



Nutrient analysis of eggs

Sampling Report

Nutrient analysis of eggs

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Description	This survey forms part of the Department of Health's rolling programme of nutrient analysis which provides up-to-date and reliable information on the nutrient content of foods. The results are incorporated into nutrient databanks which support the National Diet and Nutrition Survey and other national dietary surveys used to monitor the nations diet. Any data queries will be dealt with on a case by case basis.	
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Prepared by the Institute of Food Research

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Executive summary

The aim of this survey was to provide up-to-date nutrient composition data for chicken eggs to reflect changes in chicken feed and egg production methods.

The results from this analytical survey will update the information currently held by providing composition data that reflects changes in hens' diets since eggs were last analysed. The results will be incorporated into the Department of Health's¹ nutrient databank that supports dietary surveys and will be also be disseminated via the authoritative UK food composition tables, *McCance and Widdowson's The Composition of Foods*.

This project reports analysis of 8 composite samples that were made up of 12 sub-samples that were representative of eggs consumed in the UK. Sub-samples included enriched cage eggs, free range eggs, barn eggs and organic eggs in proportion to market share. Samples were collected direct from three large regional packing centres, with the assistance of the British Egg Industry Council (BEIC), to provide a representative sample covering eggs supplied to all the major retailers, the foodservice and food processing industries.

Results from the survey are contained in a separate analytical report and results for individual fatty acids are reported separately in electronic format.

Sampling notes

1. Samples were collected according to a sample protocol produced in agreement with the Department of Health (DH).
2. Sub-samples were agreed with DH based on a review of market shares and nutrient content.
3. Eggs were collected from three egg distribution centres in the UK: Nobel Foods Ltd, Newark, Nottinghamshire; Fridays Ltd, Cranbrook, Kent; and Oaklands Farm Eggs, Telford, Shropshire.
4. Collection from each distribution centre took place before grading and consisted of 20 trays of enriched cage eggs; 15 tray of free range eggs; and 5 trays of organic eggs. If barn eggs were not available, they were substituted with enriched cage eggs. If organic eggs were not available, they were substituted with free range eggs.
5. All samples were collected between the 22 and 25 March 2011 and stored at a constant temperature of 6°C until required for processing.
6. Eggs were sorted by size at the Institute of Food Research (IFR) before processing. Medium eggs were classified as 53 - 62.9g and large eggs as 63 – 73g. In the event that there were not enough large eggs for a sub-sample, eggs weighing more than 62g were used.
7. All composites were prepared and processed between the 28 March and 14 April 2011.
8. Cooking guidelines were based upon those given on the BEIC website (<http://www.eggrecipes.co.uk>).
9. Each sub-sample was sampled at three different time points (stored at 6°C for between 6 and 24 days after collection) to ensure that different aged eggs were included in the sample. Equal weights of the three samples were combined to form one sub-sample. Equal weights of each sub-sample were combined to complete the composite sample for analysis.
10. Sub-samples were stored at –20°C until required for further preparation. Composite samples were stored at -40°C before being sent to laboratories for analysis.

Composite sample list

Sample Number	Sample Name	Description
1	Eggs, chicken, whole, raw	12 sub samples from 3 UK egg distribution centres, including enriched cage, barn, free-range and organic
2	Eggs, chicken, white, raw	12 sub samples from 3 egg distribution centres, including enriched cage, barn, free-range and organic
3	Eggs, chicken, yolk, raw	12 sub samples from 3 egg distribution centres, including enriched cage, barn, free-range and organic
4	Eggs, chicken, whole, boiled	12 sub samples from 3 egg distribution centres, including enriched cage, barn, free-range and organic
5	Eggs, chicken, white, boiled	12 sub samples from 3 egg distribution centres, including enriched cage, barn, free-range and organic
6	Eggs, chicken, yolk, boiled	12 sub samples from 3 egg distribution centres, including enriched cage, barn, free-range and organic
7	Eggs, chicken, whole, poached	12 sub samples from 3 egg distribution centres, including enriched cage, barn, free-range and organic
8	Eggs, chicken, whole, fried in sunflower oil	12 sub samples from 3 egg distribution centres, including enriched cage, barn, free-range and organic

Sub-samples

Each composite sample consisted of 12 sub-samples as follows:

Sub-sample Number	Number of eggs ¹	Packing Centre	Production Type
1	24/36	North Scarle	Enriched cage
2	24/36	North Scarle	Enriched cage
3	24/36	Wem	Enriched cage
4	24/36	Wem	Enriched cage
5	24/36	Cranbrook	Enriched cage
6	24/36	Cranbrook	Enriched cage
7	24/36	Combined (8 from each centre)	Barn ²
8	24/36	North Scarle	Free Range
9	24/36	Wem	Free Range
10	24/36	Cranbrook	Free Range
11	24/36	Combined (8 from each centre)	Free Range
12	24/36	Combined (8 from each centre)	Organic ³

¹24 eggs were used for raw egg samples and 36 for cooked samples (to allow for a range of 3 different cooking times)

²Substituted with enriched cage if barn eggs not available

³Substituted with free range if organic not available

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Sub-samples 1 & 2

Composite Sample Number:	All composite samples
Sub-sample Number:	1 & 2
Sub-sample Name:	North Scarle Enriched Cage Eggs
Brand:	
Pack size:	20 trays, 600 eggs
Collection Date:	22.03.2010
Place of Collection:	Nobel Foods Ltd, Newark, Nottinghamshire
Display Until Date:	
Best Before Date:	
Batch Number:	
Packaging:	Cardboard
Sample Condition As Collected:	Ambient
Post Collection Storage:	Chilled

Nutrient analysis of eggs

Sub-samples 3 & 4

Composite Sample Number:	All composite samples
Sub-sample Number:	3 & 4
Sub-sample Name:	Wem Enriched Cage Eggs
Brand:	
Pack size:	20 trays, 600 eggs
Collection Date:	23.03.2011
Place of Collection:	Oaklands Farm Eggs, Telford, Shropshire
Display Until Date:	
Best Before Date:	
Batch Number:	
Packaging:	Cardboard
Sample Condition As Collected:	Ambient
Post Collection Storage:	Chilled

Nutrient analysis of eggs

Sub-samples 5 & 6

Composite Sample Number:	All composite samples
Sub-sample Number:	5 & 6
Sub-sample Name:	Cranbrook Enriched Cage Eggs
Brand:	
Pack size:	20 trays, 600 eggs
Collection Date:	25.03.2011
Place of Collection:	Fridays Ltd, Cranbrook, Kent
Display Until Date:	
Best Before Date:	
Batch Number:	
Packaging:	Cardboard
Sample Condition As Collected:	Ambient
Post Collection Storage:	Chilled

Nutrient analysis of eggs

Sub-sample 7

Composite Sample Number:	All composite samples
Sub-sample Number:	7
Sub-sample Name:	Combined Barn Eggs
Brand:	
Pack size:	15 trays, 450 eggs (5 trays from each distributor)
Collection Date:	22.03.2010; 23.03.2010; and 25.03.2010
Place of Collection:	Nobel Foods Ltd, Newark, Nottinghamshire; Oaklands Farm Eggs, Telford, Shropshire; and Fridays Ltd, Cranbrook, Kent
Display Until Date:	
Best Before Date:	
Batch Number:	
Packaging:	Cardboard
Sample Condition As Collected:	Ambient
Post Collection Storage:	Chilled

Nutrient analysis of eggs

Sub-sample 8

Composite Sample Number:	All composite samples
Sub-sample Number:	8
Sub-sample Name:	North Scarle Free Range Eggs
Brand:	
Pack size:	15 trays, 450 eggs
Collection Date:	22.03.2011
Place of Collection:	Nobel Foods Ltd, Newark, Nottinghamshire
Display Until Date:	
Best Before Date:	
Batch Number:	
Packaging:	Cardboard
Sample Condition As Collected:	Ambient
Post Collection Storage:	Chilled

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Sub-sample 9

Composite Sample Number:	All composite samples
Sub-sample Number:	9
Sub-sample Name:	Wem Free Range Eggs
Brand:	
Pack size:	15 trays, 450 eggs
Collection Date:	23.03.2011
Place of Collection:	Oaklands Farm Eggs, Telford, Shropshire
Display Until Date:	
Best Before Date:	
Batch Number:	
Packaging:	Cardboard
Sample Condition As Collected:	Ambient
Post Collection Storage:	Chilled

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Sub-sample 10

Composite Sample Number:	All composite samples
Sub-sample Number:	10
Sub-sample Name:	Cranbrook Free Range Eggs
Brand:	
Pack size:	15 trays, 450 eggs
Collection Date:	25.03.2011
Place of Collection:	Fridays Ltd, Cranbrook, Kent
Display Until Date:	
Best Before Date:	
Batch Number:	
Packaging:	Cardboard
Sample Condition As Collected:	Ambient
Post Collection Storage:	Chilled

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Sub-sample 11

Composite Sample Number:	All composite samples
Sub-sample Number:	11
Sub-sample Name:	Combined Free Range Eggs
Brand:	
Pack size:	15 trays, 450 eggs (5 trays from each distributor)
Collection Date:	22.03.2010; 23.03.2010; and 25.03.2010
Place of Collection:	Nobel Foods Ltd, Newark, Nottinghamshire; Oaklands Farm Eggs, Telford, Shropshire; and Fridays Ltd, Cranbrook, Kent
Display Until Date:	
Best Before Date:	
Batch Number:	
Packaging:	Cardboard
Sample Condition As Collected:	Ambient
Post Collection Storage:	Chilled

Nutrient analysis of eggs

Sub-sample 12

Composite Sample Number:	All composite samples
Sub-sample Number:	12
Sub-sample Name:	Combined Organic Eggs
Brand:	
Pack size:	15 trays, 450 eggs (5 trays from each distributor)
Collection Date:	22.03.2010; 23.03.2010; and 25.03.2010
Place of Collection:	Nobel Foods Ltd, Newark, Nottinghamshire; Oaklands Farm Eggs, Telford, Shropshire; and Fridays Ltd, Cranbrook, Kent
Display Until Date:	
Best Before Date:	
Batch Number:	
Packaging:	Cardboard
Sample Condition As Collected:	Ambient
Post Collection Storage:	Chilled

Sample Preparation

Eggs were stored at a constant temperature of 6°C until needed for processing.

Each sub-sample contained equal amounts of three different ages of eggs (approximately 7, 13 and 21 days). Equal weights of homogenised sub-samples were combined to form single composite samples. The composite samples were homogenised as thoroughly as possible and split into sub-samples of approximately 100g each. Where cooking was required, cooking guidelines from the BEIC website (<http://www.eggrecipes.co.uk>) were used. Composite samples were stored frozen at -40°C before being sent to laboratories for analysis.

Details of yolk, white and shell proportion, cooking methods and cooking weight loss data are included below. All data are average values.

Sample 1: Eggs, chicken, whole, raw

	<i>Medium Eggs (53 - 62.9g)</i>			<i>Large Eggs (63 – 73g)</i>		
	Whole Egg (g)	Shell (g)	Edible Portion	Whole Egg (g)	Shell (g)	Edible Portion
1.1	59.0	7.8	0.87	64.0	8.3	0.87
1.2	59.9	7.8	0.87	64.2 ^a	8.3	0.87
1.3	58.8	7.6	0.87	66.1	8.4	0.87
1.4	58.8	7.4	0.87	66.7	8.0	0.88
1.5	59.2	7.5	0.87	66.4	8.2	0.88
1.6	59.3	7.7	0.87	67.1	8.4	0.87
1.7	59.7	7.7	0.87	66.6	8.2	0.88
1.8	59.6	7.7	0.87	66.4	8.4	0.87
1.9	58.7	7.4	0.87	67.5	8.5	0.87
1.10	60.5	7.8	0.87	67.0	8.2	0.88
1.11	58.5	7.6	0.87	67.6	8.6	0.87
1.12	58.2	7.7	0.87	66.0	8.5	0.87
Average	59.2	7.6	0.87	66.3	8.3	0.87

^aThere were insufficient numbers of individual eggs weighing ≥63g, therefore some eggs weighing >62g but <63g were used

Nutrient analysis of eggs

Sample 2 & 3: Eggs, chicken, white, raw & eggs, chicken, yolk, raw

Egg whites were separated from yolks using commercially available egg white separators. Yolk samples contained small amounts of egg white. Egg white samples contained no yolk. All blood spots were removed from egg white samples.

	<i>Medium Eggs (53 – 62.9g)</i>					
	Whole Egg (g)	Raw Yolk ^a (g)	Raw White ^a (g)	Shell ^a (g)	Yolk in edible portion (%)	Edible Portion
2.1 & 3.1	60.0	15.0	36.9	7.8	28.7	0.87
2.2 & 3.2	60.0	15.6	35.5	7.9	29.9	0.87
2.3 & 3.3	60.5	15.2	37.4	7.5	28.7	0.88
2.4 & 3.4	59.0	14.6	36.8	7.3	28.2	0.88
2.5 & 3.5	58.4	15.6	34.4	7.7	30.8	0.87
2.6 & 3.6	58.4	15.7	34.7	7.7	31.0	0.87
2.7 & 3.7	60.0	14.1	37.5	7.5	26.9	0.88
2.8 & 3.8	60.5	15.3	37.3	7.5	28.9	0.88
2.9 & 3.9	57.6	14.3	35.5	7.6	28.6	0.87
2.10 & 3.10	58.5	15.1	35.5	7.5	29.6	0.87
2.11 & 3.11	58.3	15.7	34.4	7.6	31.0	0.87
2.12 & 3.12	59.3	15.4	36.0	7.4	29.7	0.88
Average	59.2	15.1	36.0	7.6	29.3	0.87

^aThe sum of yolk, white and shell is not equal to the weight of the whole egg because of small losses (including blood spots), and limitations in weighing accuracy

Nutrient analysis of eggs

	<i>Large Eggs (63 – 73g)</i>					
	Whole Egg (g)	Raw Yolk ^a (g)	Raw White ^a (g)	Shell ^a (g)	Yolk in edible portion (%)	Edible Portion
2.1 & 3.1	63.7	15.8	39.1	8.2	28.5	0.87
2.2 & 3.2	63.6 ^b	15.8	39.4	7.9	28.4	0.88
2.3 & 3.3	65.5	16.2	41.0	7.9	28.1	0.88
2.4 & 3.4	66.9	15.7	42.7	8.0	26.7	0.88
2.5 & 3.5	66.2	17.0	39.8	8.5	29.5	0.87
2.6 & 3.6	66.9	17.7	40.3	8.4	30.3	0.87
2.7 & 3.7	66.9	16.7	41.5	8.2	28.4	0.88
2.8 & 3.8	67.0	16.8	41.0	8.5	28.7	0.87
2.9 & 3.9	66.1	16.6	40.8	8.3	28.7	0.87
2.10 & 3.10	66.8	16.9	41.3	8.3	28.9	0.88
2.11 & 3.11	66.8	16.9	41.0	8.2	28.8	0.88
2.12 & 3.12	65.7	17.0	40.0	8.3	29.6	0.87
Average	66.0	16.6	40.7	8.2	28.7	0.88

^aThe sum of yolk, white and shell is not equal to the weight of the whole egg because of small losses (including blood spots), and limitations in weighing accuracy

^bThere were insufficient numbers of individual eggs weighing >63g, therefore some eggs weighing >62g but <63g were used

Nutrient analysis of eggs

Sample 4: Eggs, chicken, whole, boiled

Eggs were boiled in equal proportions for 3 cooking times:

- 3 minutes for soft boiled yolk and set white
- 5 minutes for firmer yolk and white
- 7 minutes for firm boiled yolk and white

	<i>Medium Eggs (53 – 62.9g)</i>				
	Whole raw Egg (g)	Whole egg after boiling (g)	Shell after boiling (g)	Weight loss (%)	Edible Portion
4.1	60.9	60.0	6.8	1.5	0.89
4.2	59.0	58.4	6.4	1.0	0.89
4.3	59.3	58.7	6.2	1.0	0.89
4.4	59.1	58.5	6.2	1.0	0.89
4.5	59.7	58.9	6.6	1.3	0.89
4.6	59.8	59.2	6.6	1.0	0.89
4.7	58.9	58.3	6.4	1.0	0.89
4.8	59.5	58.7	6.6	1.3	0.89
4.9	59.3	58.7	6.8	1.0	0.88
4.10	58.5	57.8	6.3	1.2	0.89
4.11	59.7	58.8	6.3	1.5	0.89
4.12	60.4	59.7	6.9	1.2	0.88
Average	59.5	58.8	6.5	1.2	0.89

	<i>Large Eggs (63 – 73g)</i>				
	Whole raw Egg (g)	Whole egg after boiling (g)	Shell after boiling (g)	Weight loss (%)	Edible Portion
4.1	63.8	63.2	7.4	0.9	0.88
4.2	62.9 ^a	61.9	6.9	1.6	0.89
4.3	65.5	64.4	6.8	1.7	0.89
4.4	66.0	65.5	6.8	0.8	0.90
4.5	66.0	64.9	7.6	1.7	0.88
4.6	65.7	64.6	6.8	1.7	0.89
4.7	66.3	65.7	7.3	0.9	0.89
4.8	68.3	67.7	7.3	0.9	0.89
4.9	66.3	65.5	7.1	1.2	0.89
4.10	66.1	65.1	7.2	1.5	0.89
4.11	65.9	65.3	7.0	0.9	0.89
4.12	65.3	64.7	7.3	0.9	0.89
Average	65.7	64.9	7.1	1.2	0.89

^aThere were insufficient numbers of individual eggs weighing >63g, therefore some eggs weighing >62g but <63g were used

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Sample 5 & 6: Eggs, chicken, white, boiled & eggs, chicken, yolk, boiled

Eggs were boiled in equal proportions for 3 cooking times:

- 3 minutes for soft boiled yolk and set white
- 5 minutes for firmer yolk and white
- 7 minutes for firm boiled yolk and white

When separating the cooked yolk and white, any piece of egg where white could not be separated from the yolk, was discarded.

	<i>Medium Eggs</i> (53 – 62.9g)	<i>Large Eggs</i> (63 – 73g)
	Whole Raw Egg (g)	Whole Raw Egg (g)
5.1 & 6.1	59.7	63.8
5.2 & 6.2	58.1	63.1 ^a
5.3 & 6.3	60.5	64.9
5.4 & 6.4	58.8	65.7
5.5 & 6.5	59.4	65.9
5.6 & 6.6	59.4	66.3
5.7 & 6.7	59.4	66.6
5.8 & 6.8	59.2	67.0
5.9 & 6.9	58.3	66.2
5.10 & 6.10	58.4	66.8
5.11 & 6.11	59.1	66.2
5.12 & 6.12	59.8	66.4
Average	59.2	65.7

^aThere were insufficient numbers of individual eggs weighing >63g, therefore some eggs weighing >62g but <63g were used

Nutrient analysis of eggs

Sample 7: Eggs, chicken, whole, poached

Eggs were poached either directly in Analar grade water or using a poacher. When poaching in water, eggs were cracked onto a plate and tipped into the water. Once cooked, eggs prepared by both methods were drained using kitchen paper. Eggs were poached in equal proportions for the following times:

- 3 minutes in water for a runny egg yolk
- 4 minutes in a poacher for a runny egg yolk
- 4 minutes in water for a slightly set yolk with a runny middle
- 5 minutes in a poacher for a slightly set yolk with a runny middle
- 5 minutes in water for a firm egg yolk
- 6 minutes in a poacher for a firm egg yolk

	<i>Medium Eggs</i> (53 – 62.9g)	<i>Large Eggs</i> (63 – 73g)
	Whole Raw Egg (g)	Whole Raw Egg (g)
7.1	59.1	63.4 ^a
7.2	58.4	63.5 ^a
7.3	59.8	66.6
7.4	59.4	66.3
7.5	58.3	65.3
7.6	60.4	65.4 ^a
7.7	57.5	66.9
7.8	60.5	67.6
7.9	59.1	67.3
7.10	58.5	66.1 ^a
7.11	59.6	68.2
7.12	59.2	66.3
Average	59.2	66.1

^aThere were insufficient numbers of individual eggs weighing >63g, therefore some eggs weighing >62g but <63g were used

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Sample 8: Eggs, chicken, whole, fried in sunflower oil

Eggs were fried in 3 tablespoons of sunflower oil over a medium heat, using a teaspoon to scoop surplus hot fat over the top of the egg until the yolk cooked. Equal proportions of eggs were cooked for the following times:

- Heat for 1 minute or until the white is set. Cook for an extra 1.5 minutes
- Heat for 1 minute or until the white is set. Cook for an extra 3 minutes

	<i>Medium Eggs</i> (53 – 62.9g)	<i>Large Eggs</i> (63 – 73g)
	Whole Raw Egg (g)	Whole Raw Egg (g)
8.1	57.8	63.5 ^a
8.2	59.3	63.0 ^a
8.3	59.6	66.0
8.4	59.1	65.9
8.5	59.4	66.0
8.6	58.8	64.5
8.7	59.5	66.1
8.8	60.4	66.2
8.9	58.0	65.7
8.10	59.5	67.4
8.11	60.2	67.3
8.12	59.3	67.0
Average	59.2	65.7

^aThere were insufficient numbers of individual eggs weighing >63g, therefore some eggs weighing >62g but <63g were used

References

¹ Responsibility for nutrition policy in England transferred from the Food Standards Agency to the Department of Health (DH) on 1 October 2010. Management of the rolling programme of nutrient analysis also transferred to DH.