Aspergillosis in wild and captive birds in Japan

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Japan is long islands located in far north of Asian monsoon area. We have a clear rainy season with frequent rainy days named “Tuyu” from the end of May to the end of July.
### Aspergillosis in USA

<table>
<thead>
<tr>
<th>Category</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waterfowl</td>
<td>Rare or not reported</td>
</tr>
<tr>
<td>Gulls</td>
<td>Common</td>
</tr>
<tr>
<td>Crows, raven</td>
<td>Occasional</td>
</tr>
<tr>
<td>Ravens</td>
<td>Infrequent</td>
</tr>
<tr>
<td>Raptors</td>
<td>Rare</td>
</tr>
<tr>
<td>(free-living)</td>
<td></td>
</tr>
<tr>
<td>(captive)</td>
<td></td>
</tr>
<tr>
<td>Songbirds</td>
<td>Rare</td>
</tr>
<tr>
<td>Upland gamebirds</td>
<td>Rare</td>
</tr>
<tr>
<td>Blackbirds, cowbirds, grackles</td>
<td>Rare</td>
</tr>
<tr>
<td>Herons</td>
<td>Rare</td>
</tr>
<tr>
<td>Shorebirds</td>
<td>Rare</td>
</tr>
</tbody>
</table>

A wide variety of both wild and captive birds have died of aspergillosis in Japan; more frequent cases were found among captive birds and those in zoos and aquariums.

### Aspergillosis in Japan

1. Penguins
2. Pet birds
3. Raptors
4. Cormorants
5. Swan

“Field manual of Wildlife Diseases”
USGS
About penguins

- Penguins (order Sphenisciformes, family Spheniscidae) are a group of aquatic, flightless birds living in the southern hemisphere.

- Highly adapted for life in the water, penguins have countershades dark and white plumage, and their wings have become flippers.

- Kept in zoos and aquariums all over the world.

- There are about 3,500 penguins in Japan, in the world.

The most frequent aspergillosis cases were seen in flocks of various sub-species of penguins maintained in zoos and aquariums.
Penguins

- Retrospective cases of penguins in Gifu University: 2004～2008

<table>
<thead>
<tr>
<th>Penguins</th>
<th>cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humboldt</td>
<td>36</td>
</tr>
<tr>
<td>King</td>
<td>7</td>
</tr>
<tr>
<td>cape</td>
<td>4</td>
</tr>
<tr>
<td>macaroni</td>
<td>4</td>
</tr>
<tr>
<td>Rock hopper</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>56</strong></td>
</tr>
</tbody>
</table>
Cause of death of 56 penguins (2004-2008)

- Infection: 7 cases
- Tumor: 6 cases
- Amyloidosis: 6 cases
- Cardio-vascular Dis.: 3 cases each
- Accidental death: 3 cases each
- Respiratory Dis.: 2 cases each
- Weakening: 2 cases each
- Intestinal obstruction: 1 case
- Liver fibrosis: 1 case
- Poisoning: 1 case
- Peritonitis: 1 case
- Senile decay: 1 case
- Unknown: 14 cases

Before 2004, 10 of 42 penguins were died of aspergillosis (28.3%)
Penguin Cases

- Macaroni penguin  ♂  Ad

Clinical episodes

2008.06.16  The first examination. Coughing after the meal
2008.06.17  No appetite. Suspected mycosis by X ray micrograph.
2008.06.18  Administration of anti-fungi drugs (itoraconazole). There were vomiting, coughing and bloody feces.
2008.07.02  Poor health condition.
2008.08.03  Found dead.
Aspergillosis (air sacs)

Macaroni penguin, male adult
Markedly thickened air sacs with grayish green mycotic colonies

pericarditis

peritonitis
There are many vesicles, which is one of characteristics of *Aspergillus* spp.
Morphological features of *Aspergillus*

- This fungus has a conidium with specific morphology named the phialoconidium or phialide.
There were multiple necrotic areas with cavities, grayish-white to yellow in color, around the esophagus and the lungs. The cavities contained mycotic colonies. By culture of a colony, *aspergillus spp* was isolated and diagnosed *aspergillus fumigatus* by PCR.
After fixation, multi-focal necrosis became more clear in the lung.

Affection usually occurred in the cranial and caudal thoracic air sacs.
Histologically, the air sac was thickened with layers of pus and *aspergillus spp.*

Necrosis of the epithelial cells

Thickened air sac
Conidial heads in lumen of the air sac. The arrangement of phialides and conidia is of *Aspergillus fumigatus*.
In the lung, there were multi-focal necrosis in the parabronchi, which contained numerous hyphae.
The hyphae showed segmentation
Histological features in Penguins

• Mycotic air saculitis
• Multifocal-necrosis in the lung and larynx
• Peritonitis
• Pericarditis

Pathological diagnosis
Aspergillosis based on morphology of hyphae

PCR
Aspergillus fumigatus (all cases)
Case 5 Humboldt penguin

Occasionally there were necrotic lesions with *aspergillus* spp. in the mucosa of the gizzard.
Recently some Japanese aquarium adopted barrier-system with HEPA-filtered air filtration and cold maintaining facility. These may be very effective to decrease aspergillosis in penguins.
Aspergillosis in pet birds

シロムネオオハシ
Red-billed Toucan : *Ramphastos tucanus*.

There was mycotic lesions in the lung, and the liver showed multifocal mottle.
This case had disseminated mycobacteriosis.

Foamy macrophage infiltrations in the intestine, liver, spleen and lungs.

Acid-fast positive bacilli were seen.
There are numerous hyphae radiated from a central necrotic nodule, forming microcolony (left).

Conidial heads were observed in a pulmonary cavity (right).
Aspergillosis is frequently observed in raptors, birds of prey
Aspergillosis was 5.9% in cause of death in 102 raptors.

No. 172  Snowy Owl (Bubo scandiacus)
Severely thickened air sacs caused by aspergillus spp. infection.
PCR: Aspergillus fumigatus
Goshawk, *Accipiter gentilis*,

- Abdominal cavity
- Lung
Gifu city is famous for cormorant fishing, which is a traditional fishing by using cormorants, *Phalacrocorax capillatus*. There were sporadic occurrence of *Aspergillosis* in retired cormorants.

This fishing has 1300 years history.
In the lung there were multi-focal necrosis with aspergillus phypae.
Swans migrate from Siberia to Northern Japan in Winter.
A male Whooper swan was rescued in unusual place, Kume island in Okinawa in poor health condition. He was attacked by crows.

Mycotic air saculitis
Air sacs had multi-focal white nodules, with frequent fungi.
The lungs and larynx showed multiple mycotic lesions.
In the lung there were multi-focal necrosis with occasional cavities.

In the cavity a large amount of Aspergillus hyphae. PCR: *Aspergillus fumigatus*

GMS
Aspergillosis in Japanese wild or captured birds

• Most of aspergillosis cases may be caused by *Aspergillus fumigatus*

• Penguins and raptors were major affected bird species

• Disease course was acute in most cases:
Thank you!
When inquiry, please contact us.

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