**Mycology**

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**Systemic Mycosis**

**ASPERGILLOSIS**

 Aspergillosis is a spectrum of diseases of humans and animals caused by members of the genus *Aspergillus*. These include (1) mycotoxicosis due to ingestion of contaminated foods; (2) allergy and sequelae to the presence of conidia or transient growth of the organism in body orifices; (3) colonization without extension in preformed cavities and debilitated tissues; (4) invasive, inflammatory, granulomatous, necrotizing disease of lungs, and other organs; and rarely (5) systemic and fatal disseminated disease. The type of disease and severity depends upon the physiologic state of the host and the species of *Aspergillus* involved.

 Aspergilli rarely infect a normal host. The organism is distributed world-wide and is commonly found in soil, food, paint, air vents. They can even grow in disinfectant. There are more than one hundred species of aspergilli.

 The most common etiologic agents of aspergillosis :

*Aspergillus fumigatus* , *A. niger, A. flavus* .

 **Characteristics of Aspergillus spp.**

* Some *Aspergillus* species cause serious disease in humans and animals – it is pathogenic.
* Some *Aspergillus* species produce enzymes which have important industrial applications(the enzymes in biological washing powders and enzymes for maturing cheeses are derived from *Aspergillus* species).
* *Aspergillus* can produce mycotoxins – these are often found in contaminated foodstuff and are hazardous to the consumer.

**Where is Aspergillus found?**

*Aspergillus fumigatus* is thermotolerant and grows at temperatures ranging from 15°C to 53°C. Although it is ubiquitous in nature, present both indoors and outdoors, it is commonly found in large numbers around construction sites where digging occurs. *Aspergillus fumigatus* is also common in soil, mulches, sewage facilities, and bird excreta.

* *Aspergillus* spores are easily airborne and we normally breathe in 100-200 spores daily.
* Some species withstand heat eg; *Aspergillus fumigatus* (pathogenic type) these are commonly found in compost.

**Sources of Infection:**

Aspergillus species are found in :

* + Soil,
	+ Air; spores may be inhaled
	+ Water / storage tanks in hospitals etc
	+ Food, Compost and decaying vegetation
	+ Fire proofing materials
	+ Bedding, pillows
	+ Ventilation and air conditioning systems
	+ Computer fans

*Aspergillus* spores are widespread and are readily inhaled.

**Which species of Aspergillus are pathogens?**

* The most common causing invasive disease are *Aspergillus fumigatus* and *Aspergillus flavus.*
* The most common causing allergic disease are *Aspergillus fumigatus* and *Aspergillus clavatus.*

**Aspergillus as a pathogen in man**

 Aspergillosis is a group of diseases caused by *Aspergillus*. The symptoms – fever, a cough, chest pain or breathlessness occur in many other illnesses so diagnosis can be hard. Usually only patients with already weakened immune systems or who suffer other lung conditions are susceptible.

* In man the major forms of disease are:
1. **Allergic aspergillosis** (affects asthma, cystic fibrosis and sinusitis patients).
2. **Acute invasive aspergillosis** (risk increases if patient has weakened immunity such as some cancer patients and those on chemotherapy).
3. **Disseminated invasive aspergillosis** (widespread through body).

**Aspergillus as a pathogen in animals**

* All domestic mammals, birds and numerous
wild species can get aspergillosis.
* Aspergillosis is a major cause of morbidity and mortality in birds. Birds when stressed by malnutrition or capture are particularly susceptible to aspergillosis.
* Spores of *Aspergillus fumigatus* cause lung
infections – leading to death.
* *Aspergillus fumigatus* spores are often present on the surface of eggs after laying. The spores may penetrate the shell pores and contaminate newly hatched chicks.
* Canine sinonasal aspergillosis is a disease that predominately effects breeds of dogs that are typically relatively young and active. *A. fumigatus* is the organism most commonly isolated with this disease; however, *A. terreus* predominates in cases involving German shepherd dogs.
* Another animal that is affected by aspergillosis is the horse, specifically in the head region, With **equine guttural pouch mycosis.**
* Bovine mycotic abortion is a worldwide sporadic disease . Cows typically abort in their second or third trimester of pregnancy. Aspergillus spp. are commonly isolated and **A. fumigatus** accounts for the majority of the cases

**Aspergillus Mycotoxins**

* Mycotoxins are chemical products of fungi that have the capacity to damage animal health and contaminate crops.
* Repeated aflatoxin ingestion in man has been linked to liver cancer.

Mycotoxins **(aflatoxins)** produced by ***Aspergillus parasiticus* and *A. flavus*** are commonly found to contaminate corn, peanuts, and other crops used for animal feedstuff. High temperature and humidity increase chances of contamination

**Ochratoxin A** - secreted by ***Aspergillus ochraceus* and *Penicillium******species****,* is a nephrotoxinfound oftenin cereal grains from tropical .

**Diagnosis:**

**Culture**: Aspergilli require 1-3 weeks for growth. The colony begins as a dense white mycelium which later assumes a variety of colors, according to species, based on the color of the conidia. The hyphae are branching and septate. Species differentiation is based on the formation of spores as well as their color, shape and texture.

**Serology**: There is an excellent serological test for aspergillosis which is an Immunodiffusion test. There may be 1 to 5 precipitin bands. Three or more bands usually indicate increasingly severity of the disease. i.e., tissue invasion.( detection of IgG and IgE), ( ELISA).

**Treatment:**

Voriconazole, Fluconazole, Itraconazole and Amphotericin B.