

November 9, 1999

Dr. James B. Gardiner  
SARE Northeast Region Program Manager  
Hills Building  
University of Vermont  
Burlington, Vermont 05405

Project # FNE99-248 Final Report

Enclosures:

10 page American Westech Laboratory Services report

USDA Nutrient Database for Standard Reference for eggs; chicken, breast meat only, raw; and chicken, meat and skin, raw

"Omega Eggs--A Dietary Source of n-3 Fatty Acids, NF97-354"

USDA Guidelines for Escherichia coli Testing for Process Control Verification in Poultry Slaughter Establishments

Report Summary:

**Nutrition** - The pastured whole chickens were found to have significantly higher levels of vitamin A than the standard; the same was not true of the skinless breast meat as Vitamin A is a fat soluble vitamin that would be found mainly in the skin. The Vitamin A in the pastured eggs was also greater than in the standard. The pastured whole chickens and eggs were also found to have less fat than the standard.

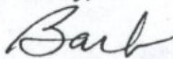
**Omega 3 and Omega 6** - The USDA tables do not specify which of the fatty acids are Omega 3 or 6, so a comparison of the chicken was not done. However, the table from the University of Nebraska does list a USDA standard for Omega 3 and 6, which is significantly lower than that of the pastured eggs.

**Conjugated Linoleic Acid** - Unfortunately, there were no levels of CLA found in either the pastured chickens or the eggs. Chickens do not retain any significant amounts of CLA, whereas beef does, according to Dr. Michael Pariza of the Food Research Institute at the University of Wisconsin-Madison.

**Microbiology** - These tests were only performed, due to logistics, on the chickens from our farm. There was an absence of the major pathogens: *Listeria monocytogenes*, *Salmonella*, and *Campylobacter*. The coliform counts were higher than expected. These tests were taken 2 days after slaughter, but the only USDA comparison we have is for birds tested immediately after slaughter. After discussing our process with the lab, we have come up with areas on which to improve in the future.

We now have a nutrition label for our pastured poultry products, as well as some positive information regarding the Omega 3 & 6 content of the pastured eggs. These items will be reported to other pastured poultry growers through our national newsletter, to the Pennsylvania Association for Sustainable Agriculture, and to our customers. This will provide tremendous marketing support for the pastured poultry growers and will help these farmers to grow or maintain a viable pastured poultry business. Thank you for the support of this grant.

Sincerely,



Barbara L. Gorski

cc: John Hopkins  
Scott Masich  
Greg Stricker



October 29, 1999

Kevin & Barb Gorski  
Double G Farm  
227 Henne Road  
Bernville, PA 19506

Project: F10049902 (from proposal # F08169903P)  
Date Received: 10/4/99

## ***Summary Report: Characterization of Pastured Poultry Products***

### **Statement of Work**

American Westtech, Inc. (Westtech) provided analytical testing and consulting services to Double G Farm (Double G) for the nutritional and microbiological characterization of pastured poultry products, specifically broiler chickens and eggs. Westtech completed all of the microbiology analyses. Analysis for conjugated linoleic acid (CLA) was completed at the University of Guelph, Lipid Analytical Lab, Ontario, Canada. Warren Analytical Lab, Greeley, CO, completed the nutritional analyses, including analysis for Omega 3 and Omega 6 fatty acids. Westtech completed all sample preparation and homogenization.

### **Summary of Findings**

#### **Nutritional Analysis**

The following samples were analyzed for nutritional composition:

1. Whole Chicken, skin on – composite of 6 individual half chickens
2. Boneless Skinless Breast – composite of 6 individual half breasts
3. Raw Eggs – composite of 12 eggs.

Pastured chickens were slaughtered and prepared by three individual farms: Double G, Forks Farm, and Lone Pine Farm. Each farm supplied two half-chickens and two skinless breast halves. Samples were wrapped in moisture-proof material and were held frozen until the time of analysis.

**CORPORATE HEADQUARTERS**  
4349 LINGLESTOWN ROAD ♦ HARRISBURG, PA, 17112

TELEPHONE: (717) 651 - 9700  
FAX: (717) 657 - 0752

Complete nutritional results are contained in the attached tables. The pastured whole chickens contained 21% less total fat and 30% less saturated fat than average whole chickens as reported in the USDA Nutrient Database for Standard Reference. The pastured chickens also contained 50% more vitamin A than average chickens.

The skinless chicken breast was not significantly different in overall composition than average chicken breast. A difference in the levels of omega 3 and omega 6 fatty acids may exist; however, comparison data was not found for this comparison.

The eggs from the pastured chickens contained 34% less cholesterol and about 10% less fat than average chicken eggs as reported in the USDA Nutrient Database for Standard Reference. In addition, the pastured eggs contained over 40% more vitamin A, twice as much omega 6 fatty acids, and four times more omega 3 fatty acids than average eggs.

Conjugated linoleic acid (CLA) was not discovered in any of the pastured chicken products. As communicated by Dr. Michael Pariza of the Food Research Institute at the University of Wisconsin-Madison, poultry products in general (except for turkey) contain little, if any, CLA. In his opinion, the lack of CLA in these products is not unusual (Dr. Pariza originally discovered the anticarcinogenic properties of CLA and has done extensive research into the sources of this fatty acid).

### **Microbiological Analysis**

Westech individually sampled five whole (skin-on) chicken carcasses by rinsing the surfaces of the birds with 400 ml of sterile Butterfield's phosphate buffer contained in a sterile 15 x 20 inch plastic bag. The chickens were analyzed for the following bacteria:

- Campylobacter
- Salmonella
- Listeria monocytogenes
- Aerobic (Standard) Plate Count
- Coliforms and E. coli Count.

Double G slaughtered and processed these chickens according to their normal protocol and refrigerated the carcasses in sealed plastic bags until sampling. The carcasses were sampled about 48-54 hours after processing.

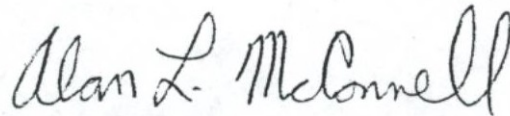
A table of the microbiological results is attached. All of the carcasses were free of the major pathogens: *Campylobacter*, *Salmonella*, and *Listeria monocytogenes*. Aerobic plate counts were within range for typical fresh chicken products. However, the coliform counts, and especially the *E. coli* counts, were higher than normal. As compared to the USDA Guidelines for *Escherichia coli* Testing for Process Control Verification in Poultry Slaughter Establishments, *E. coli* counts for chickens #1, 2 and 3 were in the "Marginal Range" while

Westech Labs

*Summary Report: Characterization of Pastured Poultry Products*

the counts for chickens #4 and #5 were in the "Unacceptable Range."

The high *E. coli* counts arise from fecal contamination during the slaughter process. Areas to focus upon to reduce these counts would be the evisceration process and the final rinse process.

A handwritten signature in black ink that reads "Alan L. McConnell". The signature is written in a cursive style with a large, prominent 'M'.

Alan L. McConnell  
Director, Food Science Services  
American Westech, Inc.



**AMERICAN**  
**Westtech**  
LABORATORY SERVICES

Attention: Barb Gorski  
Double G Farm

Project: F10049902-1  
Date Received: 10/04/1999  
Date Reported: 10/27/1999

**Sample ID: Whole Chicken, Meat & Skin, Raw**

Composite of 6 half-chickens; 2 halves each from three farms.

Label Type: Adult-Mandatory  
Serving Size: 84 g (3 ounces)

	Nutrient	Amount per 100g	Amount per Serving	% Daily Value
(E)	Calories	177.65	149.23	-
	Calories from Fat	106.29	89.28	-
(A)	Total Fat	11.81 g	9.92 g	15.3
(B)	Saturated Fat	3.04 g	2.55 g	12.8
(C)	Monounsaturated Fat	4.34 g	3.65 g	-
(D)	Polyunsaturated Fat	3.82 g	3.21 g	-
	Omega-3 Fatty Acids	0.36 g	0.30 g	-
	Omega-6 Fatty Acids	3.40 g	2.86 g	-
	Conjugated Linoleic Acid	0.00 g	0.00 g	-
(F)	Cholesterol	68.00 mg	57.12 mg	19.0
(G)	Sodium	47.00 mg	39.48 mg	1.6
	Total Carbohydrate	0.00 g	0.00 g	0.0
	Dietary Fiber	0.00 g	0.00 g	0.0
	Sugars	0.00 g	0.00 g	-
(H)	Protein	17.84 g	14.99 g	30.0
(I)	Vitamin A	210.00 IU	176.40 IU	3.5
(J)	Vitamin C	0.74 mg	0.62 mg	1.0
(K)	Calcium	7.00 mg	5.88 mg	0.6
(L)	Iron	0.70 mg	0.59 mg	3.3
(M)	Moisture	69.46 g	58.35 g	-
(N)	Ash	1.39 g	1.17 g	-

**Double G Farm  
Whole Chicken, Meat & Skin, Raw**

**October 27, 1999**

## **Nutrition Facts**

Serving Size 3 ounces (84g)  
Servings Per Container varied

---

**Amount Per Serving**

**Calories 150** Calories from Fat 90

**%Daily Value\***

<b>Total Fat</b> 10g	<b>15%</b>
Saturated Fat 2.5g	<b>13%</b>
<b>Cholesterol</b> 55mg	<b>19%</b>
<b>Sodium</b> 40mg	<b>2%</b>
<b>Total Carbohydrate</b> 0g	<b>0%</b>
Dietary Fiber 0g	<b>0%</b>
Sugars 0g	

---

**Protein 15g**

---

Vitamin A 4% • Vitamin C 0%

Calcium 0% • Iron 4%

\*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories: 2,000	2,500
Total Fat	Less than 65g	80g
Sat Fat	Less than 20g	25g
Cholesterol	Less than 300mg	300mg
Sodium	Less than 2,400mg	2,400mg
Total Carbohydrate	300g	375g
Dietary Fiber	25g	30g

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

Prepared by American Westech, Inc.

Attention: Barb Gorski  
 Double G Farm

Project: F10049902-2  
 Date Received: 10/04/1999  
 Date Reported: 10/27/1999

**Sample ID: Skinless Chicken Breast, Raw**

Composite of 6 half-breasts; 2 halves each from three farms.

Label Type: Adult-Mandatory  
 Serving Size: 84 g (3 ounces)

Nutrient	Amount per 100g	Amount per Serving	% Daily Value
Calories	108.74	91.34	-
Calories from Fat	15.30	12.85	-
Total Fat	1.70 g	1.43 g	2.2
Saturated Fat	0.49 g	0.41 g	2.1
Monounsaturated Fat	0.55 g	0.46 g	-
Polyunsaturated Fat	0.58 g	0.49 g	-
Omega-3 Fatty Acids	0.06 g	0.05 g	-
Omega-6 Fatty Acids	0.49 g	0.41 g	-
Conjugated Linoleic Acid	0.00 g	0.00 g	-
Cholesterol	50.00 mg	42.00 mg	14.0
Sodium	34.00 mg	28.56 mg	1.2
Total Carbohydrate	0.00 g	0.00 g	0.0
Dietary Fiber	0.00 g	0.00 g	0.0
Sugars	0.00 g	0.00 g	-
Protein	23.36 g	19.62 g	39.2
Vitamin A	0.00 IU	0.00 IU	0.0
Vitamin C	1.04 mg	0.87 mg	1.5
Calcium	4.00 mg	3.36 mg	0.3
Iron	0.40 mg	0.34 mg	1.9
Moisture	74.67 g	62.72 g	-
Ash	1.87 g	1.57 g	-

**Double G Farm  
Skinless Chicken Breast, Raw**

October 27, 1999

**Nutrition Facts**

Serving Size 3 ounces (84g)  
Servings Per Container varied

**Amount Per Serving**

**Calories 90**    **Calories from Fat 15**

**%Daily Value\***

<b>Total Fat</b> 1.5g	<b>2%</b>
Saturated Fat 0g	<b>0%</b>
<b>Cholesterol</b> 40mg	<b>14%</b>
<b>Sodium</b> 30mg	<b>1%</b>
<b>Total Carbohydrate</b> 0g	<b>0%</b>
Dietary Fiber 0g	<b>0%</b>
Sugars 0g	

**Protein 20g**

Vitamin A 0%    •    Vitamin C 2%

Calcium 0%    •    Iron 2%

\*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories: 2,000	2,500
Total Fat	Less than 65g	80g
Sat Fat	Less than 20g	25g
Cholesterol	Less than 300mg	300mg
Sodium	Less than 2,400mg	2,400mg
Total Carbohydrate	300g	375g
Dietary Fiber	25g	30g

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

Prepared by American Westech, Inc.





**Attention: Barb Gorski**  
**Double G Farm**

Project: F10049902-3  
Date Received: 10/04/1999  
Date Reported: 10/27/1999

**Sample ID: Eggs, Whole, Raw**

Composite of 12 eggs.

Label Type: Adult-Mandatory  
Serving Size: 60 g (1 large egg)

Nutrient	Amount per 100g	Amount per Serving	% Daily Value
Calories	134.46	80.68	-
Calories from Fat	79.74	47.84	-
Total Fat	8.86 g	5.32 g	8.2
Saturated Fat	2.69 g	1.61 g	8.1
Monounsaturated Fat	3.44 g	2.06 g	-
Polyunsaturated Fat	2.29 g	1.37 g	-
Omega-3 Fatty Acids	0.27 g	0.16 g	-
Omega-6 Fatty Acids	1.96 g	1.18 g	-
Conjugated Linoleic Acid	0.00 g	0.00 g	-
Cholesterol	280.00 mg	168.00 mg	56.0
Sodium	130.00 mg	78.00 mg	3.3
Total Carbohydrate	1.39 g	0.83 g	0.3
Dietary Fiber	0.00 g	0.00 g	0.0
Sugars	0.00 g	0.00 g	-
Protein	12.29 g	7.37 g	14.7
Vitamin A	1100.00 IU	660.00 IU	13.2
Vitamin C	0.00 mg	0.00 mg	0.0
Calcium	47.00 mg	28.20 mg	2.8
Iron	0.40 mg	0.24 mg	1.3
Moisture	76.34 g	45.80 g	-
Ash	1.12 g	0.67 g	-

**Double G Farm  
Eggs, Whole, Raw**

October 27, 1999

**Nutrition Facts**

Serving Size 1 large egg (60g)  
Servings Per Container 12

**Amount Per Serving**

**Calories 80**    Calories from Fat 50

	<b>%Daily Value*</b>
<b>Total Fat</b> 5g	<b>8%</b>
Saturated Fat 1.5g	<b>8%</b>
<b>Cholesterol</b> 170mg	<b>56%</b>
<b>Sodium</b> 80mg	<b>3%</b>
<b>Total Carbohydrate</b> 1g	<b>0%</b>
Dietary Fiber 0g	<b>0%</b>
Sugars 0g	

**Protein 7g**

Vitamin A 14%    •    Vitamin C 0%  
Calcium 2%        •    Iron 2%

\*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

Prepared by American Westech, Inc.



(10) E

Double G Farm Pastured  
Chicken Microbiology Results<sup>1</sup>

Project: F10049902  
 Date Sampled: 10/04/1999  
 Date Analyzed: 10/05/1999

Analysis	Chicken #1	Chicken <sup>3</sup> #2	Chicken #3	Chicken #4	Chicken #5
Aerobic Plate Count (cfu/ml) <sup>2</sup>	62,000	110,000	160,000	70,000	310,000
Coliform Count (cfu/ml)	2000	900	1500	1600	1700
<i>E. coli</i> Count (cfu/ml)	400	370	800	1400	1100
<i>Listeria monocytogenes</i>	Absent	Absent	Absent	Absent	Absent
<i>Salmonella</i>	Absent	Absent	Absent	Absent	Absent
<i>Campylobacter</i>	Absent	Absent	Absent	Absent	Absent

<sup>1</sup> Whole, skin-on, eviscerated chickens were rinsed with 400ml of sterile Butterfield's phosphate buffer. Chickens were held 48-54 hours in refrigeration prior to sampling.  
<sup>2</sup> (cfu/ml) is cell forming units per milliliter of rinse fluid.  
<sup>3</sup> Chicken #2 had a broken wing.

# Egg, whole, raw, fresh

NDB No: 01123

Nutrient	Units	Value per 100 grams of edible portion	Sample Count	Std. Error
<b>Proximates</b>				
Water	g	75.330	20	0.069
Energy	kcal	149.000	0	0.000
Energy	kJ	623.000	0	0.000
Protein	g	12.490	20	0.036
Total lipid (fat)	g	10.020	33	0.031
Carbohydrate, by difference	g	1.220	0	0.000
Fiber, total dietary	g	0.000	0	0.000
Ash	g	0.940	20	0.019
<b>Minerals</b>				
Calcium, Ca	mg	49.000	20	0.548
Iron, Fe	mg	1.440	20	0.028
Magnesium, Mg	mg	10.000	20	0.183
Phosphorus, P	mg	178.000	20	2.084
Potassium, K	mg	121.000	20	2.762
Sodium, Na	mg	126.000	20	1.303
Zinc, Zn	mg	1.100	20	0.027
Copper, Cu	mg	0.014	20	0.001
Manganese, Mn	mg	0.024	20	0.001
Selenium, Se	mcg	30.800	69	1.156
<b>Vitamins</b>				
Vitamin C, ascorbic acid	mg	0.000	0	0.000
Thiamin	mg	0.062	20	0.002
Riboflavin	mg	0.508	20	0.013
Niacin	mg	0.073	20	0.002
Pantothenic acid	mg	1.255	20	0.019
Vitamin B-6	mg	0.139	20	0.002
Folate	mcg	47.000	20	1.364
Vitamin B-12	mcg	1.000	20	0.047
Vitamin A, IU	IU	635.000	20	8.614
Vitamin A, RE	mcg_RE	191.000	0	0.000
Vitamin E	mg_ATE	1.050	0	0.000
<b>Lipids</b>				
Fatty acids, saturated	g	3.100	0	0.000

4:0	g	0.000	0	0.000
6:0	g	0.000	0	0.000
8:0	g	0.003	33	0.000
10:0	g	0.003	33	0.000
12:0	g	0.003	33	0.000
14:0	g	0.034	33	0.000
16:0	g	2.226	33	0.000
18:0	g	0.784	33	0.000
20:0	g	0.010	1	0.000
22:0	g	0.012	1	0.000
15:0	g	0.004	1	0.000
17:0	g	0.017	1	0.000
24:0	g	0.003	1	0.000
Fatty acids, monounsaturated	g	3.809	0	0.000
14:1	g	0.008	1	0.000
16:1	g	0.298	33	0.000
18:1	g	3.473	33	0.000
20:1	g	0.028	33	0.000
22:1	g	0.003	33	0.000
Fatty acids, polyunsaturated	g	1.364	0	0.000
18:2	g	1.148	33	0.000
18:3	g	0.033	33	0.000
18:4	g	0.000	0	0.000
20:4	g	0.142	33	0.000
20:5	g	0.004	33	0.000
22:5	g	0.000	0	0.000
22:6	g	0.037	33	0.000
Cholesterol	mg	425.000	33	2.373
<b>Amino acids</b>				
Tryptophan	g	0.152	0	0.000
Threonine	g	0.600	0	0.000
Isoleucine	g	0.682	0	0.000
Leucine	g	1.067	0	0.000
Lysine	g	0.897	0	0.000
Methionine	g	0.390	0	0.000
Cystine	g	0.290	0	0.000
Phenylalanine	g	0.664	0	0.000
Tyrosine	g	0.510	0	0.000
Valine	g	0.761	0	0.000
Arginine	g	0.749	0	0.000

Histidine	g	0.296	0	0.000
Alanine	g	0.696	0	0.000
Aspartic acid	g	1.255	0	0.000
Glutamic acid	g	1.633	0	0.000
Glycine	g	0.420	0	0.000
Proline	g	0.498	0	0.000
Serine	g	0.929	0	0.000

# Chicken, broilers or fryers, breast, meat only, raw

NDB No: 05062

Nutrient	Units	Value per 100 grams of edible portion	Sample Count	Std. Error
<b>Proximates</b>				
Water	g	74.760	31	0.228
Energy	kcal	110.000	0	0.000
Energy	kJ	460.000	0	0.000
Protein	g	23.090	32	0.194
Total lipid (fat)	g	1.240	40	0.086
Carbohydrate, by difference	g	0.000	0	0.000
Fiber, total dietary	g	0.000	0	0.000
Ash	g	1.020	28	0.025
<b>Minerals</b>				
Calcium, Ca	mg	11.000	27	0.576
Iron, Fe	mg	0.720	25	0.039
Magnesium, Mg	mg	28.000	26	0.390
Phosphorus, P	mg	196.000	27	4.036
Potassium, K	mg	255.000	27	5.796
Sodium, Na	mg	65.000	27	1.905
Zinc, Zn	mg	0.800	25	0.017
Copper, Cu	mg	0.041	25	0.002
Manganese, Mn	mg	0.018	24	0.001
<b>Vitamins</b>				
Vitamin C, ascorbic acid	mg	1.200	31	0.028
Thiamin	mg	0.070	17	0.005
Riboflavin	mg	0.092	17	0.006
Niacin	mg	11.194	17	0.511
Pantothenic acid	mg	0.819	2	0.019
Vitamin B-6	mg	0.550	2	0.136
Folate	mcg	4.000	0	0.000
Vitamin B-12	mcg	0.380	2	0.033
Vitamin A, IU	IU	21.000	0	0.000
Vitamin A, RE	mcg_RE	6.000	0	0.000
Vitamin E	mg_ATE	0.295	0	0.000
<b>Lipids</b>				
Fatty acids, saturated	g	0.330	0	0.000
4:0	g	0.000	0	0.000
6:0	g	0.000	0	0.000
8:0	g	0.000	0	0.000
10:0	g	0.000	0	0.000
12:0	g	0.000	8	0.002
14:0	g	0.010	27	0.001
16:0	g	0.210	27	0.019
18:0	g	0.100	27	0.010
Fatty acids, monounsaturated	g	0.300	0	0.000
16:1	g	0.030	27	0.002

20:1	g	0.000	4	0.002
22:1	g	0.000	0	0.000
Fatty acids, polyunsaturated	g	0.280	0	0.000
18:2	g	0.170	27	0.015
18:3	g	0.010	15	0.001
18:4	g	0.000	0	0.000
20:4	g	0.040	26	0.004
20:5	g	0.000	13	0.000
22:5	g	0.010	13	0.002
22:6	g	0.020	12	0.004
Cholesterol	mg	58.000	8	1.762
<b>Amino acids</b>				
Tryptophan	g	0.270	0	0.000
Threonine	g	0.975	0	0.000
Isoleucine	g	1.219	0	0.000
Leucine	g	1.732	0	0.000
Lysine	g	1.962	0	0.000
Methionine	g	0.639	0	0.000
Cystine	g	0.296	0	0.000
Phenylalanine	g	0.916	0	0.000
Tyrosine	g	0.779	0	0.000
Valine	g	1.145	0	0.000
Arginine	g	1.393	0	0.000
Histidine	g	0.717	0	0.000
Alanine	g	1.260	0	0.000
Aspartic acid	g	2.058	0	0.000
Glutamic acid	g	3.458	0	0.000
Glycine	g	1.134	0	0.000
Proline	g	0.949	0	0.000
Serine	g	0.794	0	0.000



# Chicken, broilers or fryers, meat and skin, raw

NDB No: 05006

Nutrient	Units	Value per 100 grams of edible portion	Sample Count	Std. Error
<b>Proximates</b>				
Water	g	65.990	82	0.239
Energy	kcal	215.000	0	0.000
Energy	kJ	900.000	0	0.000
Protein	g	18.600	82	0.085
Total lipid (fat)	g	15.060	82	0.272
Carbohydrate, by difference	g	0.000	0	0.000
Fiber, total dietary	g	0.000	0	0.000
Ash	g	0.790	25	0.020
<b>Minerals</b>				
Calcium, Ca	mg	11.000	24	0.410
Iron, Fe	mg	0.900	24	0.025
Magnesium, Mg	mg	20.000	24	0.292
Phosphorus, P	mg	147.000	24	2.956
Potassium, K	mg	189.000	24	4.592
Sodium, Na	mg	70.000	24	1.232
Zinc, Zn	mg	1.310	24	0.017
Copper, Cu	mg	0.048	24	0.001
Manganese, Mn	mg	0.019	24	0.000
<b>Vitamins</b>				
Vitamin C, ascorbic acid	mg	1.600	0	0.000
Thiamin	mg	0.060	16	0.003
Riboflavin	mg	0.120	16	0.003
Niacin	mg	6.801	16	0.219
Pantothenic acid	mg	0.910	0	0.000
Vitamin B-6	mg	0.350	0	0.000
Folate	mcg	6.000	0	0.000
Vitamin B-12	mcg	0.310	0	0.000
Vitamin A, IU	IU	140.000	0	0.000
Vitamin A, RE	mcg_RE	41.000	0	0.000
Vitamin E	mg_ATE	0.295	0	0.000
<b>Lipids</b>				
Fatty acids, saturated	g	4.310	0	0.000
4:0	g	0.000	0	0.000
6:0	g	0.000	0	0.000
8:0	g	0.000	0	0.000
10:0	g	0.000	0	0.000
12:0	g	0.020	0	0.000
14:0	g	0.120	0	0.000
16:0	g	3.150	0	0.000
18:0	g	0.870	0	0.000
Fatty acids, monounsaturated	g	6.240	0	0.000
16:1	g	0.830	0	0.000

$\times 9 - 135 = \text{Calories from Fat}$

what's left after you incinerate the meat

20:1	g	0.150	0	0.000
22:1	g	0.000	0	0.000
Fatty acids, polyunsaturated	g	3.230	0	0.000
18:2	g	2.880	0	0.000
18:3	g	0.140	0	0.000
18:4	g	0.000	0	0.000
20:4	g	0.080	0	0.000
20:5	g	0.010	0	0.000
22:5	g	0.010	0	0.000
22:6	g	0.030	0	0.000
Cholesterol	mg	75.000	0	0.000
<b>Amino acids</b>				
Tryptophan	g	0.207	0	0.000
Threonine	g	0.767	0	0.000
Isoleucine	g	0.924	0	0.000
Leucine	g	1.350	0	0.000
Lysine	g	1.509	0	0.000
Methionine	g	0.493	0	0.000
Cystine	g	0.249	0	0.000
Phenylalanine	g	0.721	0	0.000
Tyrosine	g	0.597	0	0.000
Valine	g	0.902	0	0.000
Arginine	g	1.169	0	0.000
Histidine	g	0.544	0	0.000
Alanine	g	1.089	0	0.000
Aspartic acid	g	1.659	0	0.000
Glutamic acid	g	2.714	0	0.000
Glycine	g	1.223	0	0.000
Proline	g	0.911	0	0.000
Serine	g	0.657	0	0.000

## Omega Eggs--A Dietary Source of n-3 Fatty Acids, NF97-354

<http://ianrwww.unl.edu/pubs/NEBFACTS/NF354.HTM>

**Table I. Nutritive Value of Omega Eggs Compared to Standard Eggs**

	<i>Omega Egg</i> 60 g - large egg	<i>Standard Egg</i> 60 g - large egg
Calories	75.0	75.0
Protein	6 grams	6 grams
Carbohydrate	.6 grams	.6 grams
Total Fat	6.0 grams	6.0 grams
Saturated Fat	1.5 grams	2.2 grams
Polyunsaturated Fat	1.35 grams	.90 grams
n-6 Fatty Acids	750 mg	800 mg
n-3 Fatty Acids	350 mg	60 mg
C18:3	250 mg	40 mg
C22:6	100 mg	20 mg
n-6:n-3 Ratio	2.6	13.0
Monounsaturated Fats	2.8 grams	2.4 grams
Cholesterol	180 mg	210 mg

Table I illustrates the nutrient composition of a regular United States Department of Agriculture (USDA) large egg compared to the Omega™ egg as licensed at the University of Nebraska. In the Omega egg, the ratio of n6:n3 fatty acids has been improved to 2.6:1. The Omega egg will provide 250-350 mg n-3 fatty acids, of which 100 mg are DHA (C22:6). In the human diet, one Omega egg serving would be equivalent to a one ounce serving of high oil fish (salmon) to provide essential n-3 fatty acids. Due to a special feeding and genetics program at the University of Nebraska Poultry Research facilities, the cholesterol content of Omega eggs has also been consistently reduced to 180 mg/egg, compared to the USDA standard egg value of 210 mg/egg. Current UNL research is testing the taste and health benefits of Omega versus standard eggs. Omega eggs fared very well in their taste comparisons (1) to regular eggs and human hypercholesterolemic subjects

could eat up to 12 eggs per week (2) with no increase in serum cholesterol and a 14 percent reduction in serum triglycerides when on a Step 1 heart healthy diet.

### Why are n-3 fatty acids important in the human diet?

In the past 20 years, much research has been conducted which provides a major link between intake of n-3 fatty acids and the risk of cardiovascular disease. The beneficial role of n-3 fatty acids, particularly DHA (C22:6), in thrombosis, arrhythmia and HDL:LDL ratios is becoming more clearly established in both medical and nutrition research. Both Canada and the United Kingdom have established dietary guidelines for the daily intake of these important fatty acids. European infant formula companies regularly supplement infant formulas with DHA to support early retinal and neural (brain) development. Research analysis of U.S. diets indicate a low n-3 fatty acid intake, particularly among pregnant women (3).

Many Midwesterners do not consume oily fish regularly enough to provide adequate n-3 fatty acid intake (4). The Omega egg, and other designer egg counterparts, have been developed to provide consumers a natural, healthy n-3 fatty acid dietary alternative. Omega eggs and other designer eggs are available in specific consumer throughout the United States, including several markets in Nebraska.

### References

1. Scheideler, S.E., G. Froning and S. Cuppett, 1997. Studies of Consumer Acceptance of High Omega-3 Fatty Acid Enriched Eggs. J. Appl.



United States  
Department of  
Agriculture

Food Safety  
and Inspection  
Service

Office of Policy,  
Program Development  
and Evaluation

July, 1997

E.coli-2

# Guidelines for *Escherichia coli* Testing for Process Control Verification in Poultry Slaughter Establishments

These are the requirements  
for a USDA-inspected  
Poultry plant-for E. coli.

One consideration when comparing  
these guidelines to your birds -  
your birds were sampled about  
48 hours after slaughter whereas these  
guidelines are for sampling immediately  
after slaughter. There would be some  
multiplication on your birds depending  
upon how many hours they took to  
cool down to  $\leq 40^{\circ}\text{F}$ . Below  
 $40^{\circ}\text{F}$ , growth (multiplication) would  
be minimal.

## INTRODUCTION

Under the Pathogen Reduction/HACCP Regulation, poultry slaughter establishments are required to test carcasses for generic *E. coli* as a means of verifying process control. This document outlines sampling and microbial testing procedures that would meet this requirement. These guidelines may be helpful to your company microbiologist or testing laboratory. This document is a supplement to the Regulation but not a substitute; in-depth details of microbial sampling and testing may be found in the Regulation.

In this protocol, carcass sampling for broiler and turkey carcasses employs the same nondestructive whole bird rinse used in the FSIS Nationwide Microbiological Baseline Data Collection Programs. Poultry carcasses should be sampled at the end of the chill process, after the drip line, and before packing/cut-up. (Hot-boned poultry, which is boned before chilling, should be sampled at the end of the slaughter line instead of at the end of the drip line.) Samples taken in this manner will have analytic results comparable to National Baseline figures.

*E. coli* test levels from National Baseline studies, expressed as colony forming units per milliliter (cfu/ml) of rinsate, have been separated into 3 categories for the purpose of process control verification: acceptable, marginal, and unacceptable. In the Pathogen Reduction/HACCP Regulation, the upper limits for the acceptable and marginal ranges were denoted by **m** and **M**.

Table 1. Values for Marginal and Unacceptable Results for *E. coli* performance criteria

Type of Poultry	Acceptable Range	Marginal Range	Unacceptable Range
Chicken	100 cfu/ml or less	over 100 cfu/ml but not over 1,000 cfu/ml	above 1,000 cfu/ml
Turkey	NA *	NA *	NA *

\* The FSIS Baseline study has not been completed for this type of poultry. Levels will be set upon completion of this baseline.

The *E. coli* test results for a chicken slaughter establishment will be acceptable if not above 100 cfu/ml, marginal if above 100 cfu/ml but not above 1,000 cfu/ml, and unacceptable if above 1,000 cfu/ml. To evaluate overall process performance, the establishment must apply verification criteria to a set of samples; see discussion on pp. 14-16.