Gene Expression in Breast Muscle yield in broiler chickens fed 25-OH vitamin D3 (HyD) by using Microarray technique

S. A. Fatemi*, D. R. Korver* , C. Fitzsimmons * ,M. J. Zuidhof*.

Abstract: The aim of the present study is to test reason(s) of improvement on breast muscle yield and innate immunomodulation in growing broiler chicken fed dietary Vitamin D₃ and 25-OH D₃ (HyD) by using Microarray technique. to understand molecular mechanism of this improvement which is how many genes are in charge and from which biochemical pathways dietary vitamin D₃ and HyD can cause improvement in breast muscle yield.

Introduction: 25-Hydroxycholecalciferol (25OHD₃) is the major circulating cholecalciferol (Vitamin D₃) metabolite; it is formed in the liver from vitamin D₃ by the 25-hydroxylase. Its activation to 1,25-dihydroxycholecalciferol. (1,25(OH)₂D₃), the active hormonal form of vitamin D₃, takes place in the kidney by the action of 25OHD₃-1-hydroxylase (1-hydroxylase) which is a highly regulated pathway. Dietary vitamin D₃ and HyD cause changes in different tissues. Previous studies showed that HyD™ increases breast meat yield, and has an important role in the development of the innate immune system and small intestine in young birds. HyD™ has also been shown to increase villus length and result in a higher ratio of villus length to crypt depth in both the duodenum and jejunum in broilers. This may reduce the maintenance requirements of the gut, and increase the amino acids available for breast muscle growth.

Variable and measure:

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Vitamin D₃</th>
<th>25-OH-D₃</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>2,760 IU</td>
<td>69 mg/t</td>
</tr>
<tr>
<td>Treatment 2</td>
<td>2,760 IU</td>
<td>69 mg/t</td>
</tr>
<tr>
<td>Treatment 3</td>
<td>2,760 IU</td>
<td>69 mg/t</td>
</tr>
<tr>
<td>Treatment 4</td>
<td>2,760 IU</td>
<td>2,760 IU</td>
</tr>
</tbody>
</table>

Genomics

Six-week-old male broilers (n = 10/treatment) will be selected from a group of 320 broilers. Birds will be euthanized with i.v. injection of pentobarbital into the caudal tibial vein. Breast muscle and liver samples will be collected from similar sites of breast muscle and liver from each bird. Breast muscle and liver samples for RNA assay will be collected and frozen in liquid nitrogen within 2 min after birds will be killed. mRNA expression in breast muscle will be obtained from male commercial broiler for the increased breast muscle will be investigated. mRNA samples will be labeled with cyanine 3 or 5 fluorescent dyes to generate cDNA probes will be hybridized on a chicken microarray.

Implications: We expect to see the effect of the 25-OH vitamin D₃ on important aspects of broiler chicken production: increase growth rate and breast meat yield, less skeletal disorders and find the molecular mechanism of those changes.

Sponsors:
* University of Alberta, Edmonton, AB Canada
(1) Alberta Agriculture and Rural Development, Edmonton, AB Canada
(2) Alberta Chicken Producer
(3) Alberta Livestock and Meat Agency
(4) Poultry Research Center

Contact information:
Saman Fatemi
(780)8075350
fatemi@ualberta.ca