

The 3rd Leading Seminar Report

Date: September 18, 2012, 14:30–16:00

Venue: Lecture Room

Number of participants: 62

Student organizers:

- Jun Moriwaki (Laboratory of Wildlife Biology and Medicine, DC2)
- Sarad Paudal (Laboratory of Wildlife Biology and Medicine, DC2)
- Mohamed Abdallah (Laboratory of Wildlife Biology and Medicine, DC1)

■ SEMINAR: EMPLOYING THE ONE HEALTH APPROACH TO IDENTIFY SUSCEPTIBLES, SOURCES, AND SENTINELS OF COASTAL PATHOGEN POLLUTION

Lecturer: Professor Jonna A.K. Mazet

(Director, One Health Institute & Wildlife Health Center; Department of Medicine & Epidemiology; School of Veterinary Medicine, University of California, Davis)



The 3rd Leading Seminar Report

■ ABSTRACT

The protozoan parasite *Toxoplasma gondii* is emerging in new hosts and ecosystems around the globe. Environmental transmission of the extremely resistant *T. gondii* oocysts has resulted in infection of diverse species throughout the world, leading to severe disease and deaths in human and animal populations. *Toxoplasma gondii* infection in California sea otters (*Enhydra lutris nereis*) has also raised awareness of coastal pathogen pollution. As felids are the only recognized shedding hosts, marine animal infection suggests land to sea transmission. Using a One Health approach, we evaluated terrestrial environmental loading, as well as transmission dynamics in freshwater, estuarine, and marine systems. Oocyst shedding was higher in bobcats and unmanaged feral cats than other felids. Considering relative population sizes along with infection and shedding prevalences, domestic cats likely contribute more oocysts to the environment than mountain lions and bobcats. Molecular genotyping has allowed further exploration of host dynamics. Laboratory and field studies were also employed to evaluate the contribution of wetland loss to the flux of pathogens into coastal waters. Current levels of erosion of vegetated wetlands to mudflats increased pathogen flux greater than two orders of magnitude, while total degradation of wetlands increased transport up to six orders of magnitude. Pathogens were found to associate with and concentrate in aquatic macroaggregates, influencing waterborne transport and facilitating ingestion by invertebrate vectors that can transmit pathogens to susceptible hosts, including sea otters and humans. Continued development of coastal landscapes will likely change host population numbers and distribution, increase terrestrial pathogens in run-off, and alter disease dynamics at the human-animal-environment interface. Investigation of this coastal pathogen problem has only been successful because of the bringing together of experts from many disciplines to problem-solve at the human-animal-environment interface.

■ Questions and Answers (partially paraphrased)

The 3rd Leading Seminar Report



Active discussion following the lecture

Q1: Is there any water treatment for oocysts where the sea otters live?

A1: Unfortunately, seawater cannot be treated. Oocysts are hardy and can live in seawater for up to a year and in the environment for up to 3 years. Sewage treatment, although it kills fecal coliform bacteria, does not kill oocysts; therefore, the important measure is to limit the release of oocysts into the environment. We can also increase run-off filtration. Water that filters through the ground can trap oocysts. One method is to increase and improve wetlands because wetlands trap oocysts and prevent them from flowing into the sea.

Q2: Is toxoplasmosis in cats increasing in prevalence or spreading to other species?

A2: Prevalence of toxoplasmosis in cats appears to be stable. Most research has shown that prevalence of managed cats remains at 20%–25% that appears to be a plateau, but no decrease has been observed.

As a cat owner, you can help prevent infection by not letting your cat outside. This is an effective

The 3rd Leading Seminar Report

preventive measure as long as your house does not have mice that your cat may chase. In wild felid and feral cat populations, the prevalence is very high at 70%–90% because they forage in the wild. Although we do not know whether the prevalence has peaked in the wild and feral populations, it is probably high enough that any more increase in the prevalence may be irrelevant.

Q3: How was it proven that toxoplasmosis in sea otters is a result of release of oocysts from felids?

A3: This has not been proven. However, felids are the only known definitive hosts of *T. gondii*. Although we have been searching, we have not found any other species capable of shedding oocysts. I was also very skeptical that the high prevalence in sea otters could be a result of cats alone, but I hope I have been able to convince you that it is possible because there is actually such a large quantity of feces with high prevalence of *T. gondii* flowing out to sea.

Q4: Why do you think sea otters are much more affected than other marine species?

A4: We think it is a combination of factors, but particularly believe that sea otters are particularly susceptible to *T. gondii* infection. In general, mustelids, which also include minks and river otters, are highly susceptible to the disease. They are more likely to become infected with diseases at the same exposure doses compared to many other species. Unfortunately, the sea otter is highly susceptible to both toxic and infectious insults. However, it is a characteristic that makes the sea otter a good sentinel species. In combination with increased susceptibility, we think that behavior, such as site fidelity, is a large factor. The sea otter uses the same niches throughout their lives and are known to specialize on prey. Therefore, there is a bias toward certain individuals becoming infected based on their location and their prey of choice.

■ **STUDENT SEMINAR: OPPORTUNITIES FOR GRADUATE STUDENTS WHO WANT TO STUDY AT UC DAVIS.**

The 3rd Leading Seminar Report



A photograph during the student meeting ■ From student organizers



The 3rd Leading Seminar Report

Ph.D. students on chair during the seminar

On behalf of the student organizers,

Jun Moriwaki (Lab. Wildlife Biology and Medicine, DC2)

I was surprised when I was asked to be one of the organizers of the 3rd Leading Seminar. I have heard about this duty, but I was surprised because I thought it would not come so early.

The most difficult task was arranging the seminar in English. This was my first experience negotiating with such a senior professor in English. My letter was corrected and polished with help from other members. The reply from Dr. Mazet was so quick that we were able to prepare the seminar smoothly.

The day of the seminar was very busy; setting up the lecture and meeting and chairing the seminar. Finally, the seminar ended successfully, and I realized that a student like me could organize such a seminar. However, because of my poor English skills, I could not fully understand what Dr. Mazet said. I would like to keep practicing my English.

It was a great opportunity as a student organizer to learn how to organize a seminar. I greatly appreciate the help from the staff of the Leading Graduate School Program and Global COE office.

Thank you very much.

The 3rd Leading Seminar Report



Dr. Mazet and the student organizers