Prevalence and diversity of avian malaria parasites in domestic birds from North-western Uganda: Ecosystem health for biodiversity conservation

Jesca Nakayima [3], Eugene Arinaitwe [3], William Kabasa [3], Constance Agbemelo-Tsomafo [1], Leonce Kouakanou [2] and Taiwo Crossby Omotoriogun [4, 5]

Team: AVI-WEST

Background

- Increase human population can directly lead to habitat destruction and therefore loss in biodiversity
- Habitat loss has the potential to foster disease outbreak in natural population of animals (e.g. birds) due to increase transmission of pathogens
- Pathogenic infection can induce the susceptibility /resistance of a host to other pathogens

Objective

Investigate the interactions among blood parasites, gastro-intestinal parasites, ejaculate-born parasites on sperm quality and the mechanism underlying an immunomodulatory function in avian species.

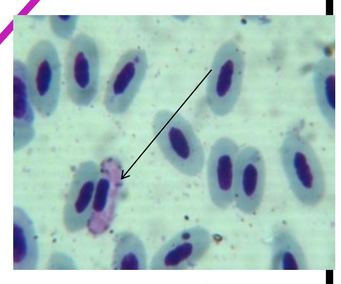
Study area

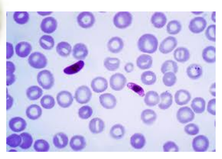
- Ghana
- Benin
- Nigeria
- Uganda

Methodology and Project Progress

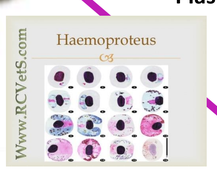
Bird trapping by mistnetting

Leucocytozoon





Plasmodium



Blood samples Nigeria → **Nigeria (Biosytematics)**

Sperm collection
- Cloaca massage
- Fixation (5% formalin)

Bird trapping by mistnetting

Blood samples
- Brachial vein (10-50 µl)
- Fixation (96% ethanol)
- 200 - 400 × mag
- 10 sperm/bird
- Head, midpiece, tail length

Blood samples Ghana → **Ghana (wildlife ecology)**

-Blood DNA, Fixed Thin blood smears
- Giemsa staining
- Microscopy
- Polymerase chain reaction
- Gel electrophoresis
- Sequencing

Blood samples Uganda → **Uganda (Veterinary medicine)**

Blood samples
- Brachial vein (1-2 ml)
- Fixation (96% ethanol)
- Giemsa stain, Microscopy-Avian Malaria Parasites. **Molecular characterization.**

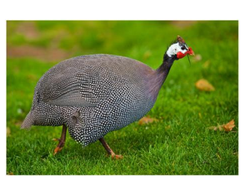
-Blood DNA, Fixed Thin blood smears
- Giemsa staining
- Microscopy
- Polymerase chain reaction
- Gel electrophoresis
- Sequencing

Benin (Immunology)

Dried blood spot (50-80 µl) → Elution → **serum**

ELISA anti-plasmodium spp.

Malaria-positive and negative samples
- → ELISA anti-GITR/GITRL
- → ELISA anti-IgG



Domestic & Semi domestic birds

Study area: North-western Uganda.

Results

Microscopy: Prevalence of Avian Malaria parasites in North-western Uganda.

Poultry species	Haemoproteus	Leucocytozoon	Plasmodium	Total (%)
Chicken	10	7	66	304 (26.6)
Duck	44		18	70 (61.4)
Turkey	7		3	14 (71.4)
Guinea fowl	8		1	19 (47.4)
Total	69	7	88	

PCR Avian malaria

NO.	PCR PDT ID	SAMPLE ID	RESULT	SPECIES
1	1PL	YUM/TURKEY/A/M/213	POS	Plasmodium spp.
2	2PL	ADJ/GF/A/M/51	POS	Plasmodium spp.
3	3PL	ADJ/GF/A/F/45	POS	Plasmodium spp.
4	4PL	ADJ/GF/A/F/44	POS	Plasmodium spp.
5	5PL	ADJ/GF/JUV/034	POS	Plasmodium spp.
6	6PL	ADJ/GF/F/A/026	POS	Plasmodium spp.
7	7PL	ADJ/GF/A/M/47	POS	Plasmodium spp.
8	8PL	ADJ/CH/M/A/4	POS	Plasmodium spp.
9	9PL	ADJ/GF/F/A/033	POS	Plasmodium spp.
10	10PL	ADJ/GF/SA/F/38	POS	Plasmodium spp.
11	11PL	ADJ/GF/A/35	POS	Plasmodium spp.
12	12PL	ADJ/GF/M/037	POS	Plasmodium spp.
1	-	KO/CH/SA/M/389	Weakly pos	Leucocytozoon spp.
2	-	KO/CH/A/F/329	Weakly pos	Leucocytozoon spp.
3	-	KO/CH/SA/F/339	Weakly pos	Leucocytozoon spp.

Further studies

-Phylogeny, Faecal analysis
-Infectious bronchitis virus
These have challenges at the moment. But to be Considered in the near future.
LAMP Development & Evaluation

Expected outcome

- Understand the role of deforestation in the diversity and distribution of pathogens in wild birds
- Understand the immune modulation in malaria infected birds
- Understand the impact of pathogen-pathogen interactions on fitness of birds
- Produce baseline data useful to the health sector and monitoring of biodiversity conservation

Acknowledgments

This project is sponsored by the International Foundation for Science (IFS)

[1]Noguchi Memorial Institute for Medical Research, Department of animal experimentation, University of Ghana, Ghana
[2] Laboratory of Biology and Molecular Typing in Microbiology, Faculty of Sciences and Techniques, University of Abomey Calavi, Benin
[3]National Livestock Resources Research Institute (NaLIRRI), Tororo, Uganda.
[4]AP Leventis Ornithological Research Institute, University of Jos, Nigeria, [5]Natural History Museum, University of Oslo, Norway