



Hokkaido University
Leading Graduate School
Veterinary Science for One Health

Leading Seminar The 3rd:

Date: Tue. Sep. 18th, 2012 14:30-16:00
Venue: Gra. Sch. Vet. Med. HU, Japan

Employing the One Health Approach to Identify Susceptible, Sources, and Sentinels of Coastal Pathogen Pollution

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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.