Nutrient Data for Whole, Large Eggs from a USDA Nationwide Sampling

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Abstract
The Nutrient Data Laboratory (NDL) collaborated with Egg Nutrition Center (ENC) in 2010 to obtain and analyze a nationwide sampling of whole, large eggs to update the egg nutrient profile in the USDA National Nutrient Database for Standard Reference (SR) (http://www.ars.usda.gov/nutrientdata). Sample units of retail whole, large eggs were obtained from 12 locations using USDA's statistically valid sampling plans previously adopted. Researchers at Virginia Tech prepared composited samples for analysis. Nine samples from each location were analyzed for proximates, fatty acids, and cholesterol. Composited samples from randomly selected city pairs were analyzed for vitamins, minerals, and sugars. QC materials (standard reference materials and matrix-specific control materials) were prepared at Virginia Tech and were also analyzed to monitor accuracy and precision of measurements.

Background
In 2009 the American Egg Board- Egg Nutrition Center (ENC) contracted with Dr. Kenneth Anderson, North Carolina State University, to compare nutrient composition of eggs from controlled cage vs. range flocks and nutrient composition and egg structural component proportions in brown and white egg strains (Anderson, K.E., personal communication). Dr. Anderson found that the cholesterol content of whole large eggs was lower than reported in USDA Nutrient Database for Standard Reference, Release 22 (SR22) in all cases. In view of the study results, Nutrient Data Laboratory (NDL) staff agreed to collaborate with ENC to conduct a nationwide study of nutrients in eggs.

Materials and Methods
Sampling
Reliably sampling following the National Food and Nutrition Analysis Program (NFPNAP) was utilized. NFPNAP uses a probability-based sampling plan picking up food sample units from large supermarkets at 12 locations nationwide. The previous data on eggs were determined in another NFPNAP sampling in 2001/2002 in collaboration with ENC.

Processing and analysis
The samples were sent to the Food Analysis Laboratory Center (FALCC) at Virginia Tech, a NFPNAP collaborator, for preparation. Proximates (moisture, protein, total fat, and ash) and cholesterol were analyzed in individual samples from each of the 12 locations. Vitamin D3 and vitamin B12 were measured in six city-pair randomized samples from the 12 locations.

Methods
- Vitamin D3: HPLC-UV-Vis (initial) or LC-MS-MS (later samples) (both unpublished).
- Vitamin B12: microbiological method (AOAC 952.20).

Quality control
Quality control (QC) samples from National Institute of Standards and Technology (NIST) or reference materials prepared by FALCC were included with each batch of samples. Cholesterol:
- Results for the QC materials met the acceptance criteria of the NDL Quality Control Panel.
- Lab A: NIST SRM 1546 Meat Homogenate
- Lab B: NIST SRM 1546 and NIST SRM 1563 Spiked Coconut Oil
- Vitamin D3 and vitamin B12:
  - Well characterized control composites prepared by FALCC were used as the QC materials.

Acknowledgement
This work was supported by the USDA Agriculture/NRCS SRM 1945 Whole Egg Powder.

Results

Table 1. Vitamin D3 results on paired egg samples, and on individual locations from paired samples with high vitamin D values.

<table>
<thead>
<tr>
<th>City Pair</th>
<th>Vitamin D3 (IU/100g)</th>
<th>Initial Sampling</th>
<th>2nd Sampling</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN1, NY1</td>
<td>348</td>
<td>IN1 284</td>
<td></td>
</tr>
<tr>
<td>ALL, CA1</td>
<td>71</td>
<td>NY1 483</td>
<td>NY1 362</td>
</tr>
<tr>
<td>CA2, NC</td>
<td>39</td>
<td>NY1 259</td>
<td></td>
</tr>
<tr>
<td>CO2, CT1</td>
<td>54</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FL1, MO1</td>
<td>39</td>
<td>MI1 261</td>
<td></td>
</tr>
<tr>
<td>MI, OK1</td>
<td>150</td>
<td>OK1 46</td>
<td></td>
</tr>
</tbody>
</table>

Conclusions
Some researchers believe the decrease could be related to improvements farmers have been making to the hen’s feed, but there are no studies to confirm this.

Impact
- All SR23 egg products that contain egg yolk, where the fat soluble cholesterol and vitamin D are found, were updated to reflect the change in values.
- NDL food specialists, who use whole eggs and other egg products as ingredients in their formulations and recipes, will now use the SR23 cholesterol and vitamin D values to calculate the composition of those food items.
- The intake of vitamin D by Americans will likely increase if the feeding practice of adding vitamin D becomes widespread.

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A result of previous discussions with ENC, NDL will follow up on the sampling and analysis of whole eggs to monitor levels of vitamin D in samples nationwide.