**PYTHIOSIS**

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<th>Animal Group(s) Affected</th>
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<td>Mammals: canids, felids, equids, felids, cattle, and sheep. Birds (limited)</td>
<td>Motile biflagellate zoospore (<em>P. insidiosum</em>) released into aquatic environments.</td>
<td>Gastro-intestinal: weight loss, vomiting, diarrhea, and hematochezia. Cutaneous: Non-healing wounds, naso-pharyngeal lesions, invasive subcutaneous masses, draining nodular lesion, or ulcerated plaque-like lesions.</td>
<td>Devastating and often fatal unless resectable with wide margins.</td>
<td>Surgical resection or amputation of infected tissues with wide margins.</td>
<td>As it is environmental exposure, control is difficult.</td>
<td>No; although humans can get it from the environment, infection is rare.</td>
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**Fact Sheet compiled by:** Roberto Aguilar, updated by Leonel Mendoza and Raquel Vilela

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**Fact Sheet Reviewed by:** Amy Grooters; Roberto Aguilar

**Susceptible animal groups:** Essentially, all mammals are susceptible. Small mammals, cats and dogs have been reported. Horses, cattle, and sheep present pythiosis with some frequency. Captive wild felids and ursids have been reported although all mammals are potentially susceptible. In zoo species specifically, primary pulmonary pythiosis in a jaguar in Louisiana; spectacled bears in South Carolina; and a lion in Florida have been reported. More recently, a captive black jaguar was diagnosed with pythiosis in Mexico (pers. comm.). Mandibular and bulbar infections in captive camels and cutaneous infection in a white-faced ibis (*Plegadis chihi*).

**Causative organism** *Pythium insidiosum* (pathogenic "water mold").

**Zoonotic potential:** Humans would get pythiosis from the environment, but infection is rare. No evidence had been documented that pythiosis can be transmitted from an animal to a person.

**Distribution:** Globally, pythiosis is most often encountered in Southeast Asia (especially Thailand and Indonesia), eastern coastal Australia, New Zealand, and South America, but has also been recognized in Korea, Japan, and the Caribbean. Southeastern US but it also has been identified in Wisconsin, New Jersey, New York, Virginia, Kentucky, Arizona, California, Illinois, Indiana, Oklahoma, Missouri, Kansas, and Tennessee.

**Incubation period** Unknown, but clinical disease likely develops weeks to months after exposure.

**Clinical signs:**
- Gastrointestinal: weight loss, vomiting, diarrhea, and hematochezia. Laboratory abnormalities include eosinophilia, anemia, hyperglobulinemia, hypoalbuminemia, and rarely hypercalcemia. Abdominal
radiography and sonography usually reveal severe segmental thickening of the gastrointestinal tract, an abdominal mass, and/or mesenteric lymphadenopathy.

**Cutaneous:** Non-healing wounds and invasive masses that contain ulcerated nodules and draining tracts. In horses, the formation of hard masses (“kunkers”) within the lesions may occur. Nasopharyngeal lesions, invasive subcutaneous masses, draining nodular lesion, and ulcerated plaque-like lesions are found in cats. *Pythium insidiosum* has been also reported affecting bones, lungs, and lymph nodes.

- **Post mortem, gross, or histologic findings:** Histologically pythiosis is characterized by eosinophilic pyogranulomatous inflammation associated with broad (4-7 micron), poorly septate hyphae. Affected tissues contain multiple foci of necrosis surrounded and infiltrated by neutrophils, eosinophils, and macrophages. In addition, there are discrete granulomas composed of epithelioid macrophages, plasma cells, multinucleate giant cells. Hyphae stain well with GMS but less well with PAS. Histologically pythiosis and zygomycosis have a similar appearance.

**Diagnosis:** Veterinarians and physicians with expertise in this disease could suspect pythiosis because the clinical features of the disease. However, a clinical specimen (biopsy, scraping of the lesion, kunkers) is always recommended to support the findings. Confirmation is usually histopathology followed by serology for anti-*Pythium insidiosum* antibodies or culture. Serology has been performed successfully in canids, exotic felids, and several species of ursids. Cytologic evaluation of exudates from draining tracts or fine-needle aspirates of enlarged lymph nodes may be suggestive of fungal infection. Immunohistochemistry is not currently available, but PCR may be performed on DNA extracted from infected tissues.

**Material required for laboratory analysis:** Serum, infected tissue, fine-needle aspirates, (Gomori’s methenamine silver stain (GMS), selective media containing streptomycin and ampicillin for culture

**Relevant diagnostic laboratories:**
- Serology (ELISA), PCR amplification, rRNA gene sequencing
- Amy Grooters
- Pythium Lab, Louisiana State University
- Skip Bertman DriveBaton Rouge, Louisiana 70803
- Phone: (225) 578-9600
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**Treatment:** Surgical resection of infected tissues with wide margins or amputation for distal cutaneous lesions. Postoperative treatment with itraconazole and terbinafine may decrease the chance of recurrence in lesions that are not completely resected. Immunotherapy (Pan American Veterinary Laboratories, http://pythium.pavlab.com/) is often effective for treatment in horses, especially when it is combined with aggressive surgical resection. It is infrequently effective in dogs.

**Prevention and control:** As it is environmental exposure, control is difficult.

**Suggested disinfectant for housing facilities:** None. *Pythium insidiosum* does not survive dry
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environments.

**Notification:** None

**Measures required under the Animal Disease Surveillance Plan:** None

**Measures required for introducing animals to infected animal:** None

**Conditions for restoring disease-free status after an outbreak:** None

**Experts who may be consulted:**

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