Egg

Egg is an ovulated reproductive cell which is naturally completed in the female genital organ of birds and obtained after laying. It is the largest cell of the nature and widely used as delicious nutritive food of human.

Egg Structure

A. Egg Shell
B. Egg membrane
    a) Outer shell membrane
    b) Inner shell membrane
C. Air sac: In between outer and inner shell membrane.
D. Egg white or Albumen
    a) Dense albumen
    b) Inner loose albumen
    c) Chalaza
E. Yolk
    a) Vitelline membrane
    b) Germ spot or Germinal disc.

Egg Formation

Egg structure includes yolk, albumen, shell membranes egg shell. Egg formation starts in the ovary and is completed in the different parts of oviduct. These parts are infundibulum or funnel, magnum, isthmus, uterus and vagina.

Yolk: It is formed in the *ovary*. Mature ovum from the ovary is called yolk.

Albumen: After ovulation the yolk drops into the funnel of the oviduct. The *magnum* region of the oviduct secretes the white albumen which around the yolk.

Shell membrane: The yolk with albumen then passes the magnum and enters to the *isthmus* of the oviduct which secretes the materials to form outer and inner shell membrane.

Egg Shell: Egg shell is added in the *uterus*. The uterus secretes calcium and carbonate ions which help to form the calcium carbonate, the egg shell. Egg stay here just prior to laying. Dryness of egg shell take place her

Egg Formation in the Oviduct

Parts of oviducts	Length (cm)	Time	Function
Infundibulum or funnel	**9**	**15 min.**	It receives the mature ruptured yolk from the ovary. Fertilization occurs here if sperm is available.
Magnum	**33**	**3 hrs.**	Albumen is deposited here around the yolk.
Isthmus	**10**	**1.25 hrs.**	Shell membranes are added here.
Uterus	**11**	**21 hrs.**	Egg shell and its pigmentation are added here over the shell membrane. Egg stay here just prior to laying.
Vagina	**12**	**30 min.**	During laying egg is passed through vagina.

Note: Egg Formation Time: 24 hrs.+

Food Value of Egg

Egg is the most nearly a balance food of all the foods available to man. It contains all essential nutrients that we need for growth, maintenance, lactation and reproduction. The edible portion of the egg is made up of the yolk and the albumen. A hen's egg weighing 57g gives us about 51g of food materials made up of by 18g yolk and 33g albumen. The nutrients include proteins, fats, vitamins and minerals.

Protein: The yolk and albumen contain about 17.5 % and 11.0 % protein respectively. An egg of 57g contains 6.7g protein (3.64g in albumen and 3.15g in yolk). It is highly digestible quality protein. The biological value of egg protein is 95% as compared to 85% for milk and 70% for meat protein. It is a complete protein, because it contains all essential amino acids required to maintain body, promote growth and reproduction.

Chemical composition of an egg of 57g					
	Whole Egg	Albumen	Yolk	Shell	Energy calories
Water	37.50	29.04	8.64	-	
Protein	6.70	3.64	3.15	-	
Fat	6.20	0.06	5.85	-	
Ash	6.60	0.26	0.36	5.76	
Total	**57g**	**33g**	**18g**	**6g**	**90**

Fats: Egg yolk contains 32.5% fat & only 0.2% in albumen. An egg of 57g contains 6.2g fat. Egg fat is very well-emulsified unsaturated fats which are easily digestible.

Carbohydrate: As egg is an animal product so its carbohydrate content is below 1%.

Energy: Egg is moderate from the standpoint of calorie content. An egg of 57g supplies 90 calories energy to our body.

Vitamins: Egg contains all fat soluble vitamin- ADEK and all members of B-complex including vitamin-B_{12} which are stored in the yolk. Egg yolk is a potential source of vitamin-A varies from 200 to 1000 I.U. Its component is present in pure forma as well as in precursor i,e., as carotenoid pigments. The quantity of vitamin-D depends on direct sunshine to the layers and vitamin-D supplement in the poultry ration. An egg supplies 15% vitamin-D of the daily needs of an adult person.

Minerals: The egg contains a large number of mineral elements. It contains 116 mgm phosphorous of which 110 mgm present in yolk, iron-2 mgm mostly in the yolk, calcium in the edible portion is about 2gm per egg. Others are Na, K, Mg, S, Cl, Zn, Cu, Mn, etc. are also present.

A man recommended 3000 calories energy, 70g protein, 50g fat and 570g carbohydrate per day. A man gets 90 calories energy, 6.7g protein and 6.2g fat from an egg.

Comparison and Composition of Chicken and Duck Egg (100g edible)

	Energy (calories)	Water %	Protein %	Fat %	Carbohydrate %	Ash %
Chicken	163	73.7	12.5	11.5	0.9	1.0
Duck	191	70.4	13.0	14.5	0.7	1.1

Nutritive Value of Egg

Components	Recommended daily allowance for a man	Quantity in 1 egg	Quantity in half pint (Approx. 280 ml)
Energy(calories)	3,000	90	205
Protein(g)	70	6.6	9.9
Fat(g)	50	5.5	10.3
Carbohydrate(g)	570	--	14.0
Calcium(g)	0.8	0.03	0.37
Phosphorus(g)	0.9	0.12	0.28
Iron(mg)	12.0	1.6	0.10
Vitamin A (i.U.)	5,000	600	600
Vitamin D(i.U.)	400	50	--
Vitamin B_1(mg) (Thiamine)	1.5	0.09	0.10
Vitamin C(mg)	75	-	6.0
Vitamin B_2(mg) (Riboflavin)	2.0	0.19	0.25
Niacine (mg)	18	0.04	0.08

Composition of Protein Showing Approximate Amino Acid Content in % of Protein (N x 6.25)

Amino acid %	Rice	Cow milk	Hen egg	Chicken meat
Arginine	7.2	4.2	6.6	7.1
Histidine	1.7	2.6	2.4	2.3
Lysine	3.2	8.7	7.0	8.4
Tyrosine	5.7	6.0	4.5	4.3
Tryptophan	1.3	1.5	1.5	1.2
Phenylalanine	5.0	5.5	6.3	4.6
Cystine	1.3	1.0	2.4	1.3
Methionine	2.3	3.2	4.0	3.2
Threonine	3.8	4.7	4.3	4.7
Serine	-	4.3	-	4.7
Leucine	8.2	11.0	9.2	-
Isoleucine	5.2	7.5	7.7	-
Valine	6.2	7.0	7.2	-

Egg production of poultry

Species	Age of Sexual Maturity (Month)	Eggs/year (Nos)	Egg Weight (gm)
Chicken	5-6		57
Egg type		250	
Dual type		170	
Meat type		100	
Turkey	7	105	85
Goose	24	15-60	215
Duck			
Egg type	6	250	70
Meat type	7	110-175	80
Pheasant	6-7	50-125	30
Quail	7 weeks	250	10
Pigeon	6	12-14	17
Guinea Fowl	6-7	100	40
Ostrich	3-4 years	20-70	1.0-1.5 kg

Food Value of Chicken Meat

Nutritionally, people eat poultry meat for its high quality protein and its low fat content. Chicken meat is higher in protein and lower in fat than beef and other red meats. Human body needs protein for its cell structure and repair. Poultry meat is a great source of protein with all essential amino acids. Poultry meat is very nutritious food for all ages of peoples. Poultry meat contains less fat than animal

Comparison and Composition of Some Carcass Parts of Chicken & Beef

Species	Carcass cuts	Protein %	Fat %	Moisture %	Food energy (100g)
Chicken (Roasted& boned)	Breast(white meat)	32.2	5.0	61.3	182
	Leg(dark meat)	29.2	6.5	62.7	185
Cattle (Cooked &boned)	Round steak	28.6	15.4	54.7	261
	Rump roast	23.6	27.3	48.1	347
	Hamburger	24.2	20.3	54.2	286

Effect of Eating Raw and Cooked Eggs

Eating of raw egg

Since the nutrients in the eggs are in an easily digestible form, and also because the chick embryo can utilize these nutrients from the raw contents, one may think that it is preferable to consume the egg contents in the raw state rather than after cooking. But this is not so far the following reasons:

1. Raw egg white (albumin) contains an *anti-trypsin* factor and also particular protein, *avidin* which are in combination of vitamin *biotin* thus render the vitamin unavailable. But by cooking harmful properties of albumen are destroyed and it also become more digestible.

2. The raw egg may contain harmful organisms capable of causing diseases. The organisms will be destroyed by cooking temperature.

3. Cooked eggs also stimulate more secretion of the acid in the stomach required for protein digestion.

Eating of cooked egg

There is several types' of egg cooking methods. High or low temperature influence digestion of egg and even loss of nutrients.

1. **Egg boil:**
   - **Egg half boiled:** There is no loss of protein and vitamin in half boiling.
   - **Egg full boiled:** Trace loss of nutrients.
2. **Egg fry:**

Fried at low temperature - If frying is done at low temperature, only about 0.1 gm protein (out of 6.5 gm) may be lost.

Fried at high temperature -At high temperature 0.6 gm protein and significant amount of vitamins are lost.

3. **Egg omelette:** The loss of protein is about 0.2 gm (fried with spices)

4. **Egg poach :** The loss of protein is about 0.5 gm.(broken egg in boil water)

5. **Egg scrambled:** The loss of protein is about 1.0 gm.

6. **Spiced egg curry:** Indian type curry with other foods, loss of protein is 1.2 gm with vitamins.

Different Abnormal Eggs

1. Double-yoked egg: This is due to when two ova ripening at a time or an ovulation take place after another.

2. Small yolkless egg: When any foreign material such as blood clot or piece of membrane drops into the funnel then same phenomenon occurs as like as egg formation.

3. An egg within an egg: If a completed egg back to the funnel from the uterus by reverse peristaltic action, then the egg will again surrounded by albumen, membrane and shell.

4. Soft shelled egg: This may be occurred due to calcium deficiency of hen or laying of incomplete egg.

5. Pale yolk: This is due to lack of carotene in the ration or anemia of laying hen.

6. Blood spots: May be found as a result of haemorrhages of small blood vessel in the ovary.

7. Meat spots: Found in yolk or albumen due to degenerated cells in the ovary or oviduct

Health Problem Related to Poultry Products

Now-a-days people are becoming more and more health conscious. Unfortunately much of the nutritional information that they receive is not authoritative. One may say as ` poultry egg & meat cause allergies and heart disease', such accusations must be answered by more than simple rejection.

Allergies- Occasionally a highly sensitive infant or people exhibit allergic symptoms to eggs. In most cases the raw egg white (albumen) creates the allergic reaction. Heat destroys the trypsin

inhibitor of egg albumen which creates allergy to human. So it is advisable to the infants and children to take heat treated cooked eggs.

Heart disease- Every year numerous types' heart disease caused death of million people. This is due to hypertension, cerebro-vascular disease (stroke), congestive heart failure and atherosclerosis are common. Atherosclerosis, a type of disease sometimes due to high animal fat diet lipid and connective tissue develops inner passage of the arteries of the heart, when these deposits become sufficiently large clots may form and decreases the diameter of the artery lumen and in some cases blood flow is greatly impaired resulting a heart attack. Research indicated that individuals with high blood serum cholesterol level had a higher rate of atherosclerosis than people with normal levels. Animal fats which are highly saturated increase blood cholesterol levels. But research studies have shown that certain African tribes whose diets consist almost entirely of animal products do not have elevated serum cholesterol levels. Although dietary fat is implicated in atherosclerosis, but not the sole cause, rather a number of factors responsible for heart disease; among them, stress, hypertension, heredity, diabetes mellitus, smoking, lack of exercise and obesity etc.

Advice- Egg supplies well balanced nutrition, poultry meat contains low fat than red meat, so it can not be endangered. Countries with the highest life span (above 70 yrs) such as, Denmark (400 eggs/year), Sweden, Norway, Japan, Israel and Switzerland are noted for their per capita high egg consumption. Hence, poultry products must not be eliminated from the diet. Rather, a well-planed diet, along with exercise and a minimum of mental stress provides the best prevention against heart disease.