



August 1, 2015

Jack McAlhany
(864)-993-9185
mcalhanyjw@email.wofford.edu

Research of Unexplained Disease Provides Noninvasive Method for Detection

Determining a Disease Biomarker Through Fatty Acid Analysis

Hundreds of South African Nile crocodile deaths, close to half their population, have accompanied mass fish die offs due to a disease that causes inflammation of fat tissue. This disease is called pansteatitis and as it progresses, fat tissue is hardened and this eventually reduces the ability of the crocodile to move, thus making it more susceptible to death from drowning or starvation.

While the cause of pansteatitis is unknown there are several theories that include exposure to mining and agricultural pollution or toxins from harmful algal blooms; impacts of invasive fish populations on food web dynamics; and consumption of rancid meat. Since so little is known, it is necessary to determine the prevalence and pervasiveness of pansteatitis, to further progress towards a treatment.

Jack McAlhany, an undergraduate student at Wofford College and a summer intern with the College of Charleston, is working on a new technique to detect the disease in the blood of another affected species, tilapia (*Oreochromis mossambicus*). Tilapia are used as a proxy for crocodiles because of their relative ease of capture, handling and population stability.

Past research in the South African catfish has shown that levels of polyunsaturated fatty acids, especially omega-6 fatty acids, are significantly different between healthy and diseased animals. McAlhany is researching the fatty acid content of plasma from 42 tilapia, 81 crocodiles, 24 catfish and 5 carp as well as the adipose, swim bladder, and muscle tissue of 12 tilapia collected in South Africa to see if this finding holds true in these species and if so if a fatty acid biomarker could be developed and applicable across many species.

McAlhany is one of ten selected students participating in National Science Foundation (NSF)'s Research Experience for Undergraduates (REU) through a partnership with the College of Charleston. McAlhany is working under the mentorship of Dr. John Bowden with the National Institutes of Standards and Technology (NIST).

“A possible hypothesis of the cause of pansteatitis is through diet. The South Africans asked for the meat of diseased fish we sampled, which brings about implications for human health. Research is crucial for further knowledge of the disease because tilapia are an important food source for many people.”-Dr. John Bowden on the significance of his research on pansteatitis.

McAlhany is determining the fatty acid content of plasma gathered in South Africa using a gas chromatographer. Individual fatty acids are represented as peaks on a chart for each sample and the area under the peaks quantitate fatty acid concentration in the plasma. Statistical differences between fatty acids in healthy and diseased organisms express possible disease biomarkers.

Another benefit of finding a biomarker in the blood plasma is that it will facilitate sample gathering. Currently, many South African research facilities do not have the proper instruments to analyze samples so they rely on labs in other countries such as the United States. Also it is difficult to store and ship samples. With the right biomarker all that may be needed is a simple blood spot card that is easy to store and ship. Blood spot cards only require a small amount of blood so the crocodiles and other animals could be sampled and returned to the wild without harm.

Improved detection of pansteatitis can benefit many species and in the case of the crocodile ideally lead to a treatment and reduced mortality. This will benefit not only crocodile populations in the wild but also support the important ecotourism industry in South Africa.

To learn more about McAlhany’s project visit the College of Charleston REU’s blog at: <https://blogreu.wordpress.com/>

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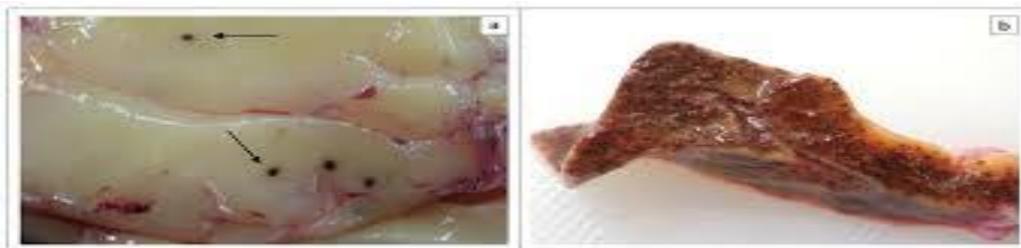


Figure 1: Healthy (left) fat tissue and diseased (right) fat. The brown granules of pansteatitis are evident on the fat of the diseased tissue compared to the healthy white fat tissue.

Jack McAlhany
College of Charleston
Grice Marine Lab
(864)-993-9185
mcalhanyjw@email.wofford.edu

John Bowden
National Institute of Standards
and Technology
(843)-762-8960
john.bowden@nist.gov