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The Cost of Triggering an Immune Response

The immune system of the pig is the link between the pathogenic environment and growth. When a pig encounters pathogens the immune system is stimulated, reducing the pig's growth potential. When a pig does not grow properly feed efficiency is reduced, therefore costing the producer. In a recent webinar as part of Prairie Swine Centre's "Focus on Feed Efficiency", Dr. Rod Johnson explained the function of the immune system and how stimulating the immune system causes a reduction in growth. Understanding the nature of the immune system and how it reacts to pathogens is important in helping producers understand the costs associated with sick pigs.

When the immune system senses pathogens immune cells produce pro-inflammatory cytokines which enter the blood stream. These cytokines disrupt normal bodily functions by inducing behavioral changes in the brain, and reducing protein deposits in skeletal muscles. The spreading of cytokines will result in anorexia, poor growth, lethargy, fever, posture adjustment, cognitive deficits, and decreased social behavior. These behavioral symptoms are part of a metabolic response that will help the pig to better contend against the pathogen. As a pig becomes sick the body sacrifices growth to fight disease.

When a pig encounters the PRRS virus the immune system responds by releasing the pro-inflammatory cytokines which induce the behavioral changes. This causes a PRRS infected pig to have half the average daily gain (ADG) of a healthy pig, and a lower protein deposition rate. Protein deposition is not lower simply because of a lower feed intake but due to metabolic change in the body function. A challenged immune system reduces the pig's capacity to deposit protein. This explains why sick pigs require less lysine than healthy pigs, their immune systems reduce the amount of protein they can convert to muscle.

Dr. Johnson examined a decrease in muscle mass of PRRS infected pigs, focusing on the levels of myostatin. Myostatin is a regulator of muscle growth - more myostatin will result in small muscles and less myostatin will result in big muscles. It was found that PRRS increased myostatin, resulting in smaller muscles.

A pig that encounters pathogens will have increased amounts of cytokines in the blood stream; this will cause a reduced appetite, a lower capacity to accrete protein, and increased myostatin causing smaller muscles. All these factors can be considered the cost of stimulating the immune system.

For more information on this topic and others related to feed efficiency can be found in our PorkInsight database found on our website at www.prairieswine.com/advanced-search/

Behaviour of pigs with viral and bacterial pneumonia http://www.prairieswine.com/behaviour-of-pigs-with-viral-and-bacterial-pneumonia/

Clinical Signs are an Interaction of Host, Agent and the Environment http://www.prairieswine.com/clinical-signs-are-an-interaction-of-host-agent-and-the-environment/

Dr. Rod Johnson, University of Illinois "Fueling the immune Response: What is the Cost?" http://www.prairieswine.com/fueling-the-immune-response-what-is-the-cost/