Ultratrace minerals have been recommended for use in commercial broiler chicken feeds based on their observed beneficial productive and/or processing performance effects.

By DANNY HOOLE*

TODAY, minerals make up roughly half of the 40 or so required nutrients in broiler chicken feeds, and these may be classified as essential major or macrominerals (calcium, phosphorus, potassium, sodium and magnesium) and trace or microminerals according to the dietary level needed.

Essential refers to the element necessary for one or more biological functions (Pérez-Granados and Vaquero, 2002). Historically, individual inorganic or organic compounds have been included in trace mineral or vitamin premixes to provide essential microminerals (manganese, zinc, iron, copper, iodine, selenium, cobalt — usually in the form of vitamin B₁₂ — and sometimes molybdenum) to the basal diet.

Nielsen (1985) indicated that between 1970 and 1985, at least 11 elements were added to the list of elements essential in animal nutrition. Those proposed were arsenic, boron, bromine, cadmium, fluorine, lead, lithium, nickel, silicon, tin and vanadium.

Estimated dietary requirements for these elements are usually less than 1 mg/kg (parts per million) and often less than 50 µg/kg of dry diet. They have been designated as the ultratrace minerals.

Chromium has been legally approved in several countries around the world (200-400 parts per billion addition to the diet may be representative) for some animal species and purposes (Qinghua, 1996).

According to Uthus and Seaborn (1996), circumstantial evidence suggests that aluminum, rubidium and germanium are also essential. Tungsten, in the form of tungstate, exhibits a significant antihyperglycemic effect in both type 1 and 2 diabetic animals (Liu et al., 2004).

The lanthanide series of elements (lathanides or La₃⁺ elements), atomic numbers 57 through 71, are particularly interesting as rare earth deposit elements and are well known in Chinese scientific literature for several beneficial effects in animal production.

In a trial in Germany, He and Rambeck (2000) reported that dietary lanthanum chloride improved average daily gain and feed conversion ratio in pigs, and a mixture of lanthanum, praseodymium and cerium chlorides improved pig performance to a greater extent than lanthanum chloride alone.

Nielsen (1996) suggested that the term ultratrace elements could be applied to at least 20 elements that have established, estimated or suspected requirements or have beneficial, if not essential, actions. It is highly likely that continued research with the previously mentioned elements and other elements will reveal further requirements and dosages needed for specific positive benefits.

Dietary minerals have been scrutinized with regard to their efficacy for providing essential elements (for example, bioavailability and metabolic utilization), their toxicity and their environmental friendliness.

As a result, more natural rather than synthetic and more organically certified mineral products have come to market and are being welcomed for use in broiler chicken feeds by both producers and consumers of broiler meat products.

This article will review a unique commercial mineral product typically containing detectable concentrations of 75 of the 92 naturally occurring earth elements present in substantial quantities (silicon, aluminum, calcium, potassium, sodium, iron, magnesium, sulfur, phosphorus and manganese) down to intermediate and “trace” levels (e.g., iodine, zinc, copper, molybdenum, chromium, selenium, cobalt, boron, iron, bromine, lithium, nickel, etc.).

© 2006 The Mosaic Company. All Rights Reserved.
**1. Comparison of broiler chicken live performance using negative control (NegCon; 0%) versus Utah HSCAS (-200 mesh)-supplemented diets in several U.S. feeding trials (1988-2005)**

<table>
<thead>
<tr>
<th>Reference (Sample; 46 d)</th>
<th>TD,% (−leg disorder)</th>
<th>−of live weight</th>
<th>−carcass weight−</th>
<th>Mortality, %</th>
<th>Feed conversion</th>
<th>Bodyweight, kg</th>
<th>Feed conversion</th>
<th>Bodyweight, kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kidd, 2004</td>
<td>0.5</td>
<td>70.33</td>
<td>71.14</td>
<td>27.10</td>
<td>20.21</td>
<td>2.0</td>
<td>1.99</td>
<td>2.0</td>
</tr>
<tr>
<td>McNaughton, 1993</td>
<td>0.5</td>
<td>70.33</td>
<td>70.88</td>
<td>27.10</td>
<td>20.21</td>
<td>2.0</td>
<td>1.99</td>
<td>2.0</td>
</tr>
<tr>
<td>Negative control</td>
<td>0</td>
<td>66.99</td>
<td>67.29</td>
<td>20.21</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>vs. Utah HCSAS 2-0.84-0.77 est.4</td>
<td>0.67b</td>
<td>67.29a</td>
<td>20.21a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relative change, %</td>
<td>-67.0</td>
<td>+0.44</td>
<td>+3.22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>rats with a different letter superscript do differ significantly at P &lt; 0.05.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** Ratios of negative control vs. Utah HCSAS 2−0.84−0.77 est.4 were 0.67b and 67.29a (P < 0.05). (P < 0.001) as an anti-caking agent, and it is generally recognized as safe. The maximum level of addition is 2% in complete feeds. The product has a specific gravity of about 0.75 (water = 1.00) and bulk density of about 48 lb./cu. ft. of material. Solubility is less than 1%. It is marketed internationally (AZOMITE, Peak Hogs, etc.) and has been marketed since 1942 first as a hogback (or large mound just east of Toquima) and by white settlers for making pottery. **The product is marketed internationally (AZOMITE, Peak Hogs, etc.) and has been marketed since 1942 first as a hogback (or large mound just east of Toquima) and by white settlers for making pottery.**

**2. Thylid diaphyldrusia (TD), dry carcass yield and breast yield results for broiler chickens fed negative control or Utah HSCAS-supplemented diets in several U.S litter pen trials (1989-2004)**

<table>
<thead>
<tr>
<th>Reference</th>
<th>TD,% (−leg disorder)</th>
<th>−of live weight</th>
<th>−carcass weight−</th>
<th>Mortality, %</th>
<th>Feed conversion</th>
<th>Bodyweight, kg</th>
<th>Feed conversion</th>
<th>Bodyweight, kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quarles, 1991</td>
<td>1.10,5</td>
<td>65.54</td>
<td>66.89</td>
<td>18.79</td>
<td>18.64</td>
<td>2.0</td>
<td>1.99</td>
<td>2.0</td>
</tr>
<tr>
<td>Negative control</td>
<td>0</td>
<td>66.99</td>
<td>67.29</td>
<td>20.21</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rodalis, 1989</td>
<td>2.0</td>
<td>67.02</td>
<td>67.38</td>
<td>18.57</td>
<td>19.21</td>
<td>2.0</td>
<td>1.99</td>
<td>2.0</td>
</tr>
<tr>
<td>Negative control</td>
<td>0</td>
<td>66.99</td>
<td>67.29</td>
<td>20.21</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference</td>
<td>TD,% (−leg disorder)</td>
<td>−of live weight</td>
<td>−carcass weight−</td>
<td>Mortality, %</td>
<td>Feed conversion</td>
<td>Bodyweight, kg</td>
<td>Feed conversion</td>
<td>Bodyweight, kg</td>
</tr>
<tr>
<td>vs. Utah HCSAS 2-0.84-0.77 est.4</td>
<td>0.67b</td>
<td>67.29a</td>
<td>20.21a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relative change, %</td>
<td>-67.0</td>
<td>+0.44</td>
<td>+3.22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>rats with a different letter superscript do differ significantly at P &lt; 0.05.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** Ratios of negative control vs. Utah HCSAS 2−0.84−0.77 est.4 were 0.67b and 67.29a (P < 0.05). (P < 0.001) as an anti-caking agent, and it is generally recognized as safe. The maximum level of addition is 2% in complete feeds. The product has a specific gravity of about 0.75 (water = 1.00) and bulk density of about 48 lb./cu. ft. of material. Solubility is less than 1%. It is marketed internationally (AZOMITE, Peak Hogs, etc.) and has been marketed since 1942 first as a hogback (or large mound just east of Toquima) and by white settlers for making pottery. **The product is marketed internationally (AZOMITE, Peak Hogs, etc.) and has been marketed since 1942 first as a hogback (or large mound just east of Toquima) and by white settlers for making pottery.**

**The natural way.**

Mycoﬁx® is not available in the United States and Canada.

**BIOMIN America Inc.**

4820 Westlake Dr.

Northbrook, IL 60062

Tel: +1 212 797 5555, Fax: +1 212 942 9575

e-Mail: office.usa@biomin.net

www.biomin.net

---

**1 extra egg**

Mycoﬁx® decrease egg production and have a negative impact on egg quality. Mycoﬁx® Plus is the right solution for mycotoxin risk management.
Nutrition & Health: Poultry

January 21, 2008

Broiler chicken trials

From 1989 to 2005, a total of 10 contract research trials sponsored by the manufacturer have been conducted using broiler chickens fed diets with and without supplemental Utah HSCAS. Live performance and processing results are presented in Tables 1 and 2. Based on 26 comparisons of negative control diets versus Utah HSCAS-supplemented diets (Table 1), significant improvements (P < 0.014) were observed with the Utah HSCAS supplement in bodyweight (27 g, +1.23%), feed conversion ratio (−0.051; −2.60%) and mortality (0.014) were observed with the Utah HSCAS. Live performance and carcass yield and breast meat yield. Utah HSCAS can be added to broiler feeds as an anti-caking agent, and it supplies other mineral elements and may provide mycotoxin binding protection as well.

Comparisons, the average inclusion rate for the Utah HSCAS over those trials was about 1.05% in supplemented diets. As shown in Table 2, only one trial examined tibial dyschondroplasia (TD) incidence, but a significant reduction was found (−2.16; −67.0%) with Utah HSCAS supplementation (P = 0.022).

There were 12 comparisons evaluating hot carcass yield as a percent of live weight, and the mineral additive significantly increased this parameter (+0.30; +0.44%) compared to negative control treatment results (P = 0.011). In 15 comparisons using negative control diets versus Utah HSCAS-supplemented diets, there was a significant increase in breast yield (+0.63; +3.22%) due to Utah HSCAS (P < 0.001). Levels of Utah HSCAS inclusion were 2.0, about 0.84 and about 0.77%, respectively, for the comparisons in Table 2.

Conclusion

Therefore, based on this research summary, Utah HSCAS at 0.5–1.0% (maximum 2.0% allowed as an anti-caking agent) is recommended for use in commercial broiler chicken feeds, with improvements expected in bodyweight, feed conversion ratio, livability, bone structure, carcass yield and breast meat yield. Utah HSCAS can be added to broiler feeds as an anti-caking agent, and it supplies other mineral elements and may provide mycotoxin binding protection as well.

References


Nielson, F.H. 1996. How should dietary guidance be given for mineral elements with beneficial actions or suspected of being essential? J. Nutr. 126(9 Suppl.):2377S-2385S.


When producers were looking for a novel DFM, we looked into our microscopes for a solution.

Introducing CloSTAT, a Novel Nutrinic for Intestinal Balance in Poultry.

Broiler or turkey losses in poultry production cost you time, money and resources. Rather than using conventional methods, feed your birds CloSTAT, our new direct fed microbial. CloSTAT contains PB6, a naturally occurring microorganism, which helps maintain the balance of gut microflora in poultry. It’s also heat resistant and very stable. Call our Kemin representative to learn more about the advantages of CloSTAT or visit www.kemin.com.

Kemin® INSPIRED MOLECULAR SOLUTIONS®

© 2008 Kemin Industries, Inc. USA * Trademark ®/Registered by Kemin Industries, Inc. USA.