



Research Summary

Metabolomics: Determining biomarkers of flock health

June 23 2020

This chick is
stressed, can you
tell?



We are studying stressed chickens

Physiological stress is the body's response to a threat, it is part of an animal's defense mechanisms. In chickens, stressors trigger the adrenal gland to release the steroid hormone corticosterone. Long-term, or chronic, stress is thought to affect the immune system, incite gastrointestinal lesions, and cause cardiovascular disease in birds. Stress has previously been shown to be a potential predisposing factor for the development of bacterial infections in chickens but it is unclear how stress predisposes birds to the development of these diseases. Recent research conducted at AAFC Lethbridge has demonstrated that physiological stress has a profound impact on bird metabolism. Stress also has several other negative effects on

chicken health including reduced feed intake, body weight gain, carcass yield and egg production. Our goal in studying stressed chickens is to develop tools for producers to use to identify when chickens are stressed before there are any outward signs of it so that they can implement mitigations earlier.

How are we studying stressed chickens?

We are developing a ^1H - Nuclear Magnetic Resonance spectroscopy (NMR)-based metabolomics method to more accurately and feasibly quantify stress levels in chickens.



700 MHz Nuclear Magnetic Resonance spectrometer at the University of Lethbridge



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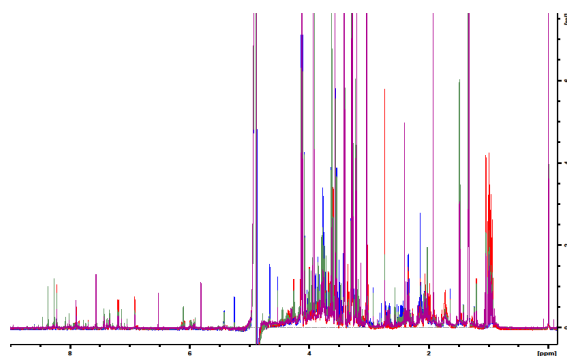
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NMR spectroscopy is often used to identify chemicals in complex mixtures. We are using NMR to examine the chicken metabolome (all metabolites present within an organism) and determine the significant differences between a healthy chicken's metabolome and a stressed chicken's metabolome.

Using NMR, I will identify biomarkers of stress that are predictive of bird health using samples that can be obtained from the chickens without harming them (ex. feces and feathers). Using these biomarkers commercial flocks can be monitored for stress levels and mitigations can be implemented before the adverse effects of stress can be seen.

Methods

Samples of feathers, feces, breast tissue and blood were taken from healthy non-stressed Ross 308 broiler chickens. The samples were processed to extract the water-soluble metabolites which were then run on the 700 MHz NMR at the University of Lethbridge. Metabolites present were then identified using Chenomx.




NMR spectra from chicken feathers

Future Work

Now that we have details of the metabolome of healthy chickens we can process samples from stressed chickens to compare the metabolomes

and identify potential biomarkers of stress which may be used to develop tools for producers to track stress levels of their flocks and raise happier, healthier chickens.

About us



Kate Brown

Is a masters student studying under Dr. Inglis at the University of Lethbridge.

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