



Monsters Unmasked

The Science Behind Legendary Creatures

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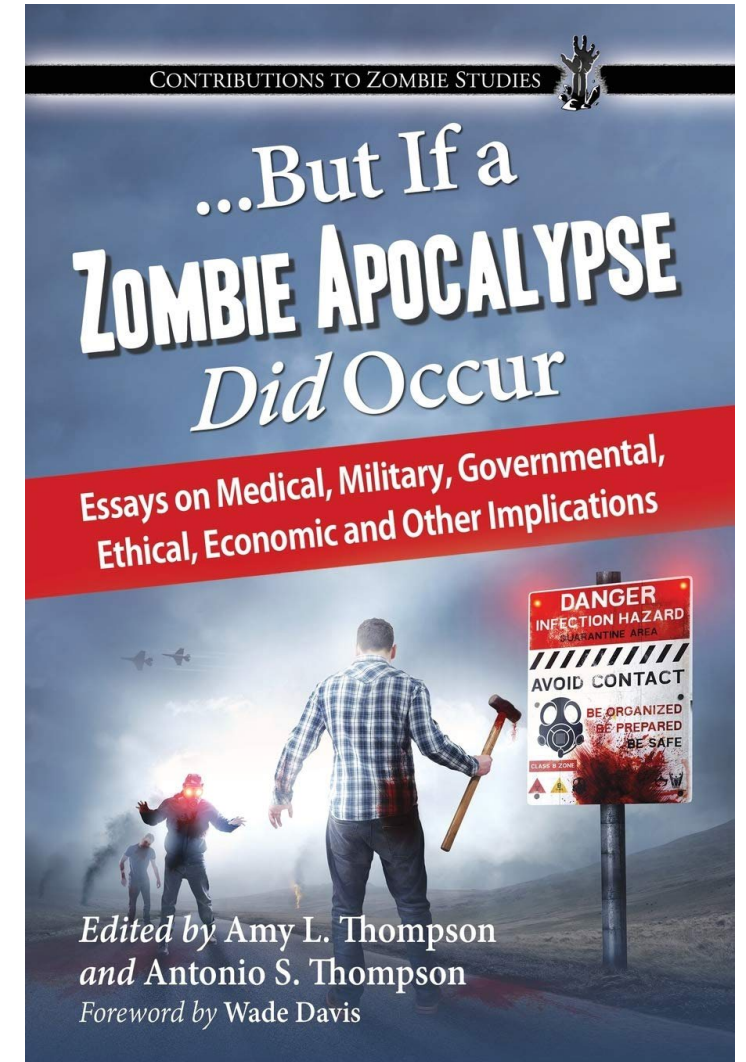
Professor and Chair, Department of Biology



Introduction to Popular Culture Work and Science Behind Legendary Creatures

- Zombies as representative of human condition
- Scientists trying to figure out cause and how to prevent effect

Focus of Talk: Possible Scientific Explanations for Monsters



Some creatures may be biological organisms



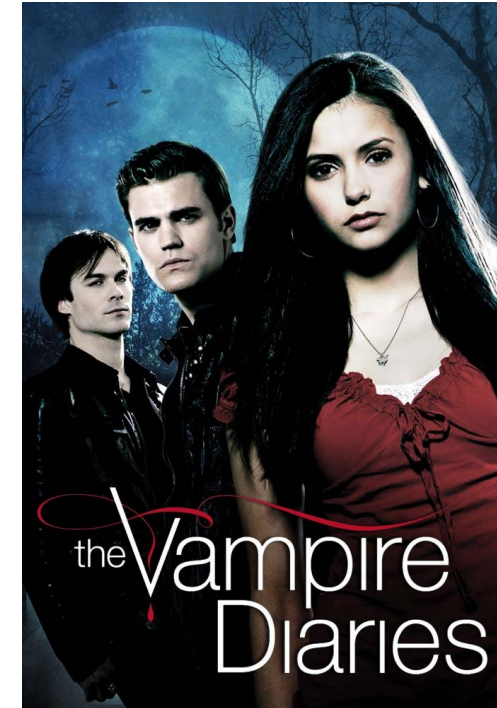


Some creatures may be explained by disease states,
impact of biological organisms on other organisms,
pharmacological agents, and toxins



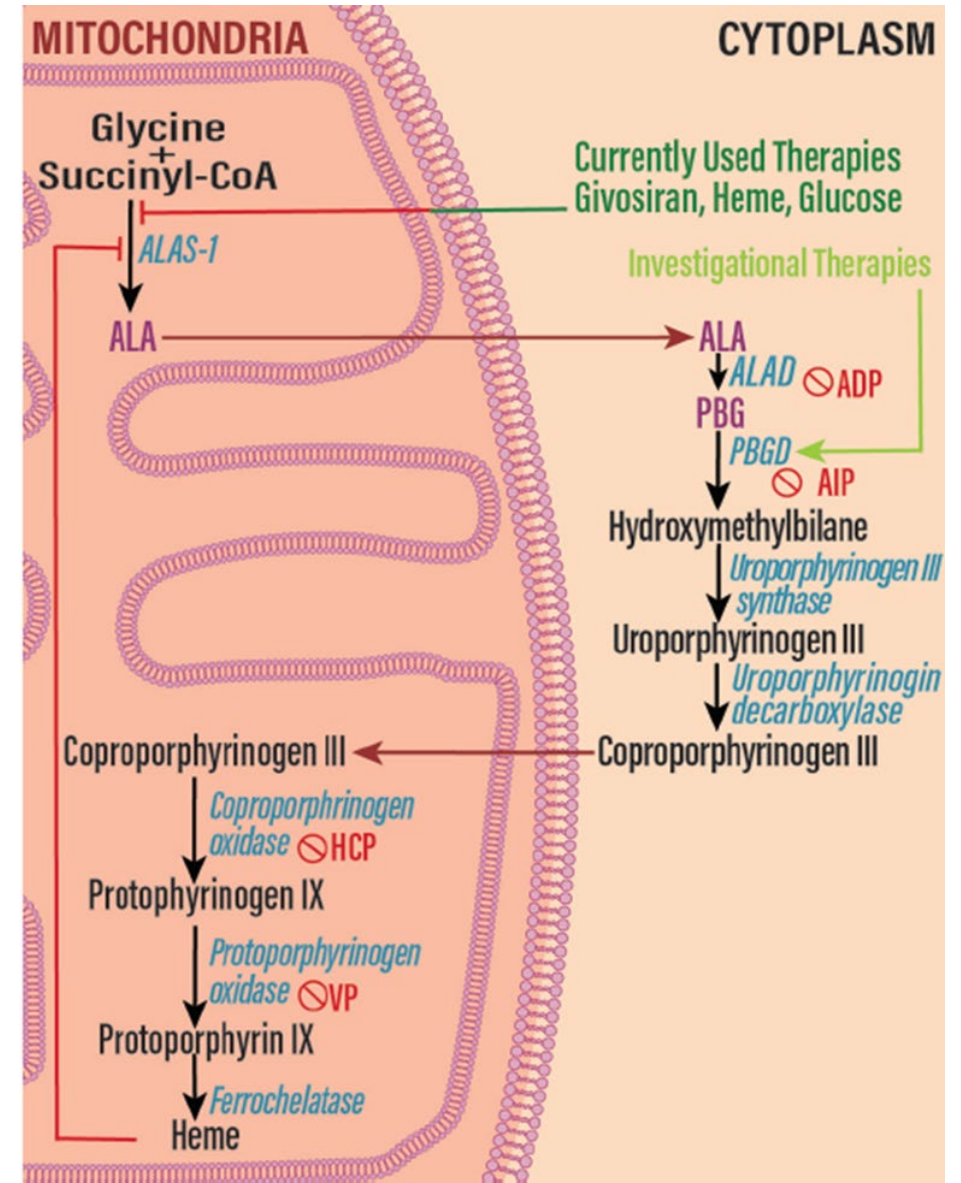
Characteristics of Vampires

- Fangs
- Pale skin
- Sensitivity to light
- Feed on blood
- Charming to Not so Charming Behavior



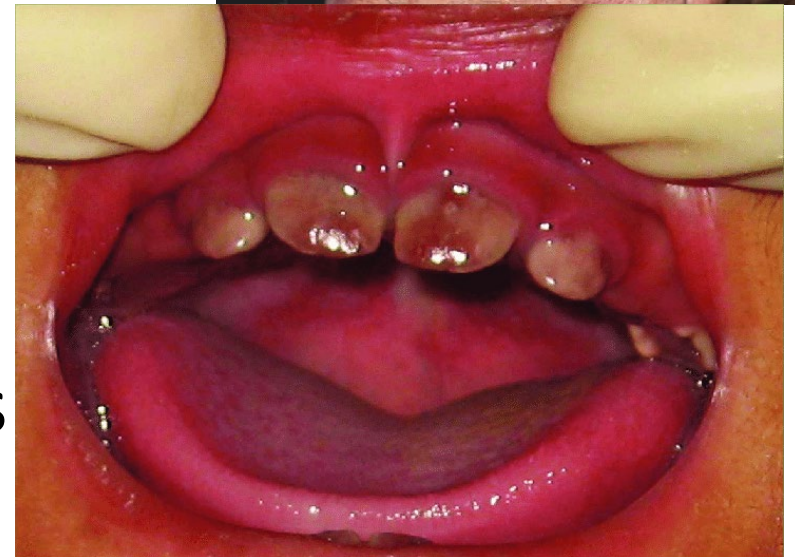
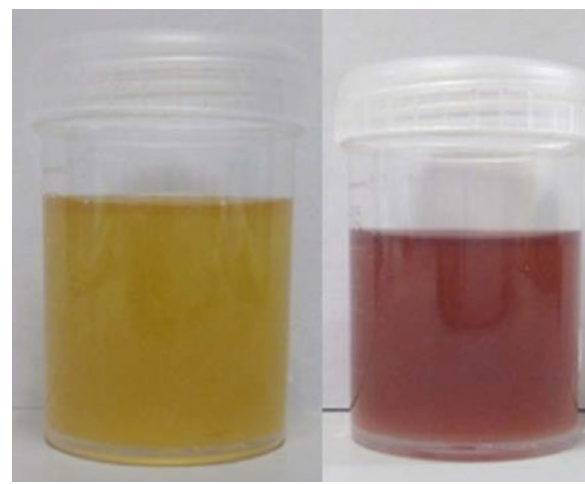
Porphyrias may explain Vampire legend

- por-FEAR-e-uh
- Group of diseases involving enzymes that produce heme
- Lead to build up of porphyrins
- Congenital erythropoietic porphyria (AKA Gunther's Disease) most like vampire legend



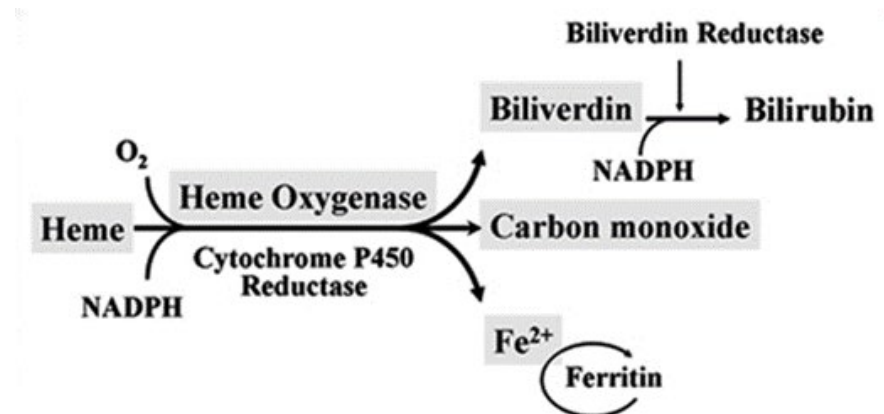
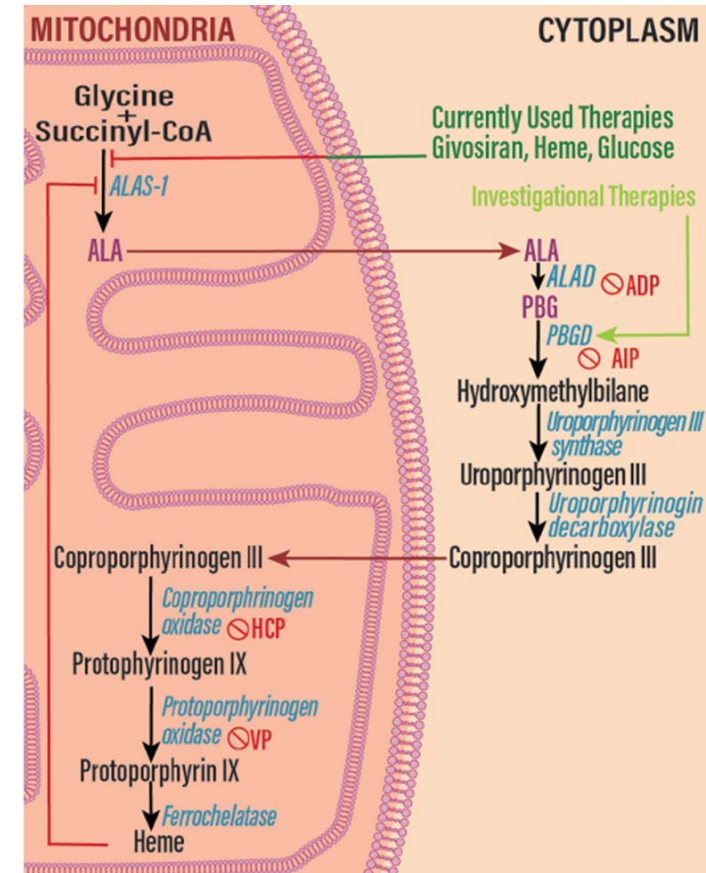
Porphyria Symptoms

- Acute attacks caused by stress, drugs/alcohol, sunlight
- Sun exposure causes skin blistering, itching, pain, burning
- Staining of teeth and gums
- Abdominal pain/vomiting/constipation
- Hyponatremia/Hypertension
- Anxiety, confusion, hallucination, psychosis



Blood and Garlic with Porphyrrias

- Vampires are looking for blood
- Garlic stimulates heme oxidase
- Avoiding mirror
- Fear of Holy water and crucifixes



Consumption and Vampires

- Tuberculosis
 - Bacterial cause
 - Pale, cough up blood, wasting
- Rhode Island Family in 1800s
 - Frail in life, bloated in death
 - Blood on mouth
 - Hair, nails, and teeth grew

BELIEVE IN VAMPIRES.

Rhode Islanders Who Are Sure
That They Do Exist.

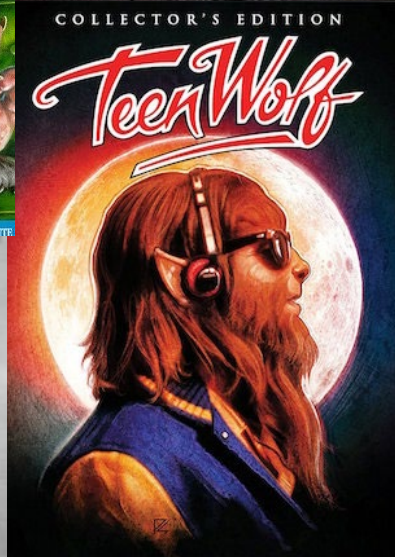
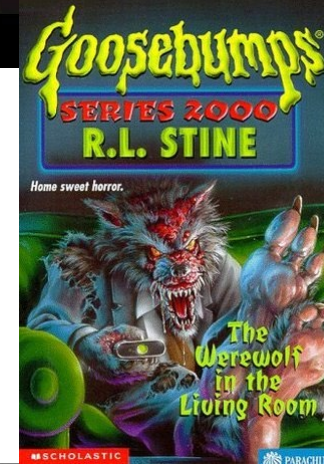
Instances Told of Where the Living
Have Been Attacked and Preyed
Upon by These Representatives
of an Unseen World.



A MEMBER OF THE ANTI-VAMPIRE PARTY.

Werewolves

- Transition to werewolf during full moon
- Hairy, monobrow, long fingernails, glowing eyes, unquenchable thirst
- Become werewolf by bite, rainwater from werewolf paw print, or too much full moon
- Porphyrias can cause excessive hair growth
- Hypertrichosis



Hypertrichosis (AKA Werewolf Syndrome)

- Excessive hair growth independent of androgen levels
- Localized or All Over
- Congenital or Acquired
- Caused by malnutrition, repetitive scratching, medications
- Certain forms have gingival hyperplasia



Cases of Hypertrichosis

- In Mexico, over 30 members of a family have hypertrichosis
- Five years ago in Spain, 17 children developed hypertrichosis after being given minoxidil instead of omeprazole



Hypertrichosis in Animals

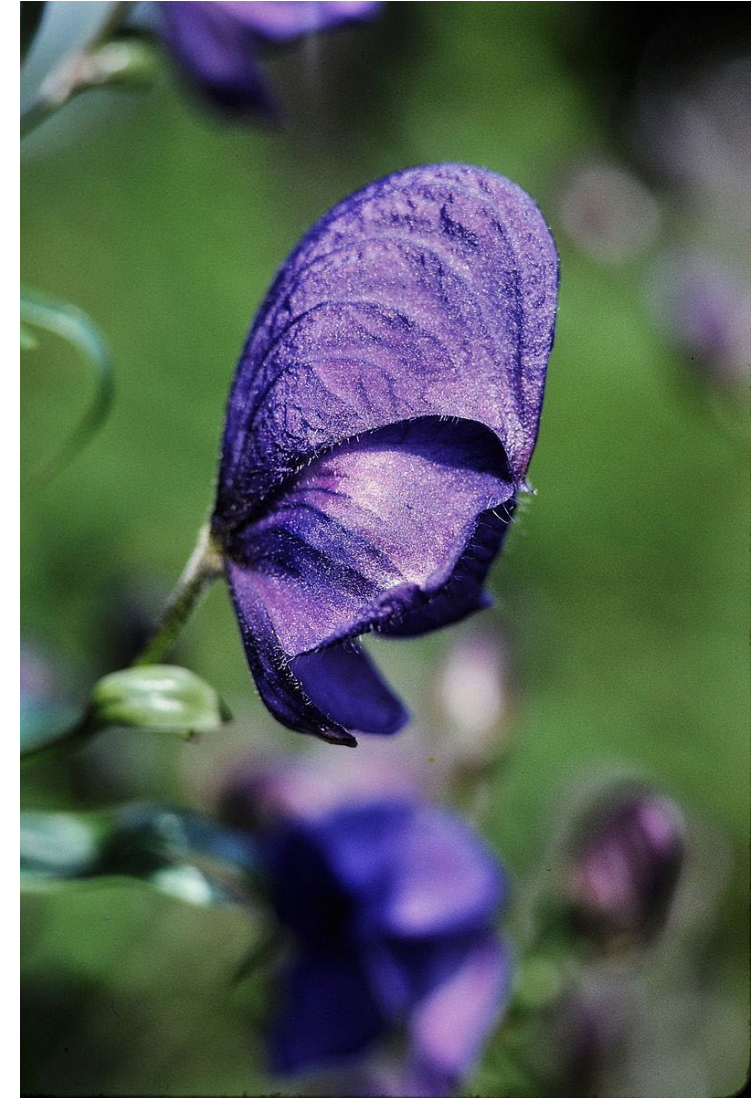
- Atchoum is Famous Cat with Congenital Hypertrichosis
- Acute Hypertrichosis in Horses
 - Pituitary dysfunction/tumor
 - Lack of shedding
 - Polydipsia, sweating, swelling of periorbital fossa





Werewolf Treatment

- In medieval Europe, Wolfsbane (*Aconitum napellus*) used
 - Contains neurotoxin aconitine
 - N/V/D, tingling, burning face and abdomen, cardiovascular and respiratory failure
- Stroke forehead or scalp with knife
- Silver bullet
- Hair removal



How did Zombies stumble onto the scene?



- Reanimated after death
- Non-communicative, unemotional, clumsy, slow stumbling or dangerously fast, insatiable hunger for human flesh, slow decomposition
- Possible causes: viruses, parasitic fungus, toxins

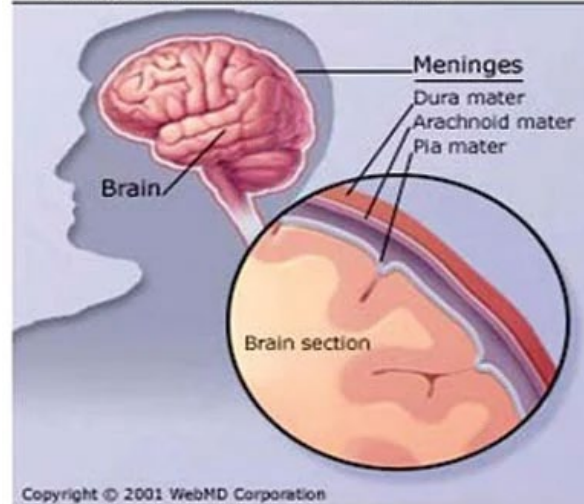


Zombie Disease Symptoms Involve Nervous System

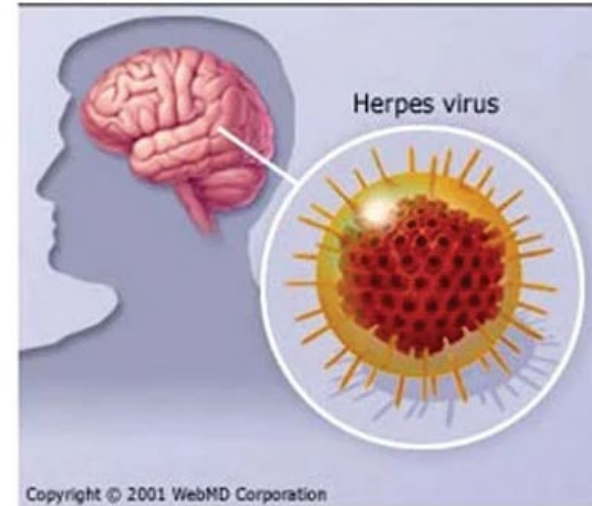
- Meningitis
 - Confusion, fatigue, hallucination, difficulty with focus/attention
 - Caused by bacteria, viruses, fungi
- Encephalitis
 - Confusion, difficulty speaking/moving, memory issues, agitation
 - Caused mostly by viruses

Meningitis and Encephalitis Differences

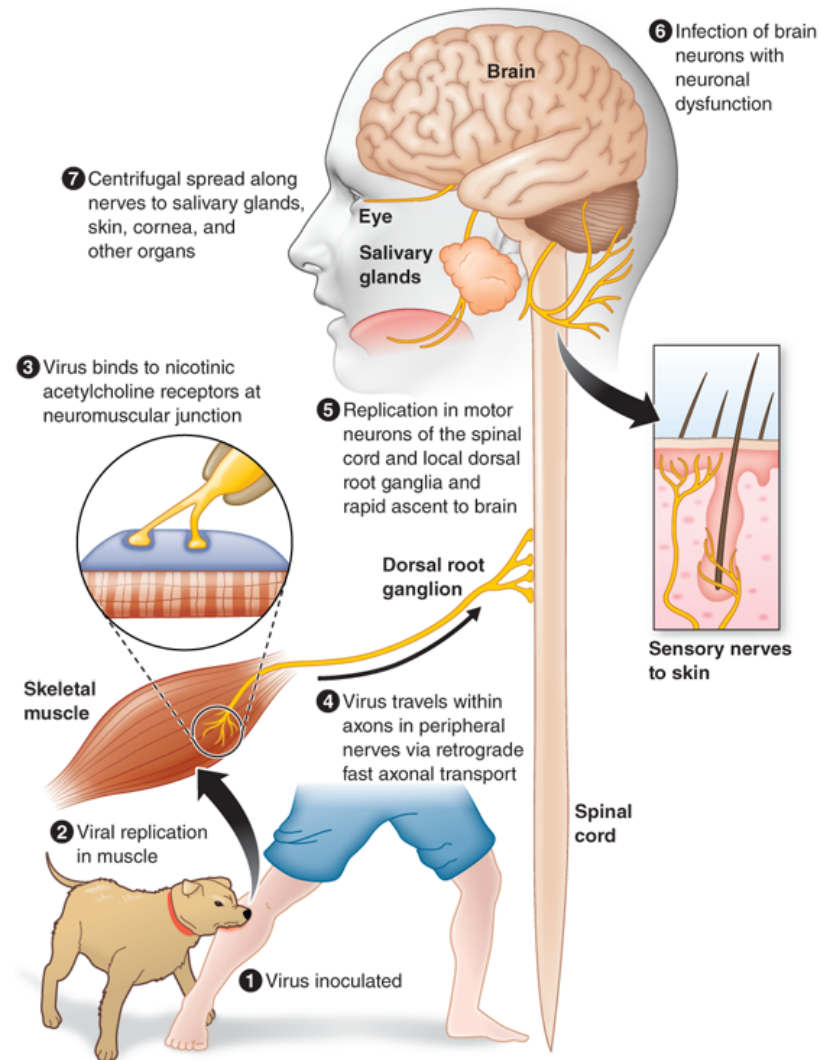
Meninges (Coverings of the Brain)



Encephalitis



Rabies Virus may explain Zombies and Others

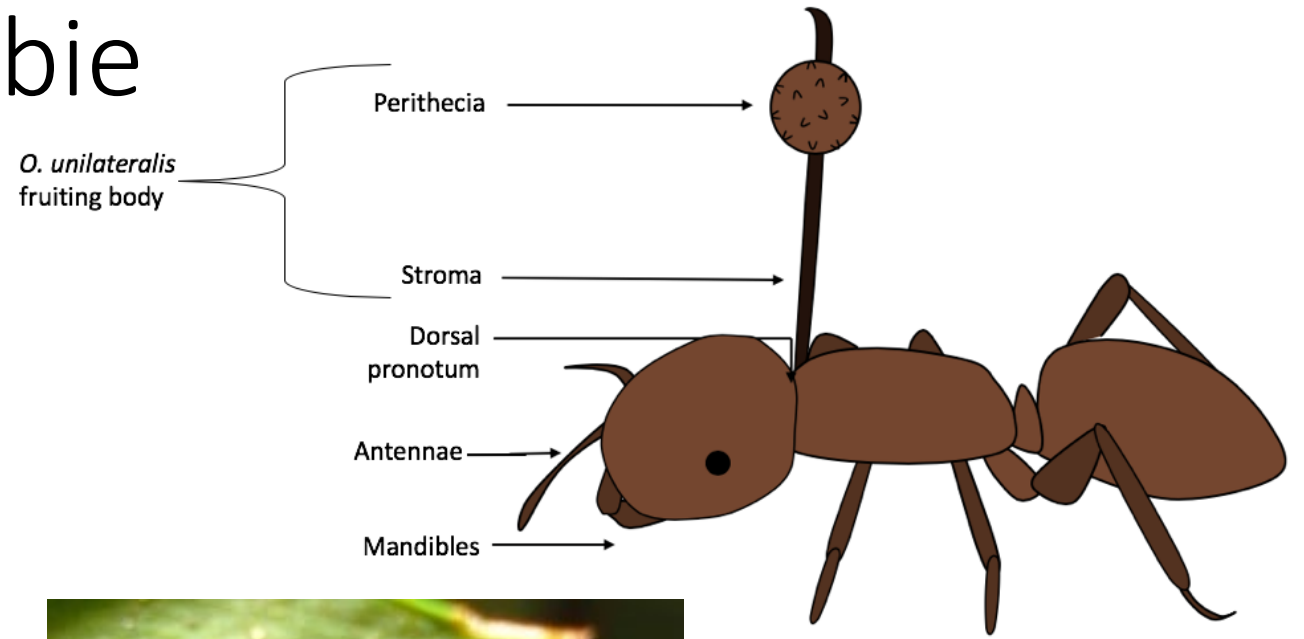


Source: D. L. Kasper, A. S. Fauci, S. L. Hauser, D. L. Longo, J. L. Jameson, J. Loscalzo: Harrison's Principles of Internal Medicine, 19th Edition.
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Fungus Induced Zombie

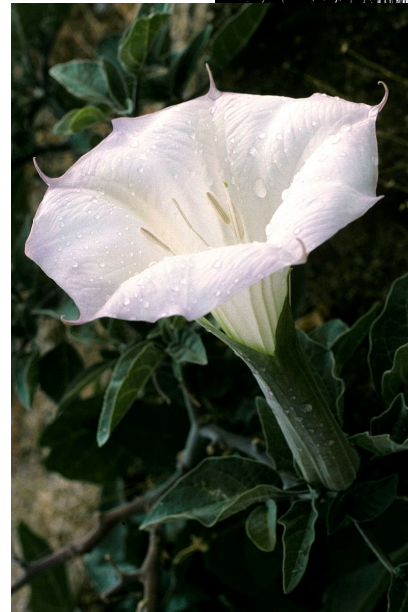
- Zombie Ant Fungus (*Ophiocordyceps unilateralis*)
- Alters behavior in ants in tropical forest ecosystem
- Neurotoxin leads to muscle atrophy in mandible causing lockjaw





Vodou Zombie Explained by Toxins

- Tetrodotoxin and Datura used by Haitian bokors to create zombies
- Person is perceived dead
- Zombie is enslaved
- Once no longer poisoned, may recover



Monsters Unmasked

- Biological organisms
- Disease States
- Pharmacological Agents
- Toxins
- Lack of understanding of science
- Deviation from societal norms





Thank You!

