The Weinstein Lab: Host-symbiont interactions in a changing world

LSB 412

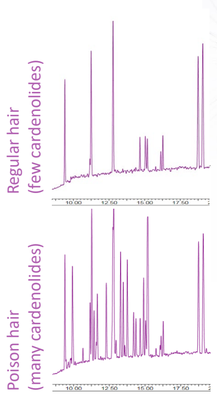
Utah State University
Department of Biology

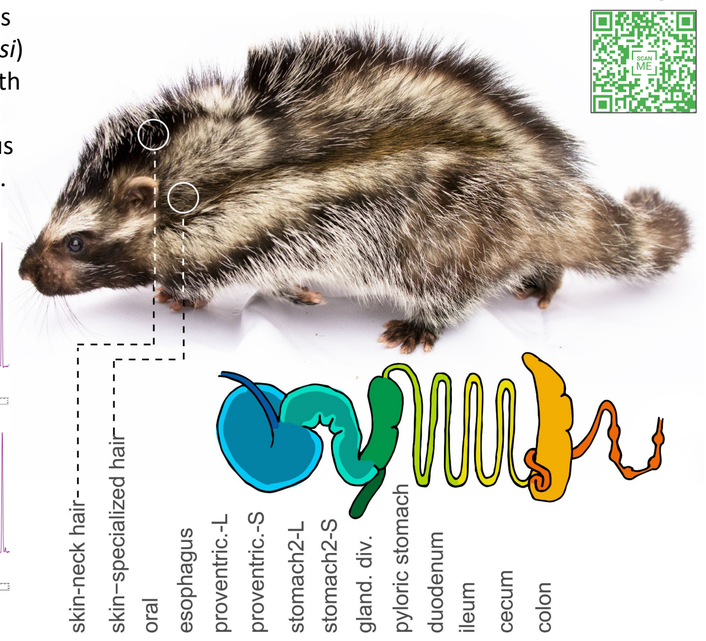
Every animal hosts a complex community of both beneficial and parasitic symbionts. Research in our group examines the interactions between these symbionts, their hosts and the environment. Current projects couple fieldwork and molecular approaches to characterize host-symbiont associations, test how parasites impact host and microbiome function, and explore how changing landscapes alter disease processes.

How do toxins impact symbiont communities?

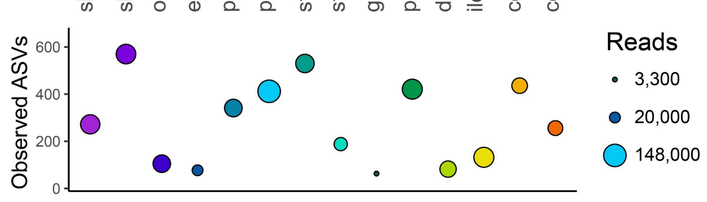
African crested rats (*Lophiomys imhausi*) anoint their fur with cardenolide toxins from the poisonous *Acokanthera* plant.

Scan for video of an *Acokanthera* chewing rat

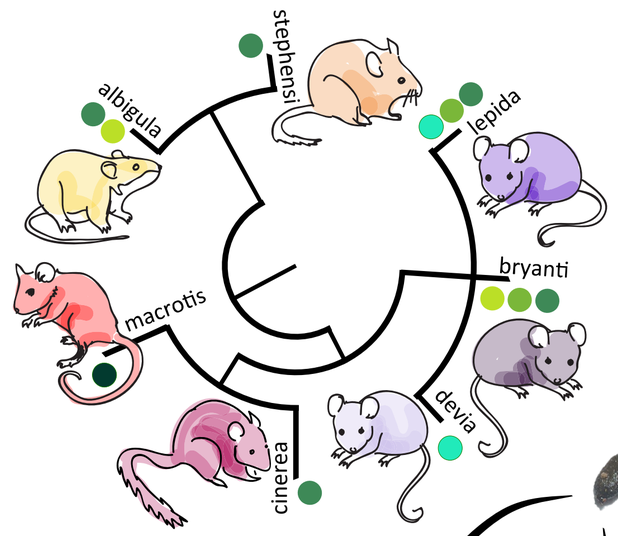




How does this predator avoidance behavior impact their parasites and bacterial symbionts?

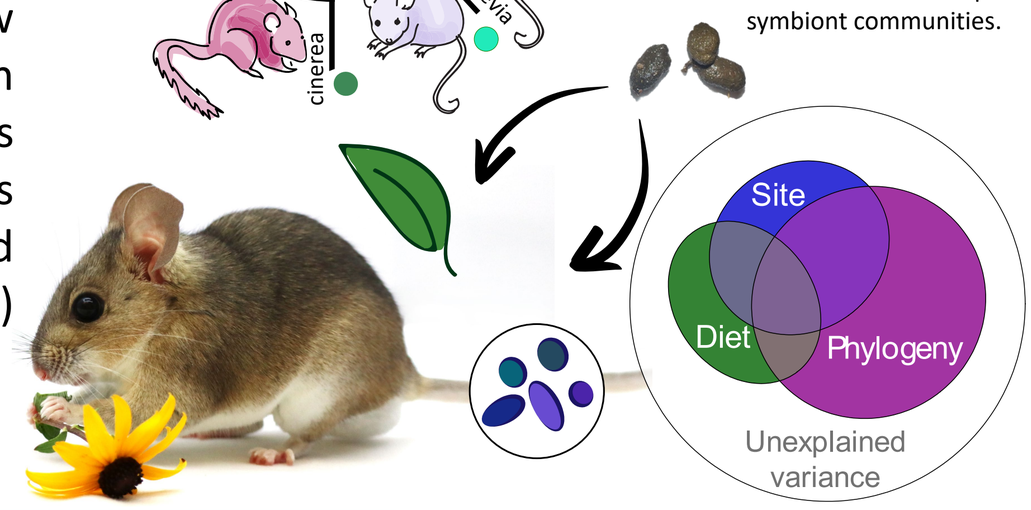


Toxins shape the ecology and evolution of hosts and their symbionts. Current projects on toxin feeding and toxin sequestering mammals examine how wild rodents interact with natural toxins and how this exposure influences symbiotic bacterial and parasitic helminth (worm) communities.



North American woodrats (*Neotoma* spp.) consume a variety of toxic plants, aided by the metabolic capacity of their specialized gut microbiota.

We can characterize wild animal diets and microbial communities using non-invasive molecular approaches to quantify how these factors shape symbiont communities.



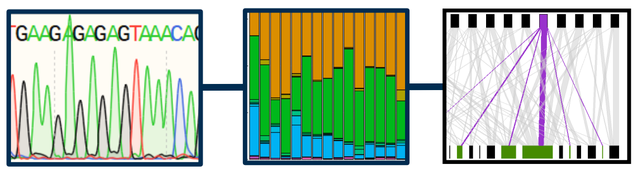
Are parasite-microbiome interactions predictable?

Animals are shared habitat for both microbes and multicellular parasites, and the interactions between these symbionts remain an unexplored frontier with implications for human and animal health. Ongoing research includes work with both model systems (e.g. *Mus* and its nematode *Heligmosomoides*) and wild animals to study how infection alters microbiome structure and function, how the microbiome influences parasite establishment and fitness, and whether parasitic worms host their own microbial communities.

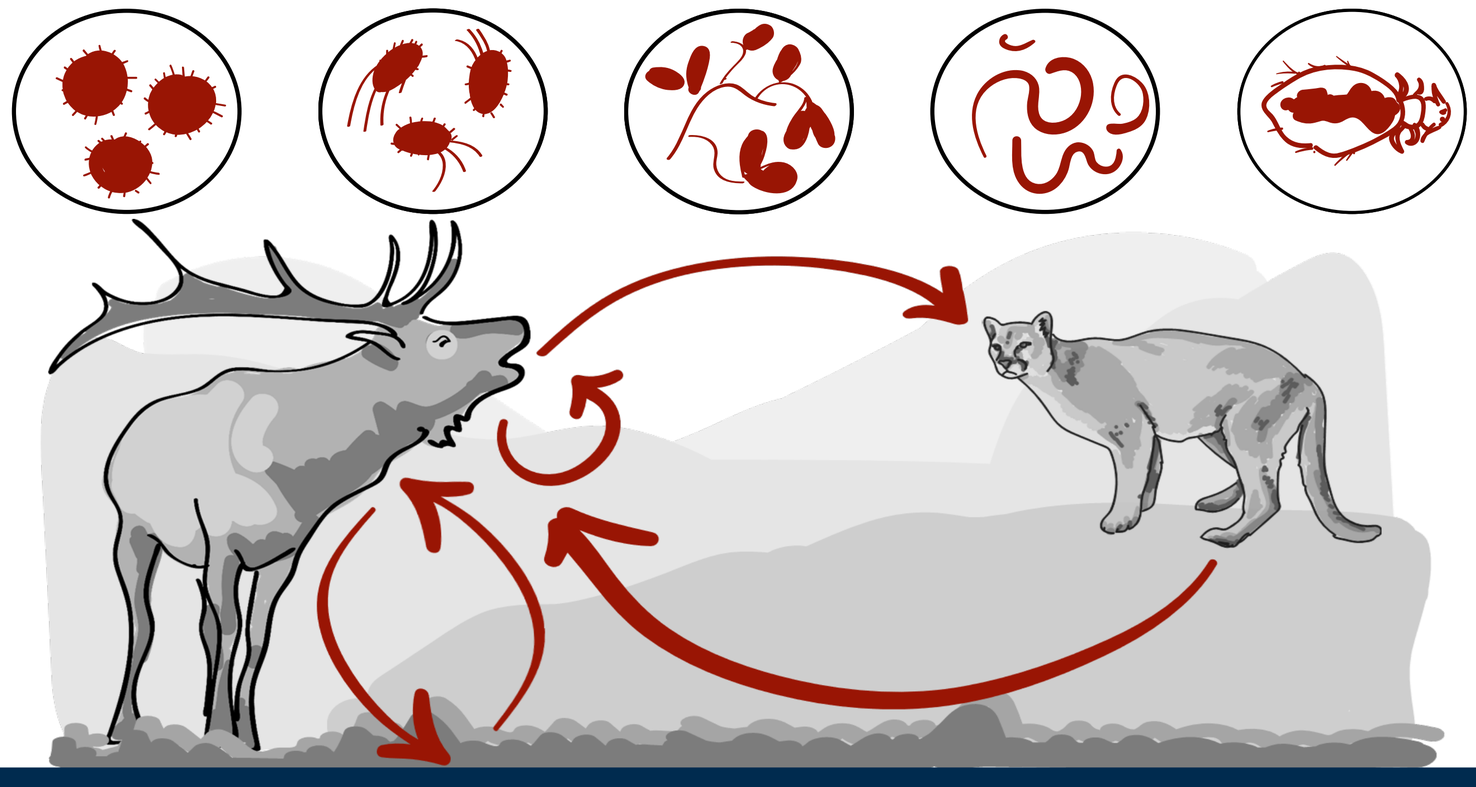
Field work

Lab work

Bioinformatics & Statistics



How do infectious agents respond to changing landscapes?



In increasingly modified landscapes, perturbations like habitat fragmentation, loss of large wildlife, and introduced species alter disease transmission and facilitate the emergence of novel parasites. Managing disease risk requires understanding parasite ecology, and how transmission differs as conditions change. Past research has examined these topics in systems ranging from raccoons in California to rodents in Kenya.

We are currently looking for new systems for studying parasite ecology in Utah.

Join the lab!

Current and upcoming undergraduate research opportunities include molecular work, parasitological sampling, animal husbandry, and field research.