Nutritional Disorders in Poultry

Nutritional disorders in poultry may be evaluated in 3 groups

1- Resulted from feedstuffs

*Physical form of feeds
*Antinutrional factors in feeds
*Microbial contamination of feeds

2- Resulted from composition of the diet
* Energy or nutrient surplus or deficiencies

3- Resulted from more than one nutrient surplus or deficiencies or another factors

1- Disorders resulted from Feeds

- A- Disorders resulted from physical form of the feeds:
- Cereal proteins, known as gluten, disperse starch molecules. If cereals, (especially wheat that is rich in gluten) are grinded too much (fine feed) and glutens combine with water it will make a mass, like concurements, around the beak and under the lingue of the bird. This mass make difficult to intake feed or water for the bird.
- Fine wheat meal should not be used in poultry diets.
- Too much grit, and fine or fibrous feed consumption results in ingestion in stomach, softness or hardness in gizzard. Fibrous-bony feeds leads to perforation in the crop

B-Disorders related to antinutritional factors in feedstuffs

- **Rye:** Ergotamine increases blood pressure by occuring arterial contraction
- **Milo**: tannin decrease feed consumption, depress in growth and constipation
- **Barley:** Barley contain 4-8 % β-glucan. The main problem of these β-glucans is the bird's inability to digest the structure, resulting in the formation of a more viscous digesta. This increased viscosity slows the rate of mixing with digestive enzymes and also adversely affects the transport of digested nutrients to the absorbtive mucosal surface. Adding synthetic **β-glucanase enzymes** to diets containing more than 15-20% barley seems to resolve many of these problems.

- **Vicia:** Vicine or vicianine, glucoside with cyanic acid
- **Soybean Meal:** Soybeans contain a number of toxins for poultry, the most problematic being trypsin inhibitor. The trypsin inhibitors will disrupt protein digestion and their presence is characyerized by compensatory hypertrophy of the pancreas. Apart from reduced growth rate and egg production, presence of inhibitors diagnosed by a 50-100% increase in size of pancreas. Heat treatment at 110-120C is adequate to destroy trypsin inhibitor and other toxins such as hemaglutinins, urease, guatrogenic, anticoagulan, allergic and ostrogenic substances. Heat sensitivity characteristics of urease similar to those of trypsin inhibitors and urease levels are much easier to measure. Residual urease in soybean meal has therefore become standard in quality control programs.
- Urease is assesses in terms of change in pH during assay, where acceptance values range between 0.05- and 0.15.

- Cottonseed meal: Cottonseed contains gossypol being a yellow polyphenolic pigment. In most meals, the gossypol content will be around 1%, although 0.1% will be free gossypol. The remaining bound gossypol is fairly inert, although binding can have occured with lysine during processing, making both the gossypol and lysine unavailable to the bird. Characteristically the gossypol causes a green-brown-black discolorisation in the yolk depending upon gossypol level and duration of egg storage. Gossypol will also depress growth by impeding vitamin A, Ca, Fe and amino acid utilisation.

- Gossypol does complex with iron, and this activity can be used to effectively detoxfy the meal. Adding iron at a 1:1 ration in relation to free gossypol greatly increases the dietary inclusion rate possible in broiler diet.

- Canola meal: While canola was derived from varieties of rapeseed, its composition has been altered through genetic selection. The level of goitrogens and eurisic acid, two of the more detrimental constituents of the original rapeseed cultivars, have been markedly reduced. Euricic acid levels are now negligible. Canola still has enough goitrogen activity to result in measurable increase in thyroid weight, although this does not appear to be a problem affecting performance of poultry. The tannin and sinapine levels in canola can also be relatively high.
- There are several reports which suggest that increased leg problems resulting from feeding canola may be due to its having a different minearl balance than soybean meal. Canola is also high in phytic acid and so the high level of this compound may be sequestering zinc and this affects bone development. There have been reports suggesting that high levels of sulfur in canola meal may be responsible for some of the leg problems and reduced feed intake

- Flaxseed (Linseed) meal:Flaxseed contains a number of antinutrients including mucilage, trypsin inhibitor, cyanogenic glycosides and phytic acid. Mucilage contributes to more viscous excreta.

C- Disorders resulted from the feeds contaminated by microorganism

- Feeds may be contaminated by microorganism
- in the field,
- harvesting
- storage
- İn the plant

Mould : < 1000 /g of feed

Bacteria: < 10.000/g of feed

Microorganism in feeds or their toxins may cause diseases

There are two important diseases resulted from microorganism in feeds: Candidiasis and Mycotoxicosis

1- Candidiasis

Candida albicans, found normally in intestinal flora, will cause this disease

- Candida albicans don't transfer by contact from animal to animal. Generally it is spread by drinking water and feed.
- No treatment has been shown to be universally effective in controlling this disease.
- Gentian violet, administared in the feed at a concentration of 8 ppm suppress the growth of C. albicans
- Preventative measures include cleanliness and disinfection of all environments. Well ventilating housing to avoid moist litter assists in avoiding candidiasis.
- Antibiotic terapy should be discontinued if candidiasis is observed. Long term antibiotic therapy leads to colonization

2-Mycotoxicosis

- Mycotoxicoses are defined as those intoxicants that result in animals from the consumption of feedstuffs contaminated by one or more poisons of fungal origin.
- These fungal poisons are collectively referred to as mycotoxins.
- The most common toxins produced by mold are aflatoxin (Aspergillus flavus, Aspergillus parasiticus) , ocratoxin (Aspergillus ochraceus), T-2 toxin - tricotescene - (Fsarium tricinctum), F-2 toxin - zearalenon - (Fusarium roseum) and sitrinin (Penicillum citrinin).

Aflatoxin

- Produced by *Aspergillus flavus* mold, aflatoxin is one of the most potent carsinogens known.
- Present in cereals in ppb levels, acute toxicity will occur at 1.2 ppm.
- Aflatoxin B1 is the most common form of the toxin – the toxin produce a blue color when exposed to ultraviolet light.
- According to feed law the highest level of aflatoxin in compound feed must be 50 ppb (0.05mg/kg) and 20 ppb (0.02mg/kg) in poultry feed.
- Aflatoxin is found in most cereals-corn and milo, some meal such as groundnut meal, cottonseed meal, soybeanmeal are the most common hosts.

- Aspergilus growth, as with any mold, is greatly reduced when corn or milo moisture levels are less than 15%.
- Symptoms change according to dose and duration of aflatoxin consumed.
- Death is inevitable in acute conditions. In chronic conditions mortality rate is not high. There seems to be retardation of growth, reduction in feed efficiency and egg production, thickness in egg shell, decrease in egg pigmentation, accumulation of fat in liver and cancer.

- Aflatoxin is a potent hepatotoxin, and so varying degrees of liver breakdown occur.
- As toxicity develops, normal liver function declines and reduced growth rate is quickly followed by death.
- There also seems to be a nutrient interaction, because toxicity is more severe when diets are low in either CP or methionine, riboflavin, folic acid or Vitamin D3.

- There is no treatment for acute aflatoxicosis
- There are a number of effective preventative measures
- Firstly, feeds contaminated with aflatoxin must be changed. New feeds should have higher energy and protein level as well as fat solubles vitamins.
- Adding toxin binding agents to the feeds seems to reduce the adverse effect of aflatoxins.
- There are some toxin binders:
- *Aluminosilicates (10-15kg/tonne of hydrated Na-Ca aluminosilicate)
- *Bentonite clays
- *Yeast cell walls

2. Disorders resulted from energy and nutrient surplus or deficiencies

- -**Energy deficiency:** As the energy decrease in the diet, birds consume more feed to meet their enegy requirements.
- As long as energy levels meet the maintanence of bird:
- It is seen only depression in growth, reduction fat reserve in the body. But,
- İf the energy levels too low to meet maintanence of bird then it is observed;
- -Weight loss will occure.
- _Bird will use glucogen in its body after then use its fat reserves and protein to meet energy requirement. As a result of this it is inavitable that bird will Die

- **Energy Surplus:** As the energy levels increases the bird reduces its feed intake
- As long as the balance between energy and protein is stay stable and the diet contain enough vitamin and mineral_____no problem on the health or performance of the bird.
- Only energy levels increase but not other nutrients:
- Decreased feed intake consequently less protein consumption____Decreased growth and production

  Increased fat reserves

  Specific disorders related to vitamin or mineral deficieny.

- **Nutrient Deficiency**
- **Water: Water consumption twofold or threefold of feed intake**
- **Water Deficiency: Reduced digestibility of the feed.**
- **During the long term deficiency:**

  Nephroz
  Polisitemi
  Dried skin and other dehydration symptoms
  Reduced egg size and shell weight
  Depressed growth rate and feed efficiency

Water Surplus: is not common in practice.

Pendulous crop: it is oAflatoxin is found in most cereals-corn and milo are the most common hosts.

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ccure because of too much water intake during long term hot weather. The crop is enlarged and pendulous and the contents are not impacted, digestion of the feed reduces, because of inflamation in the lungs mortality reaches 50%.

It has been suggested that there is a genetic predisposition to the condition in some birds.

- **Carbohydrate:** No specific disorder
- **Lipids:**
- Fats and Oils: Energy sources in the body. Sufficient energy level in diet encouregе egg production, hatchability and feed efficiency
- **Insufficiency of Esential fatty acids:**

  Linoleic, linolenic and arachidonic acids are essential for poultry. Minimum linoleic acid level is 1% for chicken and laying hen and 2% for breeder diets.
- Deppressed in growth in chicks. Vegetable oils are a good sources of linoleic acid.
- In chickens fed diet insufficient in essential fatty acid

  mortality rate will high within 10-12 weeks,

  In laying hens, egg production, egg size and hatchability decrease, embrionic mortality and susceptibility to the respiratory diseases will increase. Liver will also grow and fat accumulation increase.

- **Rancidity in Lipids:** Hydrolytic or oxidative rancidity will occure in fats or oils. Rancidity also leads to destruction in fat soluble vitamins.
- Symptoms:
- Feed refusal
- Growth depression in the chicks
- Weakness
- Anemia
- Difficulty in walking-moving (peguin walking)
- Mortality reaches 50 %
- Determine: Peroxide count: 3-5mEq/kg in poultry feed. 6-10mEq/kg acceptable

  Higher than 10mEq/kg not acceptable

  20mEq/kg in feedgrade
- Rancidity in lipids can be prevent by adding antioxidan to the feeds.

- Wet Litter:
- It is occure especially during winter and fall.
- **Causes and Symptoms are very complex**
- **There appears asites, diharhoe decrease in productivity, fatty liver as well as wet litter.**
- **Causes: Rancid fat or oils**
- **Any factor that increases water consumption will increase the likelihood of wet litter**
- **Drinking water quality**
- **Mineral level of feed (Na, K, Mg)**
- **Protein in excess,leads to increased water intake to allow the excreation of higher uric acid levels.**
- **Symptoms**
- **Wet litter, diarrhoea, asites, degeneration in the liver**

- Protein:
- All essential amino acids must be included and balanced in the diet. Protein quality is important as well as protein quantity in poultry diet.
- Protein quality is related to digestibility and amino acid content of protein.
- **Protein Deficiency:** Both quantity and quality of protein is important. In protein defficincy:
- Growth depression, weight loss, small egg size, decrease in egg production and hatchability, increased fat reserves in the body from excessive energy and amino acids (Because they can not be used for production).
- **Protein Surplus:** slightly decrease in fat reserves and growth rate, increase in blood uric acid. Excessive water intake to excreate uric acid from body