Gorilla Doctors work in Africa: One health approach in Conservation

Presented by
Dr. Julius Nziza, Country Director
PhD Research Candidate

Disease Ecology & Veterinary epidemiology SIG

University of Glasgow, Sept. 14th 2023
Mountain Gorilla Veterinary Project: 
The Beginning
Our Footprint
* 3 Countries
* 6 Facilities
* 15 Vets
* Both subspecies of Eastern Gorillas
* 37 Year History
* U of Cal, Davis
Our Mission:
To conserve wild eastern gorillas through Life Saving veterinary medicine and science using a One Health Approach
Gorillas subspecies
Gorilla Doctors Impact

- 1,063 mountain gorillas
- Up to 4% of annual growth rate
- 550+ clinical interventions to treat ill or injured gorillas
- 40+ gorillas rescued from snares since 1995
- 1st on-site medical clinic for park staff and tourists
Our Goals

• Restore the Gorilla Population
• Lead the Scientific Community
• Promote One Health
Restore Gorilla Populations
### Routine Health Checks

<table>
<thead>
<tr>
<th>Observer</th>
<th>Date:</th>
<th>Start time:</th>
<th>End Time:</th>
<th>Total Number of people: (within 2 km)</th>
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#### Gorilla Health Check Sheet – TITUS

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<thead>
<tr>
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#### Observation location: RBM

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#### General comments (remarks on the day’s tracking exercise): name of place and vegetation, etc.

<table>
<thead>
<tr>
<th>Gorilla</th>
<th>Seen</th>
<th>Activity</th>
<th>Body Condition (head)</th>
<th>Discharge (head)</th>
<th>Discharge (other)</th>
<th>Respiratory</th>
<th>Skin/Hair</th>
<th>Stool</th>
<th>Other Abnormal</th>
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#### Parameter Definitions

1. **Activity:** observe the animal for at least two to three minutes; if activity is in normal context with the other animals, enter “zero” and “normal”.
2. **Body Condition:** you must see the chest and abdomen.
3. **Discharge Head:** you must see both eyes, ears, nostrils, and mouth.
4. **Discharge other:** discharge from any other orifice or lesion other than from the head.
5. **Respiratory:** you must be able to see the mouth and chest.
6. **Skin/Hair:** you must see at least both arms and the front and back of the animal’s torso.
7. **Stool:** you have to observe the animal defecating to answer here.
8. **Other Abnormalities:** this is a free category and will be left “not seen”, unless you see something that is unusual but not included in the other parts of the form.
Health Monitoring & Evaluation
Clinical Interventions

Only When Life-Threatening or Human-Induced
Snares removal: Major CI in the past.
Medical Cases: Infectious Diseases
Traumatic injuries and infanticide
Saving Orphans
Histopathology and Skeleton Project
Leading the Scientific Community:
Molecular diagnostics and Research in wildlife health_Gorillas & other wildlife
Capacity Building: Next Gen
Grand Research Topics: Parasites Studies _Results
Partnership: University of Veterinary Sciences, Brno.

PUBLICATIONS
1. Heterogeneity in patterns of helminth infections across populations of mountain gorillas (*Gorilla beringei beringei*).

2. Other publications coming...
Grand Research Topics: Fecal Virome Studies ongoing

PhD title: PATHOGEN GENOMIC ANALYSES AT THE PRIMATE-HUMAN-DOMESTIC ANIMAL INTERFACE IN RWANDA: DIVERSITY, TRANSMISSION DYNAMICS AND RESISTOME STATUS

My Supervisors team:
Dr. Roman Biek, Dr. Daniel Streicker, Dr. Willie Weir, Dr. Dan Haydon

SBOHVM ; University of Glasgow.

Themes:-
1. Ecological predictors of viral communities in mountain gorillas.
2. Viral community sharing and cross-species transmission between primates (gorillas, golden monkeys, humans) and Feral Dogs.
3. Testing for spatial gradients in the microbial resistome as a metric of anthropogenic disturbance.
Promote One Health

• It’s All Related
Public health interventions
Domestic Animals
EMERGING PANDEMIC THREATS PROGRAM: PREDICT 2009-2019

PREDICT: Building a global early warning system for emerging diseases that move between wildlife and people.
Where are zoonotic EIDs coming from?

- ~5 new EIDs each year
- ~3 new Zoonoses each year
- Zoonotic EIDs from wildlife have reached their highest proportion in recent decades
Wildlife as sources of zoonoses

Proportion of viruses shared with humans

- Chiroptera: High
- Primates: High
- Rodentia: Medium
- Carnivora: Medium
- Lagomorpha: Low
- Cetartiodactyla: Low
- Perissodactyla: Low
- Scandentia: Low
Pathogen Emergence

Animal Amplification

CASES

TIME

SPILL OVER

UCDAVIS VETERINARY MEDICINE
WILDLIFE CONSERVATION SOCIETY
EcoHealth Alliance
METABIOTA

Smithsonian Institution
• Independent Sites: All country provinces
• Specific areas in all provinces sampled
• **Target:** HIGH wildlife-human interfaces: Ecotourism, peridomestic wildlife, Wildlife management areas etc

**RWANDA PREDICT PROJECT**
**2010-2019**
Risk-based Surveillance Strategy: High-risk taxa and human-wildlife interfaces
**PREDICT Project Scientific Strategy**

**Virology**
Evolution of viral traits enabling spillover, amplification, and spread

**Ecological Drivers**
Large-scale processes that influence host and viral ecology, spillover, amplification, and spread

**High-Risk Interfaces**
Disease transmission between animal hosts and spillover to humans in situations with animal-human contact
### Surveillance Results

#### PREDICT Surveillance and Testing - Rwanda

<table>
<thead>
<tr>
<th></th>
<th>Animals sampled</th>
<th>Samples collected</th>
<th>Animals tested</th>
<th>Samples tested</th>
<th>Tests performed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>2,624</td>
<td>14,211</td>
<td>2,624</td>
<td>5,221</td>
<td>19,925*</td>
</tr>
</tbody>
</table>

#### Taxa

<table>
<thead>
<tr>
<th>Taxa</th>
<th># Animals Sampled &amp; Humans</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bats</td>
<td>1099</td>
</tr>
<tr>
<td>Non-human Primates</td>
<td>776</td>
</tr>
<tr>
<td>Rodents &amp; Shrews</td>
<td>711</td>
</tr>
<tr>
<td>Other Taxa</td>
<td>38</td>
</tr>
<tr>
<td>Febrile illness Patients</td>
<td>400</td>
</tr>
<tr>
<td>Total</td>
<td>3024</td>
</tr>
</tbody>
</table>

* Multiple Protocols
### Hosts and Priority Pathogens – PREDICT

<table>
<thead>
<tr>
<th>Animal Host</th>
<th>Priority Pathogens</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>i. High Priority Species</strong></td>
<td></td>
</tr>
<tr>
<td>Rodents</td>
<td>Arena, Hanta, Pox, Alpha, Reo,</td>
</tr>
<tr>
<td>Bats</td>
<td>Flavi, Corona, Henipa, Hendra, Rhabdo, Arena, Filo, Reo</td>
</tr>
<tr>
<td>Non-human Primates</td>
<td>Retro, Filo, Flavi, Orthomyxo, Paramyxo, Pox, Herpes B, Corona, Arena,</td>
</tr>
</tbody>
</table>
Viral Testing & Discovery

- Oral Swab
- Rectal Swab or Feces
- Urine sample
- Blood Sample

Conventional PCR – Viral Family testing
- Sequencing
- Interpretation
- Report to Authorities
- Approval of Results
- Analysis and Modeling
- Guidance for Policy
- Over 5,221 samples from over 2,624 animals were tested for up to 14 viral families /genera.

- Twenty-five viruses were detected of which 14 are known and 11 are new viruses.

*Novel viruses several new adenoviruses, herpesviruses, paramyxoviruses, and coronaviruses, such as a known human Coronavirus (Human Coronavirus 229E) in a bat.
Non-malaria Febrile illness Patients Test Results

The viruses tested were from the Corona-, Filo-, Paramyxoxo-, Flavi and Influenza virus families.

- Administered a broad questionnaire.
- **603 samples were tested from 400 Febrile patients**
- A strain of Human Coronavirus HKU1 in 2 people
- A strain of Human Coronavirus 229E (Human strain) in 6 patients
- Influenza B in 3 children
- Influenza A in 5 adults
- A strain of Human Parainfluenza virus 1 in 1 person
- Mumps virus in 1 person
- All are known viruses and no new virus was discovered in the patients
Human Metapnuemovirus in Mt. Gorillas: Anthropozoonotic cases

• Identified and isolated Human metapnuemovirus in Mt. Gorillas in Rwanda.

Publication:
SARS-like virus identified in RWANDA

Coronavirus PREDICT_CoV-43, was detected in *Hipposideros ruber* and *R. clivosus* bats co-roosting in bat tourism caves in Musanze.

Coronavirus PREDICT_CoV-43 clustered near the SARS-like coronaviruses showing 84% nucleotide similarity to SARS-CoV.

Threats and challenges

Opportunities for emergence of pathogens:
Thriving wildlife ecotourism industry that brings people into very close contact with animals which presents a high zoonotic disease risk
Insecurity and lawlessness: DRC

- Direct mortality to gorillas
- Non-monitoring and no health interventions
- Poaching etc.
Evidence of climate change in Rwanda: *Natural calamities*
Goal #1: Advance evidence-based clinical knowledge to achieve best-possible medicine for eastern gorillas in the wild
Goal #2: Lead surveillance and investigational research on infectious pathogens impacting or threatening eastern gorilla health
Goal #3: Lead investigational research on non-infectious conditions impacting great ape health
Goal # 4: Predict future eastern gorilla health impacts under conditions of global environmental change
Gorilla Doctors is formally partnered with the following organizations:
THANK YOU.