

# A Seroepidemiological Survey for Paragonimiasis among Boar-hunting Dogs in Japan

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# Three species of *Paragonimus* are widely distributed in Japan

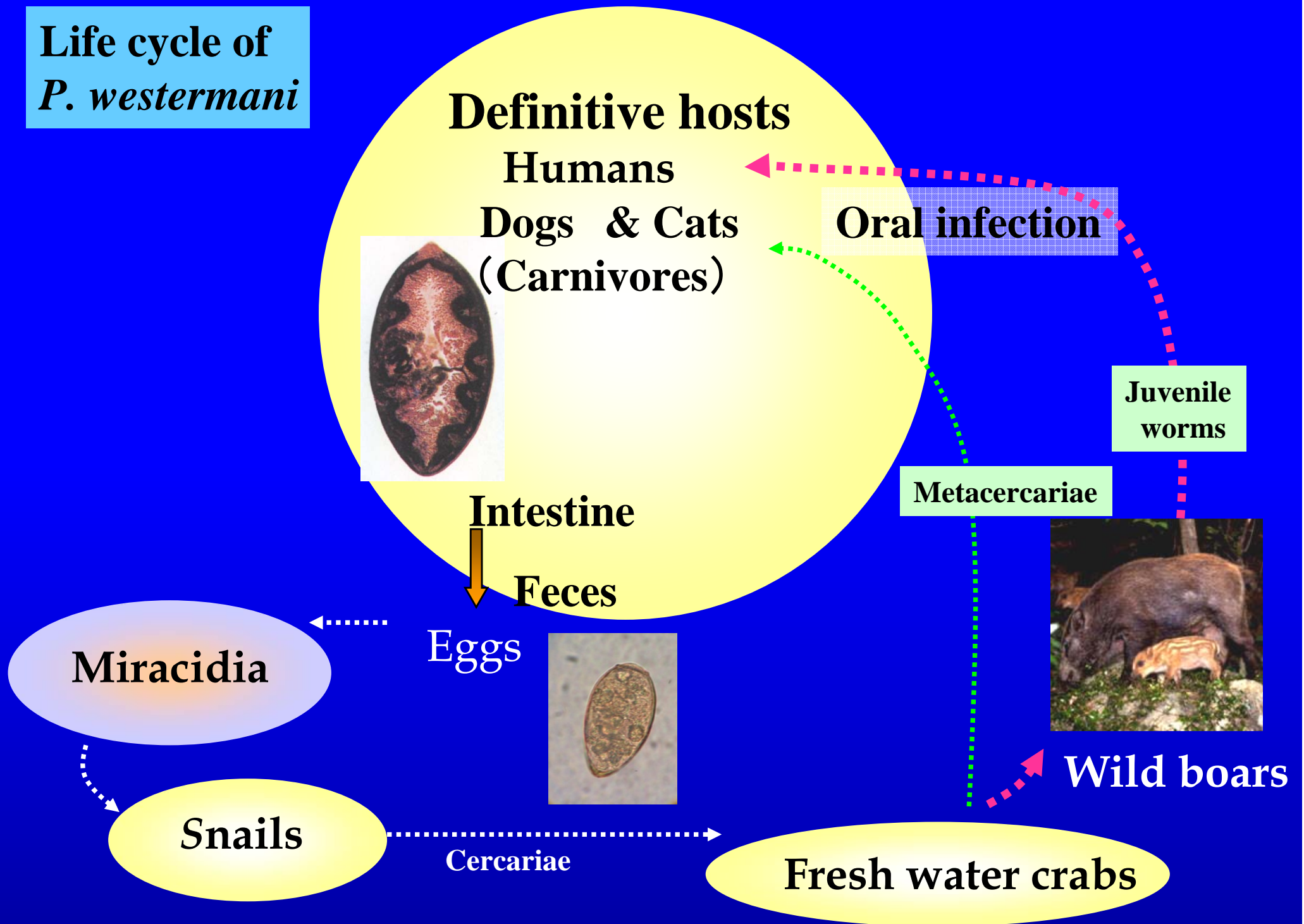
- *Paragonimus westermani*
- *Paragonimus skrjabini miyazakii*
- *Paragonimus ohirai*

Still some human paragonimiasis have been reported

by *Nawa*, 2000

*Nawa & Nakamura-Uchiyama*, 2005

**Life cycle of  
*P. westermani***



# The first case of canine paragonimiasis

- Male dog
- Plott hound back ground
- Mixed-breed
- 5 years old
- 23 kg
- Used for boar hunting for 4years



## Clinical history

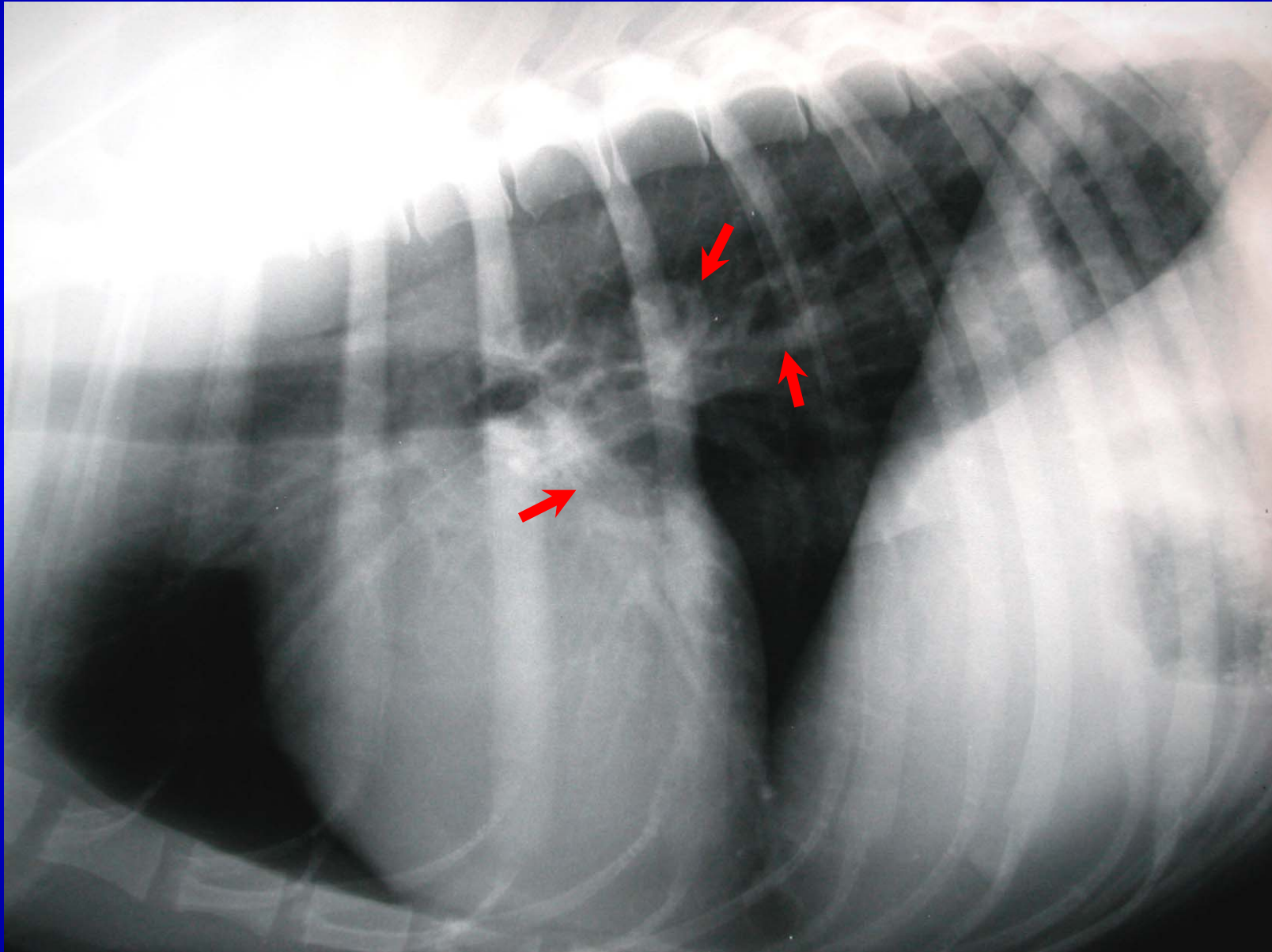
- Chronic cough and reduced exercise tolerance for 3 years
- Abnormal lung shadows were observed in a local veterinary clinic
- Treated with cough suppressants and antibiotics

# Laboratory findings

WBC ( $\times 10^2/\mu\text{I}$ )	114
RBC ( $\times 10^4/\mu\text{I}$ )	817
HGB (g/dl)	17.7
HCT (%)	37
MCV (fl)	63.9
MCH (pg)	21.7
MCHC (g/dl)	33.9
PLT ( $\times 10^4/\mu\text{I}$ )	24.9
TP (g/dl)	8.0

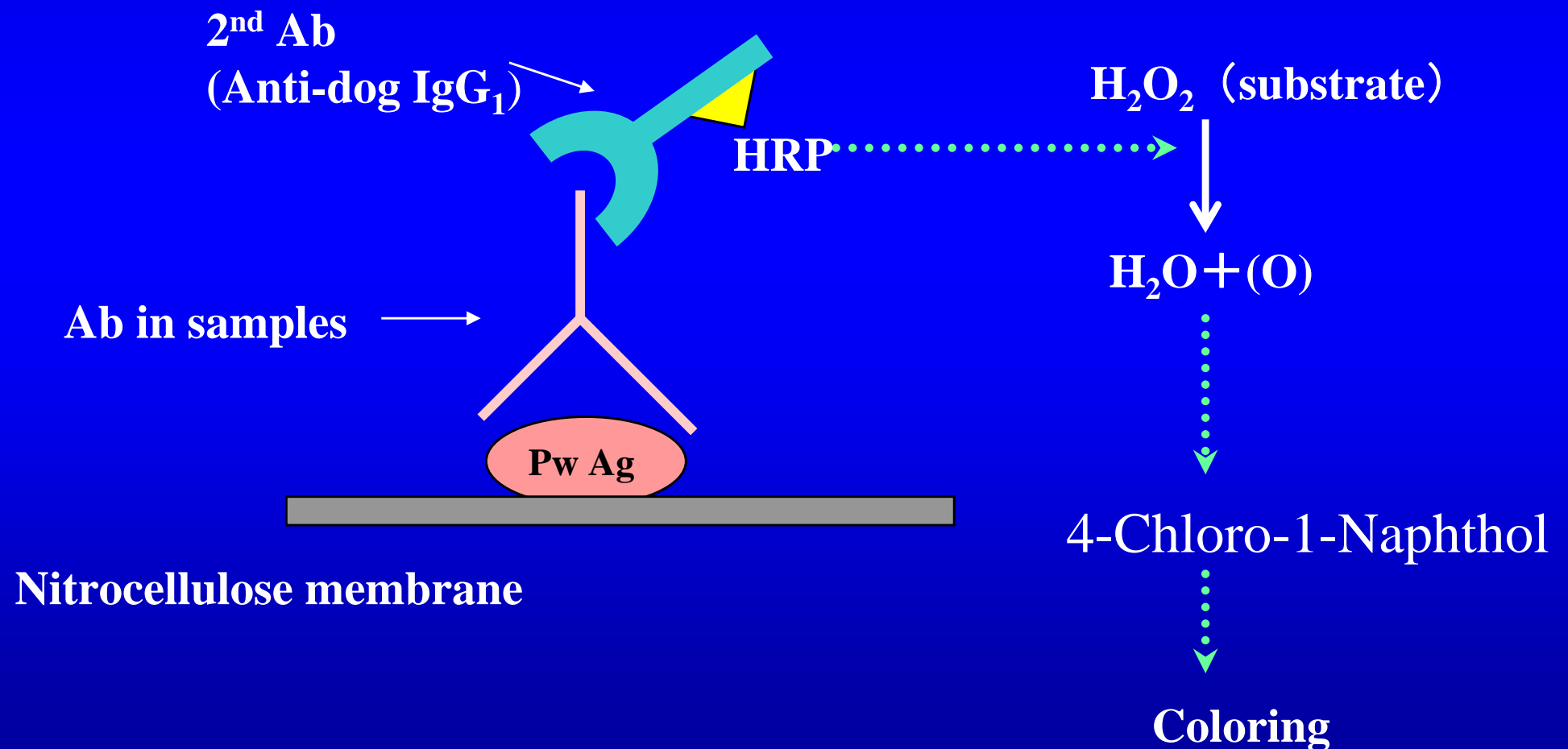
Neutrophils	54 %
Eosinophils	7 %
Lymphocytes	29 %
Monocytes	10 %

# Chest X-ray examination

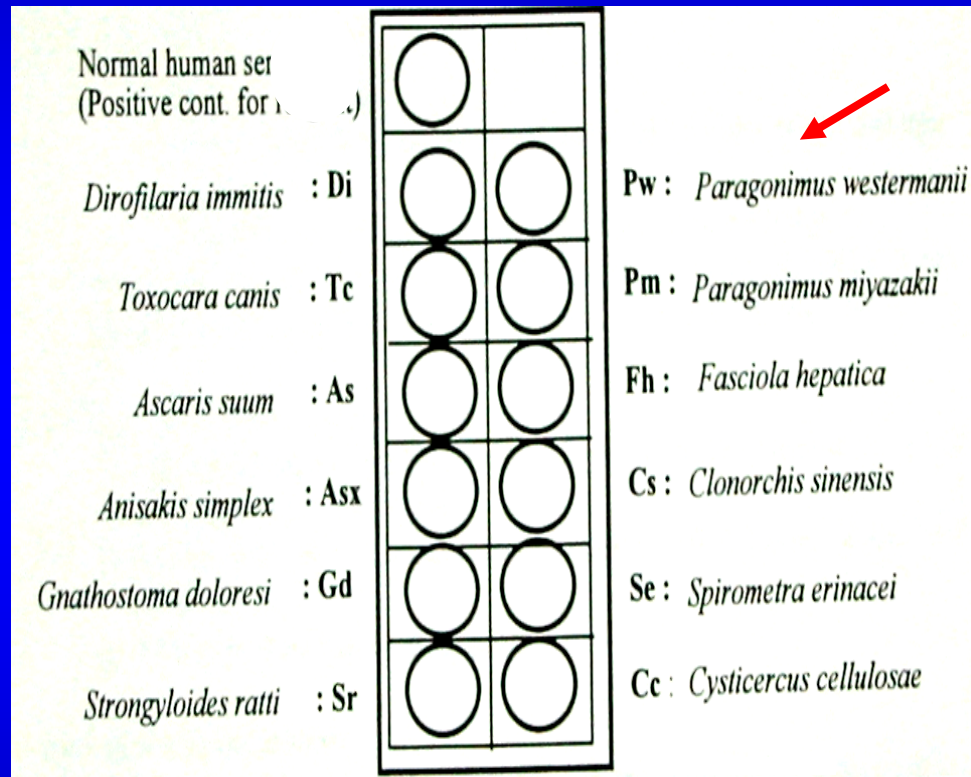


Arrows indicated cavitated lesions

# Multi-dot ELISA



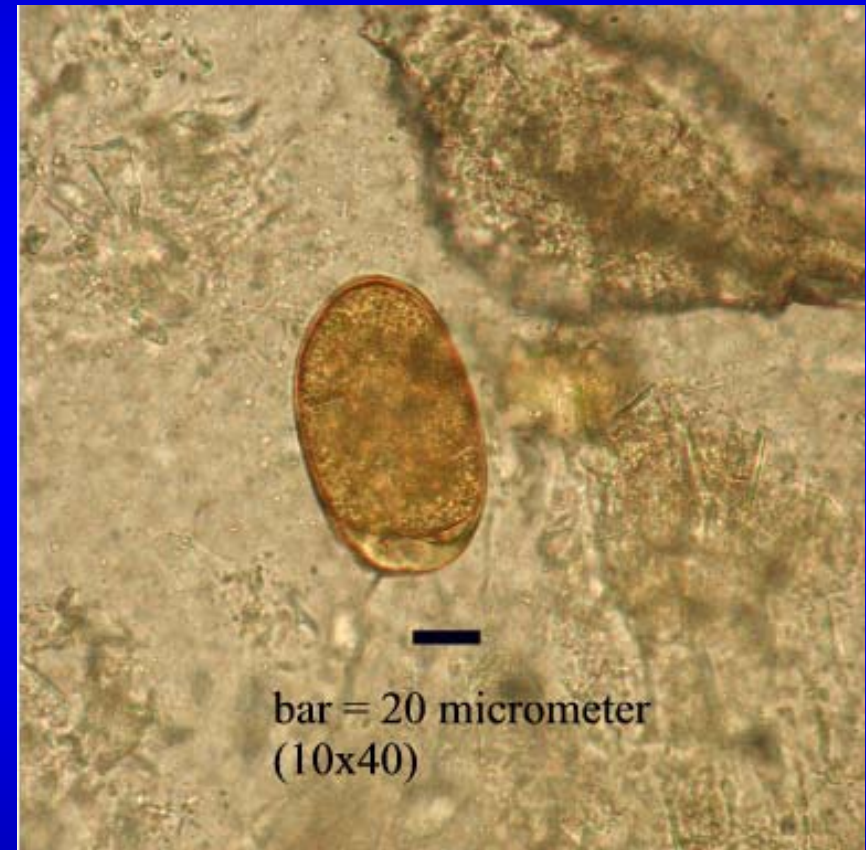
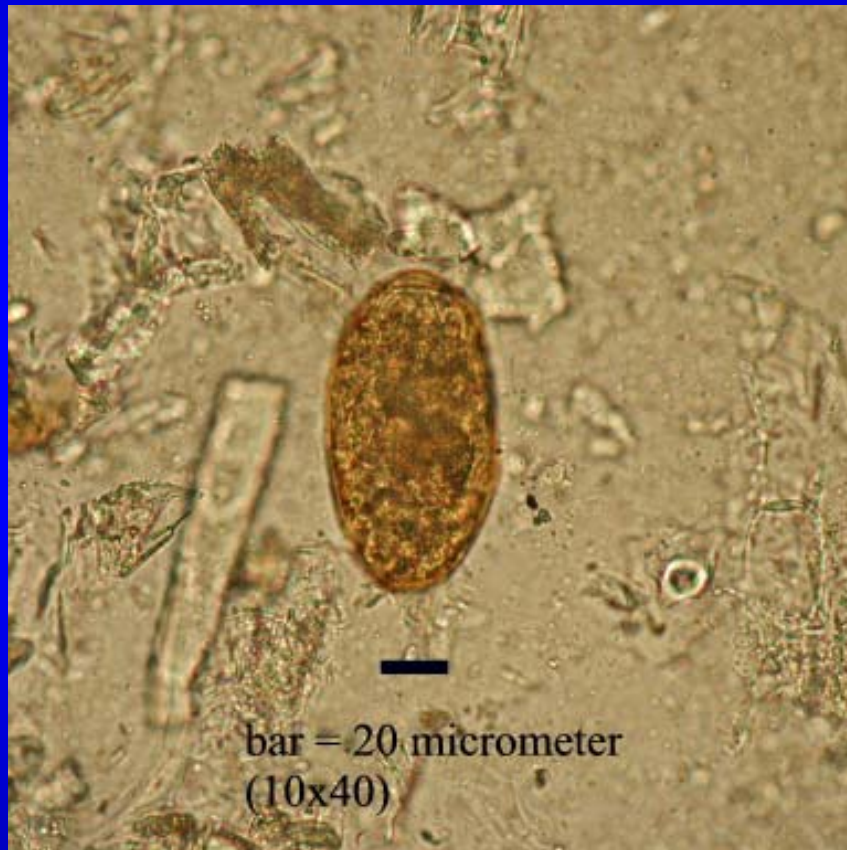
# Multi-dot ELISA test



Sera : 1000 x

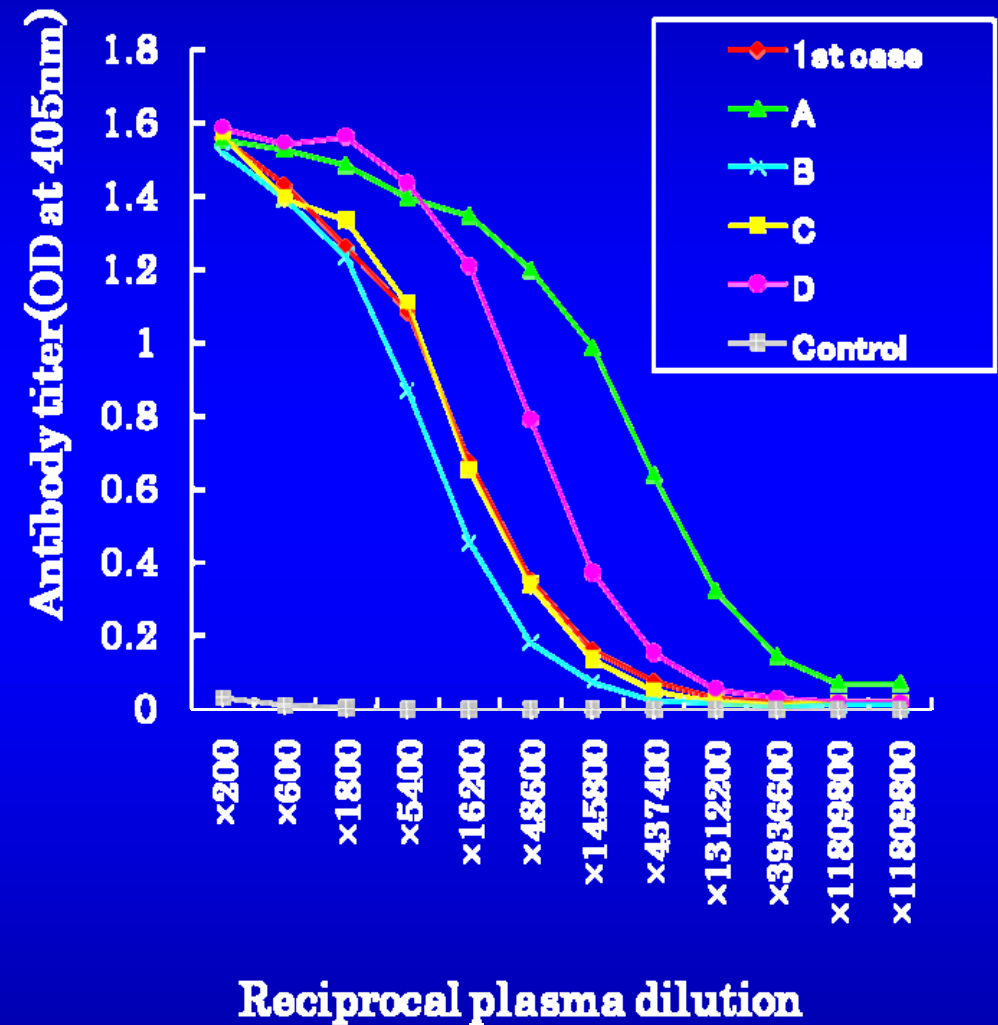
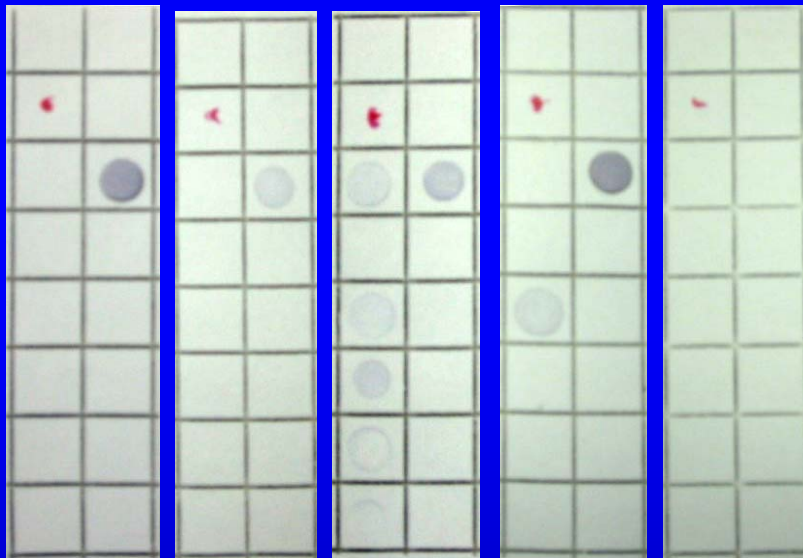
2<sup>nd</sup> Ab : 2000 x

# *P. westermanni* eggs detected in the feces



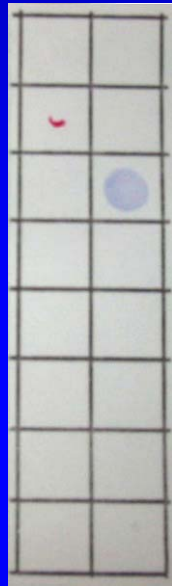
# Additional cases

A	B	C	D	Cont
36	1	1	15	2 (% Eos)



# Changes of antibody titers after treatment with praziquantel (78mg/kg/t.i.d. x 2 days)

## Multi-dot ELISA

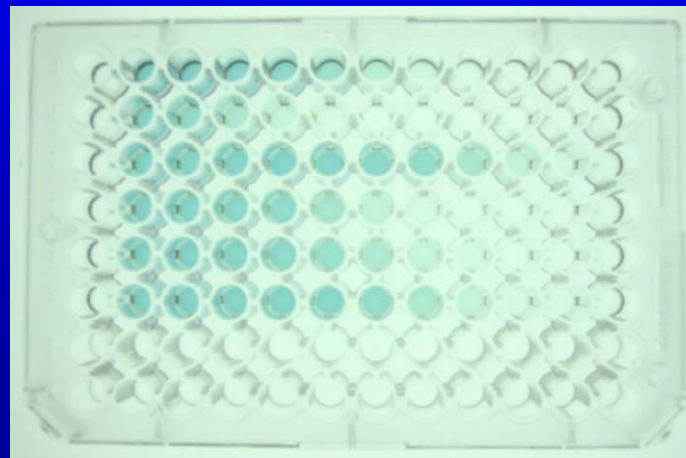
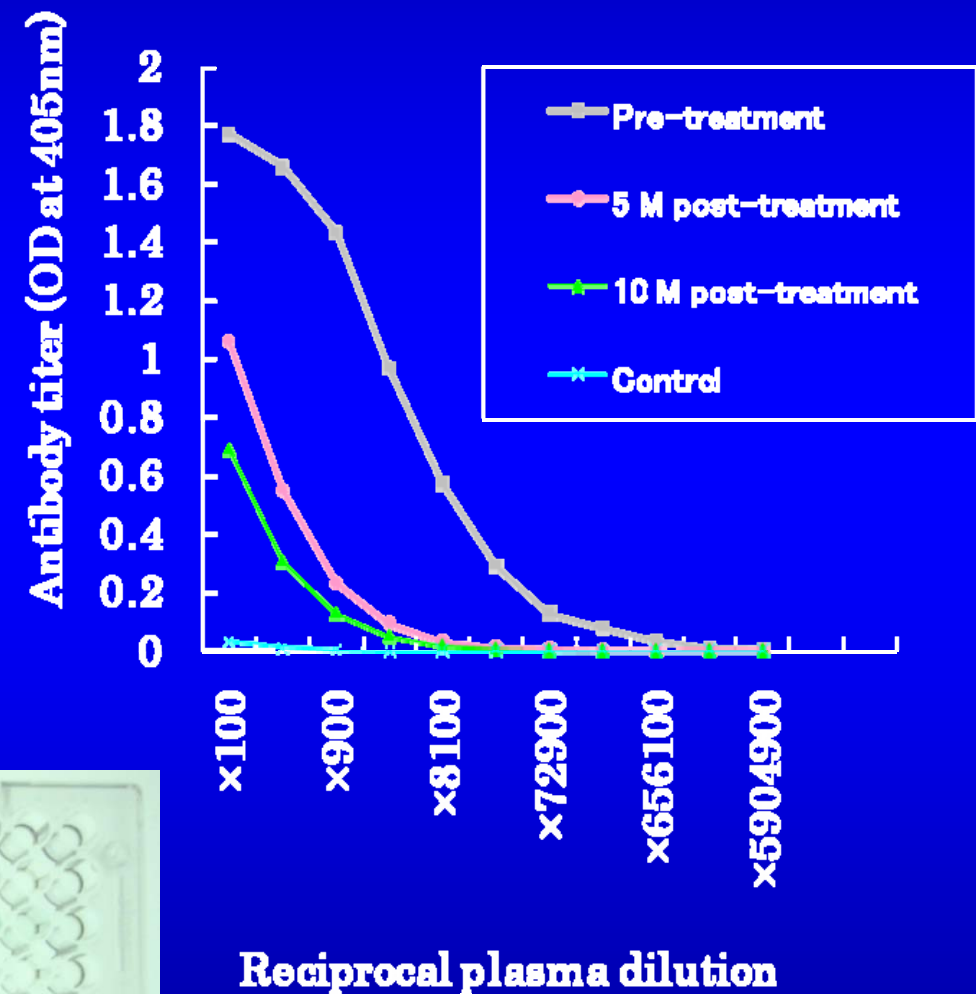


Pre-treatment

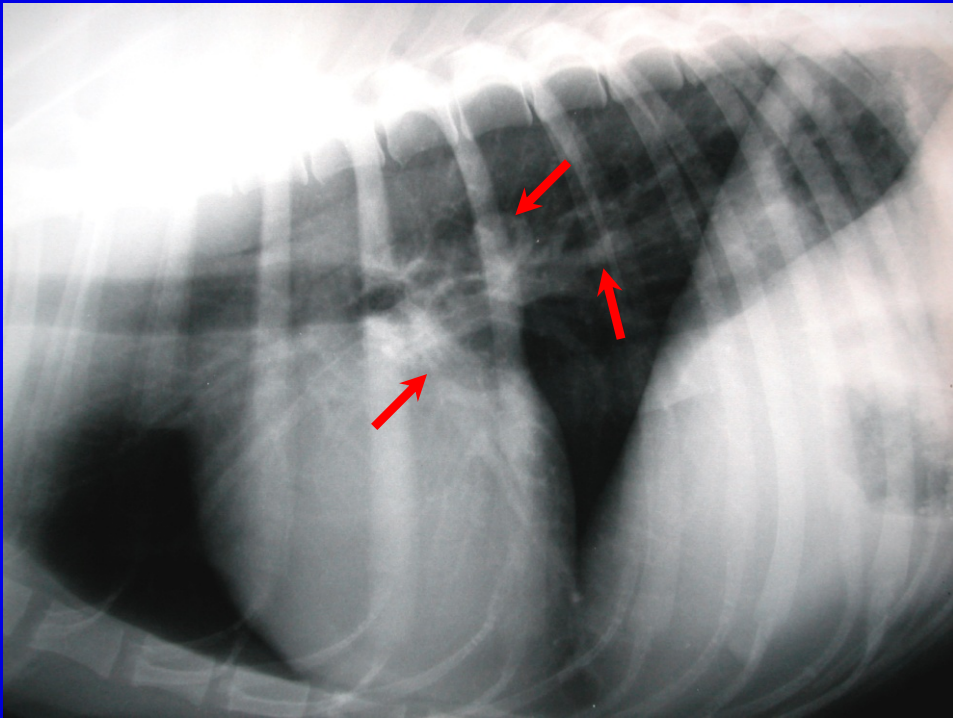


Post-treatment

## microplate ELISA



# Chest X-ray examinations

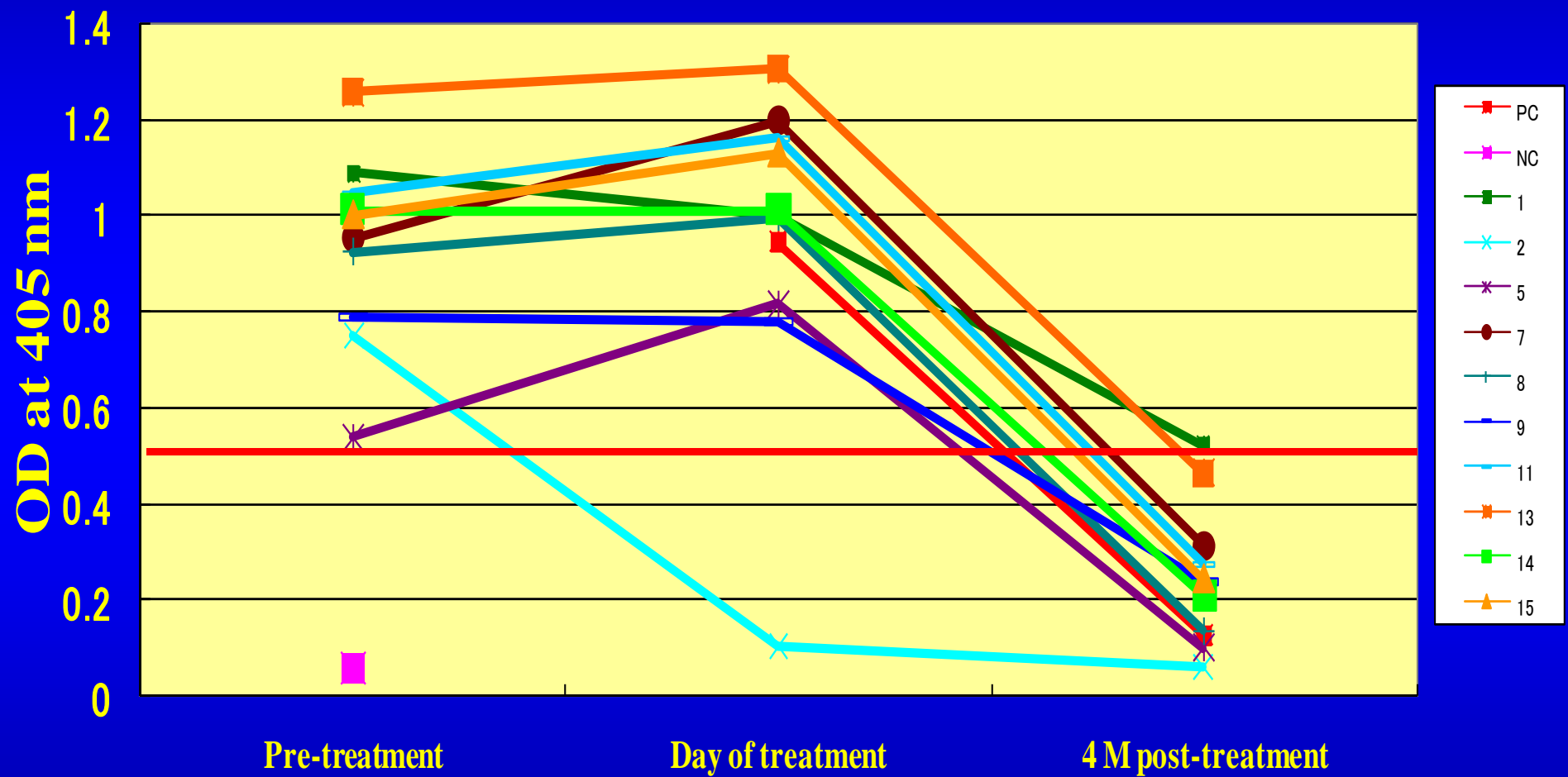


**Pre-treatment**

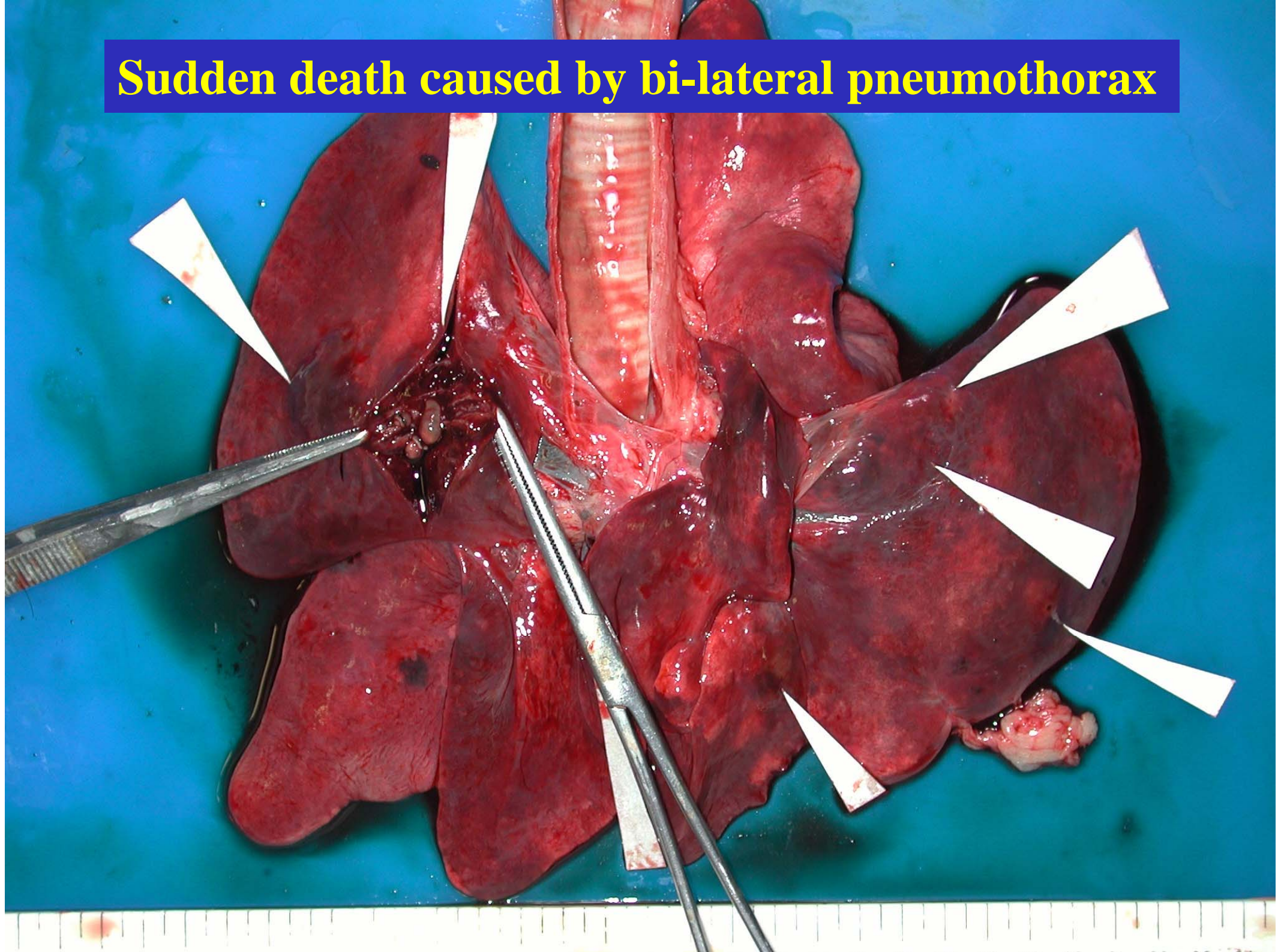


**5 M post-treatment**

## Treatment with praziquantel (10 dogs)



# Sudden death caused by bi-lateral pneumothorax



The image consists of two side-by-side intraoperative photographs. The left photograph shows a surgical incision with a white retractor or drape holding back muscle and soft tissue. The right photograph shows a more advanced dissection, revealing a large, lobulated, reddish-pink mass, likely a tumor, being manipulated with surgical instruments. The mass has a fleshy, irregular surface. The surrounding tissue is highly vascularized and red.

Are there any more cases ?

How distributed ?

# Seroepidemiological survey

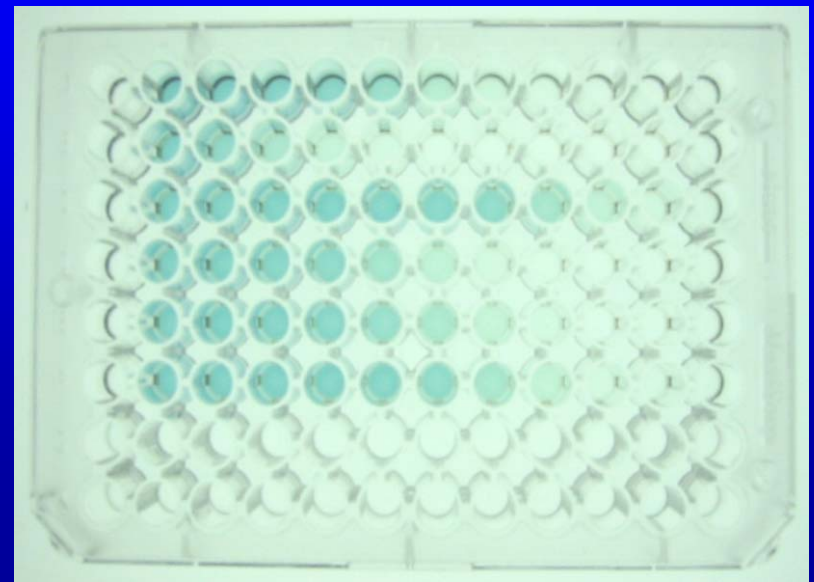
Miyazaki Prefecture, Kagoshima Pref., Kumamoto Pref., Oita Pref. in Kyushu, Japan

224 dogs mainly used for boar hunting

Collected blood samples (1-2ml each)

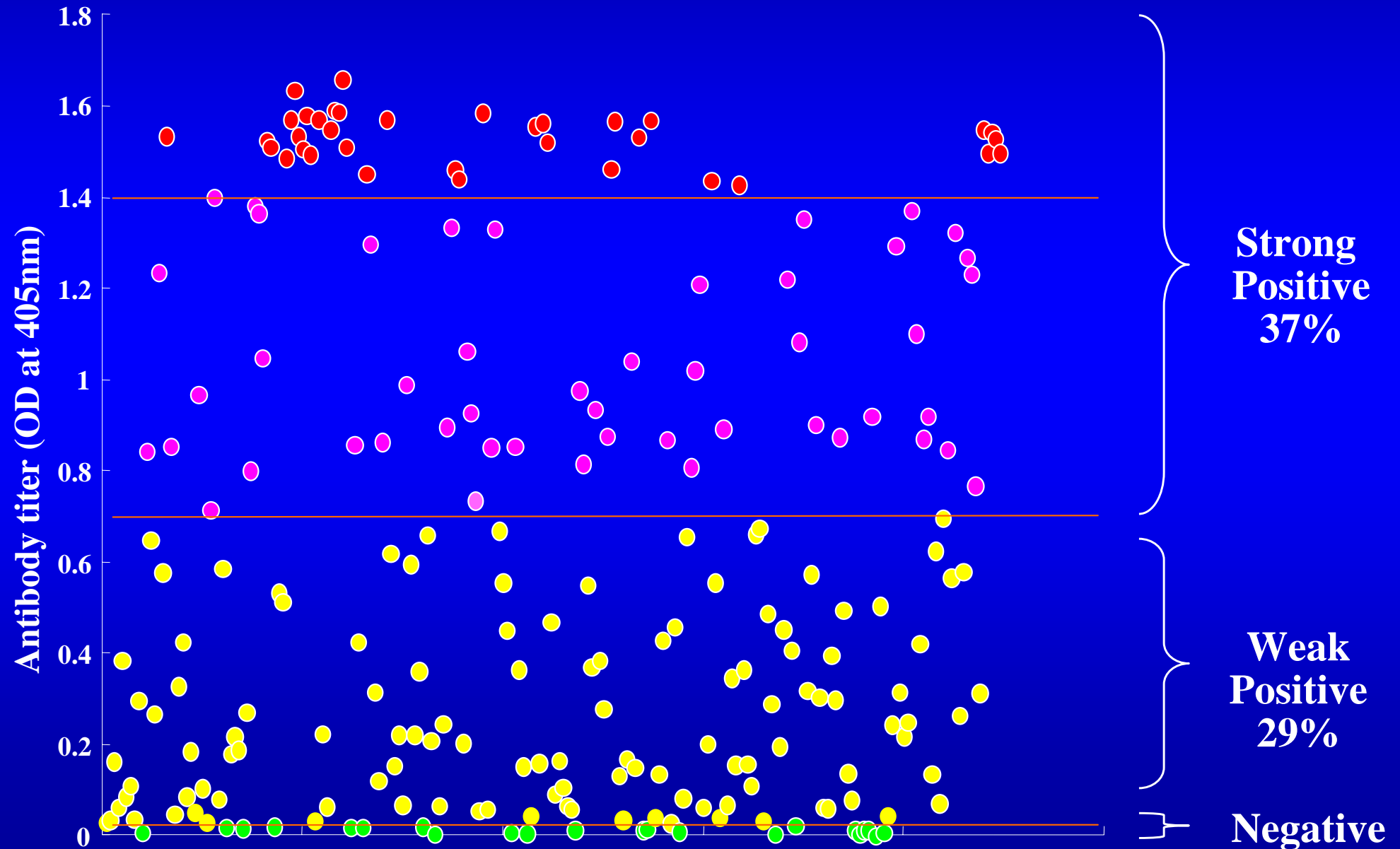
Antibody titers (microplate ELISA)

Eosinophil count

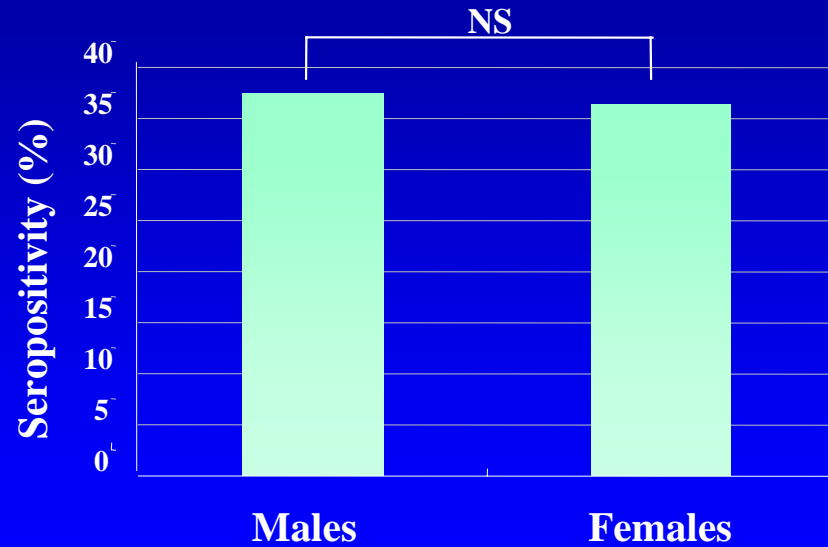


# Result of seroepidemiological survey

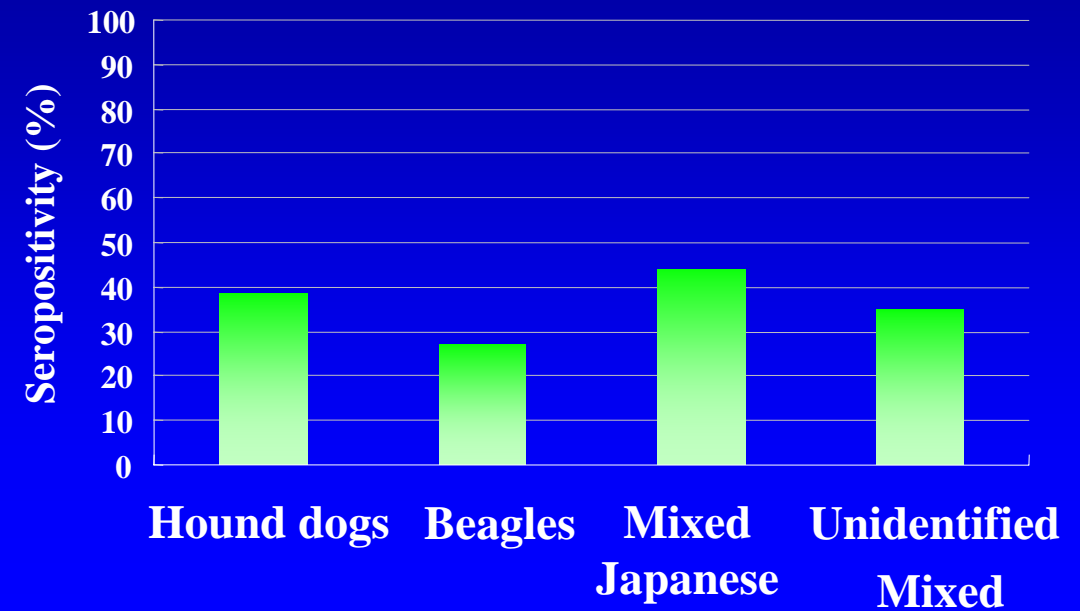
A total of 147 (66%) out of 224 dogs were seropositive



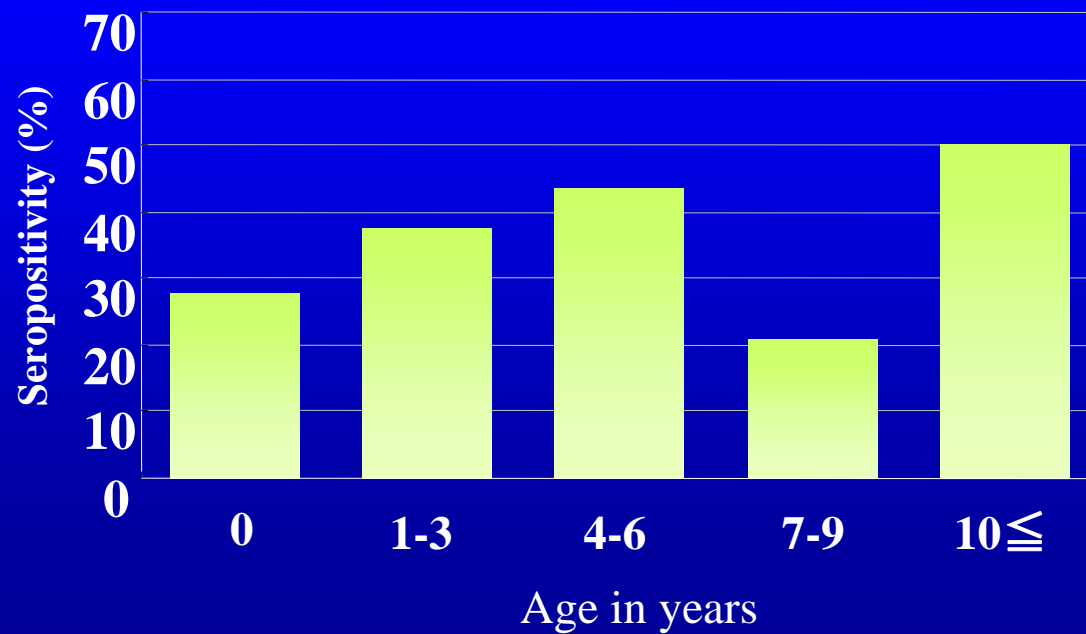
## Sex differences in seropositive rate



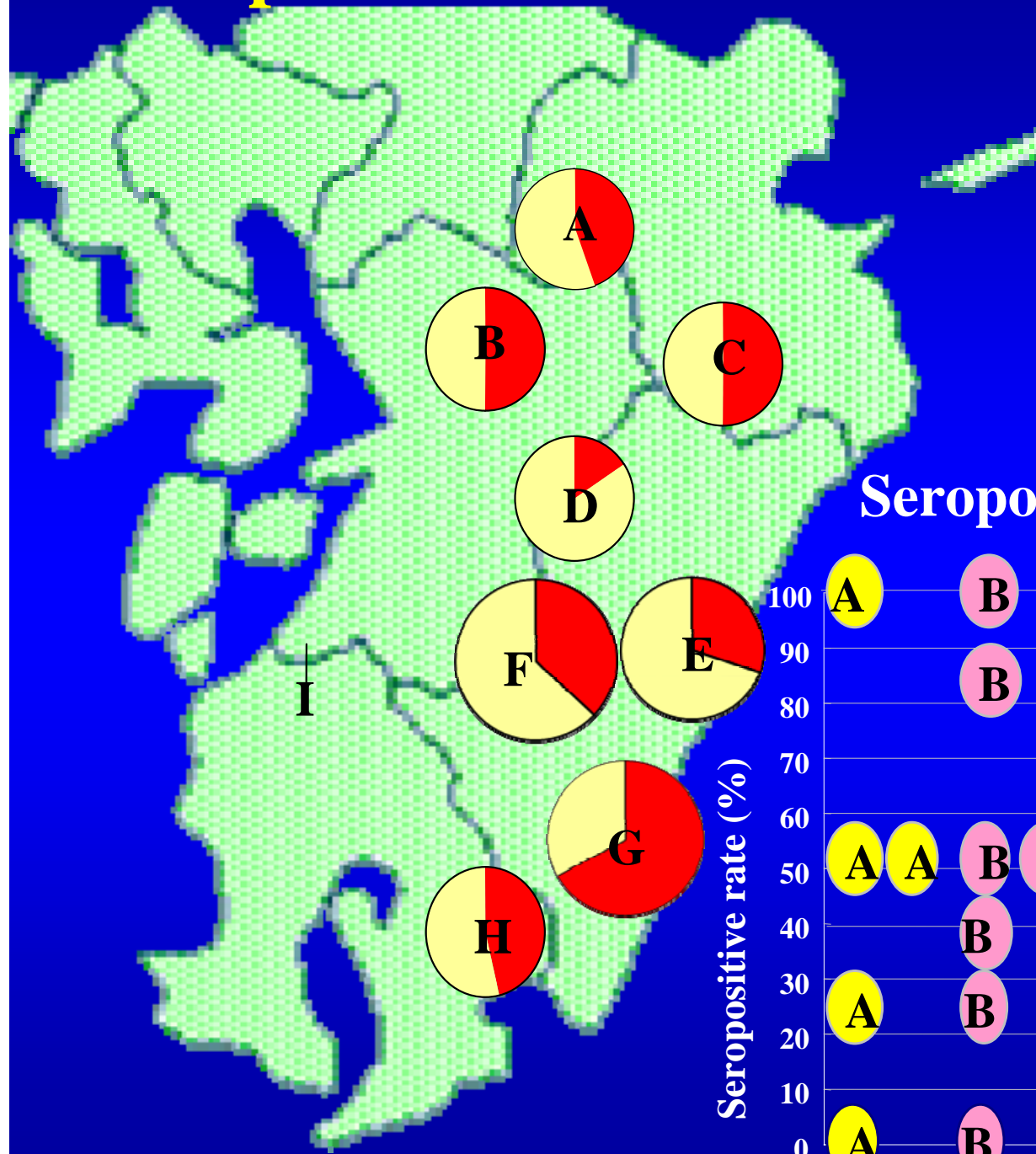
## Strain differences in seropositive rate



## Age distribution of seropositive dogs



# Seropositivities in the different areas



## Seropositivities among owners



- 1) Strongly seropositive dogs (83 dogs, 37%) were considered to have active paragonimiasis
- 2) The dogs routinely being fed with raw or undercooked boar meat showed high seroprevalence for *P. westermani*
- 3) The dogs not being fed with raw boar meat were entirely seronegative

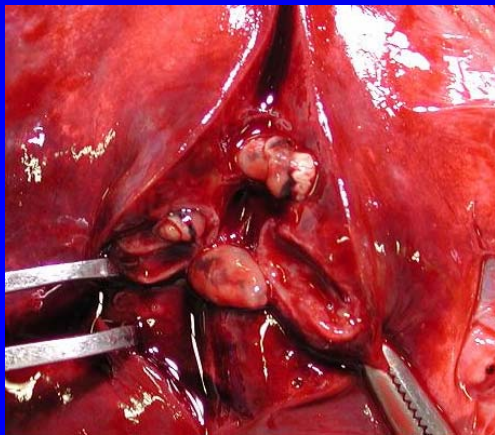
Bones of wild boars  
and a hunting dog

a skull bone



# Molecular analysis of adult worms and eggs

Internal transcribed spacer 2 (ITS2) and  
cytochrome oxidase 1 (CO1) gene sequences from



4 adult worms from  
the dog in the sudden death case

20 eggs from 8 dogs  
obtained by fecal examination

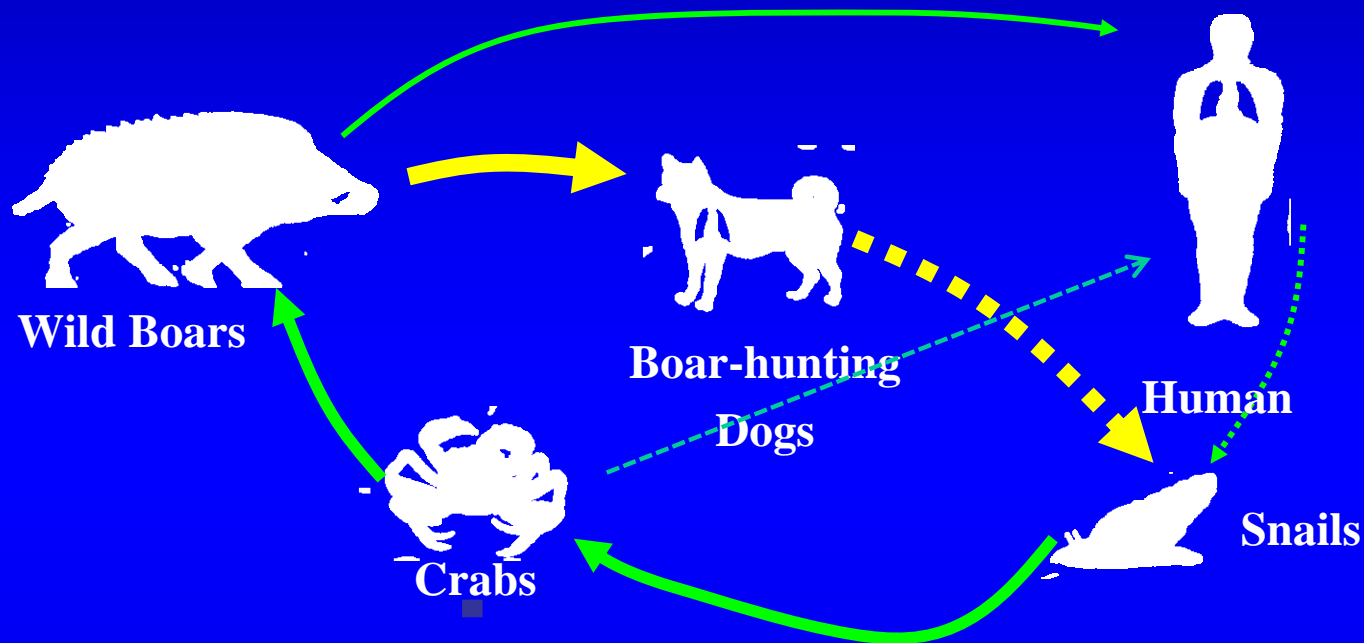


showed that all samples were completely similar to those  
from *P. westermani* deposited in GeneBank

(ITS2: U96907, CO1: U97205)

# Conclusions

- Paragonimiasis caused by *P. westermani* is highly endemic among boar-hunting dogs in central to southern kyushu



- Seroexamination of boar-hunting dogs is very convenient and efficient way to know how paragonimiasis distributed in the area, because they have dozens to hundreds times more chances than humans to ingest boar meat
- Dogs are important definitive host for the maintenance of the life-cycle of *P. westermani* in the mountainous area

# Ongoing study for paragonimiasis in dogs



- **Number of wild boars are increasing because of decreasing of hunters**
- **We are trying to expand the study area to cover at least western half of Japan**