

Use of fertilizers may increase toxicity.

Moroea pallida

Lantana spp

Pavetta harborii

Moroea pallida

Lantana spp

Fadogia homblei
Conditioned Feed Aversion (CFA)

(a) Demonstration of dosing the aversion mixture to cattle

(b) Cattle on a tulp infested grazing avoiding the toxic Yellow tulp

Public awareness on Conditioned Feed Aversion
Intra-African collaborative research on Rift valley fever
- Epidemiology and Surveillance (Disease risk mitigation)
- Analytical Services (Food safety)
- Diagnostic Services (Food Security)
- Innovative Research (Rapid diagnostic techniques)
- Vaccine development (Disease prevention)
- Public Awareness and Education (Knowledge transfer)
THE WAY FORWARD

- Disaster risk reduction and prevention approach
- Investment in emergency and disaster prevention
- Systematic and integrated approach for addressing transboundary animal diseases
- Building human capacities
- Enhancing networking among stakeholders
- Regional cooperation between affected countries
- Developing self-reliant surveillance systems and knowledge based standards
- Public stewardship
- Investing in economic strength
- Applying environmentally friendly interventions.
- Diversification of risk monitoring and international assessment of agricultural sector
- Assurance of global food security
- Strengthening adaptive capacity

A cohesive and inclusive approach at all levels and capacities for the design and implementation of disease and pest prevention and control measures.
Sundström et al. (2014). Future threats to agricultural food production posed by environmental degradation, climate change, and animal and plant diseases – a risk analysis in three economic and climate settings. Food Sec, 6:201–215

Wilcox et al. (2019) Vector-borne disease and climate change adaptation in African dryland social-ecological systems. Infectious Diseases of Poverty, 8:36
THANK YOU