Identification of the Plague reservoir in an endemic area of Zambia

HANG’OMBE BERNARD MUENDA
SCHOOL OF VETERINARY MEDICINE,
UNIVERSITY OF ZAMBIA
Introduction

Plague is one of the oldest deadly rodent associated flea-borne infectious diseases recorded.

Zoonotic disease of mammals caused by *Yersinia pestis*, primarily a parasite of wild rodents.
Plague is found throughout the world with dynamics of transmission varying from place to place.

Human plague periodically re-emerges suddenly as an outbreak in an area after many decades of absence (e.g. Algeria and India).

Plague occurs frequently across south eastern Africa, and more than 90% of all cases reported globally to the WHO are from Africa.
It continues to be a major health problem because of:

- Its rapid progression
- Severe clinical manifestations
- Its potential for human to human spread.

The disease also has major economic impacts through resource diversion during outbreaks to establish quarantine and treatment.
Although plague is relatively easy to treat with antibiotics, its rapid progress and delayed health care in rural Africa, means that mortality rates are still very high.

In this sense, plague prevention is increasingly seen as important in endemic countries through rapid confirmation of cases and identification of natural reservoirs specific to an area.
Objective of the study

To increase our knowledge specifically about reservoirs and vectors of plague in Zambia.

Justification of the study

Ultimately provide the medical, clinical and environmental management staff with knowledge on how to design and implement ecologically-based management and surveillance programmes that can prevent plague outbreaks.
Materials and Methods

Study areas in Zambia

15°56′S, 026°51′E
15°54′S, 026°54′E
The study areas were selected based on reports of outbreaks in the national press.
Plague breaks out in Petauke

By Christopher Miti

PLAUGE has broken out in Nyanje area of Petauke district in Eastern Province.

Ministry of Health spokesperson Dr Canisius Banda confirmed the outbreak in an interview on Tuesday.

Dr Banda said three out of 24 people suspected to be infected tested positive for plague.

“We began to see the signs of the disease that is fox soul throats and body aches between January 2 and 2008” Dr Banda said.

He said the Ministry of Health was on the ground to control the disease.

Deadly plague breaks out in Namwala

By Times Reporter

A DEADLY plague, caused by fleas has broken out in Namwala District where four people recently died after eating meat from cattle which died from an unknown disease.

Hosted by rats, had broken out in Namwala and of the 60 people screened, three had been admitted and put on medication.

Dr Banda said the symptoms of the disease, arising from flea bites, separately in Lusaka yesterday that the assertion that the earlier disease was as a result of eating meat from cattle which died of an unknown disease raised need for the veterinary experts to quickly join the investigating.

Results of the disease had not yet been released, the symptoms matched those of the deadly anthrax.

“Clearly Dr Chituwo’s assertion re-focuses the spotlight of this mysterious disease into the direction of...”
Capture of rodents
Rodents were trapped overnight using Sharman Traps in areas where suspected cases were being reported.

The captured animals (104) were dissected in a field mobile mounted laboratory to reduce risk of contamination.

Before dissection, fleas and ticks were collected from the animals.

Upon dissection spleen, liver and lymph nodes were collected for laboratory analysis.
Human dwellings where rodents were captured.
Laboratory Analysis

This was done according to the WHO manual for the detection of plague (CDC Laboratory Manual of Plague Diagnostic Tests) as follows:

1. Culture and Isolation with Brain Heart Infusion broth and 6% Sheep blood agar.

2. Colony morphology and Growth characteristics of the suspected isolates (Biochemical profile).

3. Mouse inoculation assay.

4. Polymerase Chain Reaction of the suspected isolates.

5. Antibiotic susceptibility tests.
Results

1. Culture and Isolation

Four rodent samples yielded some suspect colonies with two types of phenotypic appearances indicative of *Y. pestis*.

- Slightly yellow in colour
- Grey white in colour
2. Growth characteristics of the Suspected isolates

a. Biochemical profiles:

b. Growth on specialized media for detection of virulence such as Congo red agar.
3. Mouse inoculation assay

The suspect colonies were inoculated subcutaneously in the lower abdomen of the mouse, with mortalities being recorded in 48 hours.

Of significance was the enlargement of the spleen.
4. PCR of the Suspected isolates

b. *Yersinia pestis* plasminogen activator gene - 344 bp product


Full confirmation and sequencing of the positive PCR products is currently ongoing.
5. Antibiotic Susceptibility tests

Antimicrobial tests using drugs recommended by the WHO were done on the isolates.

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<th>Isolate No:</th>
<th>Strep</th>
<th>Ampic</th>
<th>Amox</th>
<th>Chlora</th>
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Drugs of choice

Alternative drugs
Discussion and conclusion

Sylvatic Cycle

Urban Cycle

Pathways
- Usual
- Occasional
- Rare or theoretical

Bubonic Plague

Secondary Plague Pneumonia

Pneumonic Plague Epidemic

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