

## INCLUSION BODY DISEASE

| ANIMAL GROUP AFFECTED     | TRANSMISSION   | CLINICAL SIGNS  | FATAL DISEASE? | TREATMENT                                | PREVENTION & CONTROL  |
|---------------------------|--|---|----------------|--|---|
| Captive pythons and boas. | Unclear:<br>Possibilities include:<br>mites,<br>direct contact,<br>venereal spread,<br>intrauterine transmission | Regurgitation followed by anorexia, neurological signs (incoordination, disorientation, head tremors) | Yes            | No treatment (Euthanasia is recommended) | <i>In houses</i><br>Strict quarantine<br><br><i>in zoos</i><br>strict quarantine, examination of liver, or esophageal tonsil biopsies for entry control of boid snakes in boid collections.<br>Ectoparasite control |

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| <b>Susceptible animal groups</b><br>All boid snakes should be considered susceptible. Similar inclusions have rarely been described in other snakes, e.g. vipers.  |                                    |
| <b>Causative organism</b><br>Unclear: retroviruses are believed to be the causative agent, but are not always detected in IBD positive snakes and retroviruses have been detected in IBD negative snakes.  |                                    |
| <b>Zoonotic potential</b><br>No.   |                                    |
| <b>Distribution</b><br>World-wide in captivity. Its occurrence in the wild is unknown.   |                                    |
| <b>Transmission</b><br>Exact route unknown.<br>Possibly the causative agent is spread by mites ( <i>Ophionyssus natricis</i> ). Infestations have been associated with outbreaks. Other possible routes include direct contact, venereal spread, intrauterine transmission to developing embryos in viviparous species and eggs in oviparous species should also be considered.  |                                    |
| <b>Incubation period</b><br>Unknown. In one study, two snakes injected with a virus isolate from an IBD positive snake developed clinical symptoms within 8 days of inoculation. In another study, four non-infected boas received inoculations of infectious material from a snake with IBD; inclusions (but not disease) developed 10 weeks later.   |                                    |
| <b>Clinical signs</b><br>Very variable. Regurgitation followed by anorexia, neurological symptoms including incoordination, disorientation, head tremors, lethargy and death. Pythons primarily show signs of CNS disease while boas may show signs of CNS disease and/or regurgitation. Clinical signs are quite variable and include: stomatitis, pneumonia, undifferentiated cutaneous sarcomas, lymphoproliferative disorders, and leukaemia. Animals with inclusions in various tissues but without apparent signs of disease have been described, particularly boas. |                                    |
| <b>Post mortem findings</b><br>As a rule, no pathognomonic macroscopic lesions. Often no inflammatory reaction is observed in association with the inclusions. Occasionally, abscesses may be seen in oesophageal tonsils.   |                                    |
| <b>Diagnosis</b><br>Detection of typical intracytoplasmic inclusions is necessary for the diagnosis of IBD.  |                                    |



In dead animals: histological examination of liver, spleen, brain, kidney, heart, and digestive tract: characteristic eosinophilic intracytoplasmic inclusions in CNS neurons and epithelial cells of multiple organs. However, inclusions can vary and the absence of inclusions may not mean the snake is free of the disease. Electron microscopy can be used to further characterize the inclusions.

In live animals: detection of inclusions in cells of live animals has been described in liver biopsies, kidney biopsies, biopsies of the esophageal tonsils, and in blood cells in blood smears. While blood smears may be the easiest to obtain, inclusions may be more readily found in other tissues (e.g. liver biopsies).

**Material required for laboratory analysis**

Live animals: biopsies of liver, oesophageal tonsils, or kidney. Detection of inclusions has also been described in blood smears.

In dead animals: Liver, pancreas, kidney, brain.

**Relevant diagnostic laboratories**

Local pathological laboratories.

**Treatment**

No effective treatment.

**Prevention and control in zoos**

Quarantine for a minimum of 90 days, the recommendation for boas is a 6-month quarantine period.

Mite control and elimination. Examination of liver biopsies. If inclusions are identified, euthanasia should be considered, although the clinical progression of inclusion body positive animals can be very variable and positive animals may remain healthy for a long period of time.

**Suggested disinfectant for housing facilities**

All virucidal disinfectants at recommended concentrations and times.

**Notification**

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**Guarantees required under EU Legislation****Guarantees required by EAZA Zoos****Measures required under the Animal Disease Surveillance Plan****Measures required for introducing animals from non-approved sources****Measures to be taken in case of disease outbreak or positive laboratory findings**

Euthanasia of snakes with inclusions is recommended. Biopsies should be collected and evaluated from snakes in contact with IBD positive animals. Ectoparasite control and strict quarantine of any snake that has come into contact (directly or indirectly) with an IBD positive snake.

**Conditions for restoring disease-free status after an outbreak****Contacts for further information****References**

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