

# Poultry Nutrition

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## First lecture

The poultry industry has advanced remarkably over the past 50 years. In particular, poultry meat production has been the most successful than any in the animal industry. Production standards of broilers and layers have continually improved over this period, with contemporary male broilers currently reaching a live weight of 2.5 kg at 33 – 35 days of age, and white egg layers capable of producing 330 eggs in 52 weeks of lay. Over this period, the body weight of broilers at 42 days has increased by 25 – 50 g per year and the feed conversion ratio to 2 kg body weight has improved 2 – 3 points annually. Genetic selection is responsible for 85 – 90% of the improvements in broiler growth, and advances in nutritional management have provided only 10 – 15% of the changes. Researchers compared the performance of the 1957 broiler strain to that of 2001, which were fed their representative diets, the birds from the 2001 genetic strain were 4.96 times heavier than those from the 1957 strain and averaged 8% more breast meat yield.

The necessity to achieve and sustain these improvements in genetic potential was the driving force behind recent advances in poultry nutrition, and there had been continuous improvements in the nutrition and feeding practices of commercial poultry.

For commercial poultry farming, feed serves as **the largest cost of the operation** (around 60-70%). Thus the nutrition gains more consideration than other factors. The use of new technologies to improve this section is in great demand to achieve least cost of the efficient feed to higher performance with fewer prices.

Although broilers are highly efficient among farm animals in converting feed to food products, they still excrete significant amounts of unutilized nutrients. For example, broilers lose almost 25 – 30% of ingested dry matter, 20 – 25% of gross energy, 30 – 50% of nitrogen and 45 – 55% of phosphorus intake in the manure. Much of this inefficiency results from nutrient over-formulation and inherent limitations in the digestion and utilization of nutrients.

Over the last 20 years, developments in poultry nutrition have paralleled and increased productivity of the various poultry industries. **As production conditions and goals have changed**, we have been able to revise our estimates of nutrient requirements. The **‘global’ recommendations are now often not applicable**.

### *General definition of poultry nutrition:*

Nutrition is an action of supporting body tissues with required nutrients included in the feed to support **growth, egg production, reproduction, movement, feed intake, digestion, and absorption of nutrients in the feed** also **transportation of those nutrients to the cell** sufficiently.

**Poultry feed:** Is food for farm poultry, including chickens, ducks, geese and other domestic birds. Feed for poultry mostly consists of grain. A portion of commercial feed, typically around a quarter, is known as bulk and is indigestible.

There are around 40 nutrients necessary to be included in the diet of poultry by adequate and balanced levels allowing the genetic potency to represent as growth and production.

For the bird to grow normally and to gain weight efficiently, the amount that it eats in one day must contain enough energy and protein for **body maintenance, growth, and production**. When nutrients inefficient some syndromes appear interacted with some diseases syndrome, thus a wrong idea given to the producer about the problem facing the flock. The producer or the veterinarian expects that the problem relate to microbial or viral infection or it is a disease problem. When the inefficiency is partial and interacts with some diseases the diagnoses will be difficult attribute to malnutrition or infections or toxicity.

**The feed must remain clean and dry**, contaminated feed can infect poultry. Damp feed encourages fungus growth. **Mycotoxin poisoning**, as an example, is "one of the most common and certainly most under-reported causes of toxicoses in poultry". Diseases can be avoided with proper maintenance of the feed and feeder

The nutritionist must select a feed mix that provides the energy and protein balance needed for the particular stage of the bird. The feed mix requires at least six different grain types in the diet formula in order to get the best protein level and quality (i.e. balance of essential amino acids). The feed (grain) mixes do not provide enough vitamins and minerals for top performance, so its essential to provide the feed mixture with additional sources of those nutrients.

All grains are low in calcium (0.01- 0.20%) and sodium (20-600 ppm) Or (0.02 - .6 %). Phosphorous, copper, zinc, manganese, and selenium are also low in some grains. The vitamin concentrations in seeds are highly variable (why?). Seeds do not contain vitamin A (corn provides carotenoids), or vitamin D. Vitamin E and vitamin K levels are low to undetectable. Among the B vitamins riboflavin, niacin, and pantothenic acid are often low and vitamin B12 is not present. This means that the vitamins, minerals and trace elements lacking in the grain must given to the birds in some form or other.

### **Relation of poultry nutrition to other animal science**

Poultry nutrition is an integral part of poultry production. It has changed drastically as a consequence of developments in the other disciplines (فرع من المعرفة) of animal science and also because of changes in poultry husbandry practices. Developments in disciplines have been so strongly related to one another. For instance, **poultry have been bred to have an increased production, but the expression of this enhanced genetic potential was only possible by continuous adjustment of nutrition to the genotype of the bird**. On the other hand, developments in poultry properties have led to research on possible changes in nutritional needs with regard to these developments.

Similar connections can be made between nutrition and **housing** and between nutrition and **developments in preventive medicine**. In addition, developments in the nutritional sciences and related technologies have revealed insight in nutritional values and also in properties of many new agricultural products and by-products of the food industry.

**Table 1. Changes in poultry production in the Netherlands in the two last decades of Feed efficiency is feed/gain for broilers and feed/egg mass for layers.**

<b>Broilers</b>			
	<b>Weight (g)</b>	<b>Feed (kg)</b>	<b>Feed/efficiency</b>
1980	1700	3.2	1.88
1990	2000	3.4	1.70
2000	2300	3.5	1.50
<b>Layers</b>			
1980	-	-	2.50
1990	-	-	2.20
2000	-	-	2.05

### Steps of feed chain in the body

Steps of feed chain in the body started from the **consumption, digestion, absorption** and the last step is **transportation**.

### Comparison between the poultry and ruminant:

General comparison between birds and other animals

<b>birds</b>	<b>Other animals</b>
High activity and movements	Lower than the birds
More sensitive to the exposure to environment	They are less
Short life and production cycle	Longer life and production cycle

**Nutrient requirements of poultry is higher than the ruminant because of the:**

1. Raped growth,
2. Higher feed conversion,
3. Higher rate of respiration and heart pulse and
4. Higher body temperature.

The diet of birds should be:

1. In small amount,
2. Concentrated,
3. Easy to digest and
4. High in feeding value

These are important because:

1. the bird hasn't teeth and the grinding of the feed particles happen in the gizzard,
2. the gastro intestinal tract (GIT) small with small capacity,
3. the feed pass quickly through the GIT (3-8h) and
4. the time of diet exposure to the GIT secrets (Hcl, bile salt and enzymes) is too short.

The digestion in ruminants is mechanical, microbial and enzymatic but in birds is enzymatic only therefore the diet should be composed mainly from concentrated form with low fiber content.

## **Classification of poultry diet:**

### **1- Maintenance ration**

For maintain the body heat to the rate that sufficient to the basic voluntary muscles movements (movement and walking) and involuntary muscle movements (heart. Respiratory system and GIT).

### **2- Production ration**

A part of the feed to support the body with essential nutrients required for production of meat and egg.

The quantity of feed, and the nutritional requirements of the bird, depends on the weight and the age of the poultry as well as the environment.

## **Feed formulation depends on many factors which are:**

- 1- Specification of each feed ingredient
- 2- Its effects on the final product of the bird (meat and egg)
- 3- Rate of the utilization from nutrients included in the feed ingredient

For each species, the NRC includes suggested requirements for 14 Amino acids, 12 minerals, 13 vitamins and one fatty acid.

These days it was been possible to achieve the true and efficient levels of each nutrient through many scientific institutes such as NRC and others.

## **References:**

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