

BIHAR ANIMAL SCIENCES UNIVERSITY

BIHAR VETERINARY COLLEGE, PATNA

Department of Animal Nutrition

ANN-606

UNIT-I (NON-RUMINANT NUTRITION)

Lecture on

Nutrient requirements in Poultry & Swine

Dr. Kaushalendra Kumar

Assistant Professor, Animal Nutrition, BVC, BASU, Patna

PG Lecture: 1

Point to be discuss.....

- **Nutrients and their requirement for various categories of chicken.**
- **Nutrients requirements for swine.**
- **Different factors influencing nutrient requirements.**

NUTRIENT REQUIREMENTS IN POULTRY

- Nutrient requirements are the **amount of nutrients** required by poultry to **support normal function**.
- Requirements may be expressed in **quantities of nutrients** or **in dietary proportions**.
- Quantitative descriptions of the amounts of nutrients required for poultry have been provided by **various agencies or organizations** such as;
 - ✓ In India we usually follow **BIS specification**.
 - ✓ In USA and in many other nations **NRC specifications** is followed.
 - ✓ However certain **commercial poultry farms follow their own standards**.

Nutrient requirements for poultry as per Bureau of Indian Standard (BIS)-2007

	Broiler Feed (0-6 wks)			Layer Feed					
Nutrient	Pre-Starter (0-7 days)	Starter (8-21 days)	Finisher (22-42 days)	Chicks (0-8 wk)	Grower (9-20wk)	Layer Phase-1 (21-45wk)	Layer Phase-II (46-72wk)	Broiler Breeder male (23wk onward)	Layer Breeder male (23wk onward)
Moisture max %	11	11	11	11	11	11	11	11	11
ME (kcal/kg)	3000	3100	3200	2800	2500	2600	2400	2750	2600
CP min %	23	22	20	20	16	18	16	15	16
Ether Extract min %	3	3.5	4	2	2	2	2	2.5	2
Crude fibre max %	5	5	5	7	9	9	10	9	9
AIA max %	2.5	2.5	2.5	4	4	4	4.5	4	2.5
Salt as (NaCl) Max %	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

Cont...

	Broiler Feed (0-6 wks)			Layer Feed					
Nutrient	Pre-Starter (0-7 days)	Starter (8-21 days)	Finisher (22-42 days)	Chicks (0-8 wk)	Grower (9-20wk)	Layer Phase-1 (21-45wk)	Layer Phase-II (46-72wk)	Broiler Breeder male (23wk onward)	Layer Breeder male (23wk onward)
Calcium min %	1	1	1	1	1	3	3.5	1	1
Total Phosphorus min %	0.7	0.7	0.7	0.7	0.65	0.65	0.65	0.7	0.6
Available Phosphorus min %	0.45	0.45	0.45	0.45	0.40	0.40	0.40	0.40	0.40
Lysine min %	1.3	1.2	1	1	0.7	0.7	0.65	0.8	0.8
Methionine min %	0.5	0.5	0.45	0.40	0.35	0.35	0.30	0.4	0.4
Meth + Cystine min %	0.9	0.9	0.85	0.7	0.6	0.6	0.55	0.7	0.6
Aflatoxin B1 max (ppb)	20	20	20	20	20	20	20	20	20
Linoleic acid min %	1.1	1.1	1.1	1	1	1	1	1	1

EGG PRODUCTION

- Good flocks of layer produce about **250 eggs per bird per year** (i.e. 70% production).
- Their eggs weigh on **average 57 g**.
- Birds start laying at around **20-21 weeks of age & continue for 52 weeks** but **laying fewer eggs near the moulting period**.
- The typical **production cycle lasts about 17 months (72 weeks)**.
- On average a bird produces one egg per day.
- Not all birds start to lay exactly when they are 21 weeks old.
- In **temperate climates birds can produce 250 - 300 eggs per year**.

Energy Required per Hen per Day by Chickens in Relation to Body Weight and Egg Production (kcal), NRC

Body Weight (kg)	Rate of Egg Production (%)					
	0	50	60	70	80	90
1.0	130	192	205	217	229	242
1.5	177	239	251	264	276	289
2.0	218	280	292	305	317	330
2.5	259	321	333	346	358	371
3.0	296	358	370	383	395	408

NUTRIENT REQUIREMENTS IN SWINE

Swine / Pigs require many nutrients for their maintenance, growth and production.

Carbohydrate Requirement

- ❖ Pigs can utilize **crude fibre to a lower extent**.
- ❖ The utilization of fibre by the pigs **depends on the age of and weight of pigs and characteristic of non-fibrous portion of the ration**.
- ❖ For growing and finishing pigs **5-6% crude fibre level** in their diet is recommended.
- ❖ In sows, **10-12% level of CF** in diet can be well tolerated.

Fat Requirement

- ❖ When **high fat diets** are fed to pigs there is **deposition of excessive fat** inside the body.
- ❖ If feed contains **higher concentration of short chained fatty acids** (ex. Soybean and groundnut) there is a production of **soft pork** which is not desirable.
- ❖ Pigs fed on rations **containing 0.5% fat**, make a **satisfactory gain** and stores **normal amount of body fat**.
- ❖ However, the practical level of **fat inclusion** is higher than this **i.e. about 4%**.

Protein Requirement

- In Swine/Pig feeding it is important to provide **good quality protein** in the ration.
- All **essential amino acids** should be present in right quantity and proper balance.
- Even if one essential amino acid is **lacking or is in excess** it will cause marked **reduction in the feed intake** which will affect the **growth and production**
- A **combination of animal and vegetable protein** in a pig's diet will provide **all essential amino acids in proper proportion**.

Nutrient Requirement in Swine as per BIS (Bureau of Indian Standard)

Nutrients	Requirement		
	Starter/Creep feed	Growth meal	Finishing / Breeding meal
Moisture content (Max %)	11.0	11.0	11.0
Crude protein (Min %)	20.0	18.0	16.0
Crude fat (Min %)	2.0	2.0	2.0
Crude fibre (Max %)	5.0	6.0	8.0
Total ash (Max %)	8.0	8.0	8.0
Acid insoluble ash (Max %)	4.0	4.0	4.0
Metabolizable energy (Kcal/kg), Min	3360	3170	3170

Protein requirements of pigs express as % in the feed

S. No.	Class of Pig	% of protein in diet
1.	Pigs - preweaning/creep feed	18-22
2.	Weaned pigs	16
3.	Growing pigs '45 kg BW'	14
4.	Breed gilts	15
5.	Sows	14
6.	Breeding boars	14
7.	Lactating sow	15

Mineral Requirements

- If swine is fed on concentrates alone calcium is more likely to be deficient and if fed only on pasture, phosphorus deficiency results.
- The recommended **calcium and phosphorus levels** for swine diet are as ;

Category of pig	Weight	Ca %	P %
Growing & Fattening Pigs	(5-10 kg)	0.80	0.60
	(10-45kg)	0.65	0.50
	(45-90 kg)	0.50	0.40
Gilts & Sow bred		0.75	0.50
Lactating Sows		0.60	0.40

- ❖ In practical swine ration it is routine practice to **add 0.5-1% limestone and 0.5% di-calcium phosphate/bone meal.**
- ❖ As per the NRC **0.5% common salt is recommended** in rations of all classes and ages of pigs.
- ❖ **Iodine need of pig is 0.2 mg/kg diet** which should be supplied in the form of iodised salt.
- ❖ Requirement of **copper is 6mg/kg diet.**
- ❖ Requirement for **Manganese is 10mg/kg diet.**
- ❖ Requirement for **zinc is 50mg/kg diet.**

Vitamin Requirements

- ❖ **Vitamin K is synthesized in the intestine of the pigs by micro-organisms** in adequate amount and hence has no practical importance.
- ❖ **Deficiency of B-complex** may occurs under practical conditions in pigs raised on feeds like cereal grains without much inclusion of green forage.
- ❖ **Liberal supply of good quality legume fodder hay, dairy products will take care of vitamins of B-series.**
- ❖ **Vitamin C is synthesized in the body and hence not of practical importance.**

Piglet anaemia “Thumps”

- Seen in piglets, **housed in concrete floors** under intensive farming system.
- Anaemic piglets are listless and flabby with **wrinkled skin and unhealthy looking hair coat**.
- At birth, piglets contains 50 mg iron and daily requirement is 7 mg & about 1 mg is supplied in daily sow milk consumed by the piglet.
- So, deficit of 6mg/day will exhaust the body stores within a week if iron is not provided.
- This condition can be prevented by giving iron orally or by injections.
- Iron dextrose 100 mg on third day of birth followed by 50 mg on 21 day prevents anaemia.
- **Painting the udder of the sow with a pate of ferrous sulphate causes intake of iron when the piglet suckles its mother and helps prevent thumps.**

Creep Ration

- The practice of self feeding of concentrates to young ones away from their mother is called as "Creep Feeding".
- It is usually given in a separate enclosure which the sow cannot access.
- In pigs, it is given from second week of age.
- Creep feed should contain 19-20% CP and 3360 kcal/kg of ME.
- Major portion of creep feed should be of animal origin.
- The feed should contain appropriate quantity of vitamins and minerals.
- It should contain low crude fibre.
- Dry creep feed are called as pre-starter feed.

Creep feed

S. No.	Ingredients	Parts
1.	Ground Yellow maize	40
2.	Skim milk	10
3.	Ground nut oil cake	10
4.	Sesame oil cake	10
5.	Wheat bran	10
6.	Molasses or jaggery	10
7.	Fish meal	6
8.	Brewers yeast	2
9.	Mineral mixture	2

Supplemented with vitamin mixture at the rate of 10 gm/100 kg feed

NUTRIENT REQUIREMENT IN SWINE AS PER NATIONAL RESEARCH COUNCIL (NRC)

Nutrient requirement of Growing pigs

	Body Weight (kg)					
	3–5	5–10	10–20	20–50	50–80	80–120
Average weight in range (kg)	4	7.5	15	35	65	100
DE content of diet (kcal/kg)	3,400	3,400	3,400	3,400	3,400	3,400
ME content of diet (kcal/kg)	3,265	3,265	3,265	3,265	3,265	3,265
Estimated feed intake (g/day)	250	500	1,000	1,855	2,575	3,075
Crude protein (%)	26.0	23.7	20.9	18.0	15.5	13.2

Requirement of Barrows and Gilts

Body weight range	50–80 kg Body Weight					
Lean gain (g/day)	300	300	325	325	350	350
Gender	Barrow	Gilt	Barrow	Gilt	Barrow	Gilt
Average weight in range (kg)	65	65	65	65	65	65
DE content of diet (kcal/kg)	3,400	3,400	3,400	3,400	3,400	3,400
ME content of diet (kcal/kg)	3,265	3,265	3,265	3,265	3,265	3,265
Estimated feed intake (g/day)	2,750	2,400	2,755	2,400	2,755	2,400
Crude protein (%)	14.2	15.5	14.9	16.3	15.6	17.1

Cont...

Body weight range	80–120 kg Body Weight					
Lean gain (g/day)	300	300	325	325	350	350
Gender	Barrow	Gilt	Barrow	Gilt	Barrow	Gilt
Average weight in range (kg)	100	100	100	100	100	100
DE content of diet (kcal/kg)	3,400	3,400	3,400	3,400	3,400	3,400
ME content of diet (kcal/kg)	3,265	3,265	3,265	3,265	3,265	3,265
Estimated feed intake (g/day)	3,280	2,865	3,280	2,865	3,280	2,865
Crude protein (%)	12.2	13.2	12.7	13.8	13.2	14.4

Nutrient requirement of Gestating sows

	Body Weight at Breeding (kg)					
	125	150	175	200	200	200
	Gestation Weight Gain (kg)					
	55	45	40	35	30	35
	Anticipated Pigs in Litter					
	11	12	12	12	12	14
DE content of diet (kcal/kg)	3,400	3,400	3,400	3,400	3,400	3,400
ME content of diet (kcal/kg)	3,265	3,265	3,265	3,265	3,265	3,265
Estimated feed intake (kg/day)	1.96	1.84	1.88	1.92	1.80	1.85
Crude protein (%)	12.9	12.8	12.4	12.0	12.1	12.4

Nutrient requirement of Lactating sows

	Sow Postfarrowing Weight (kg)					
	175	175	175	175	175	175
	Anticipated Lactational Weight Change (kg)					
	0	0	0	-10	-10	-10
	Daily Weight Gain of Pigs (g)					
	150	200	250	150	200	250
DE content of diet (kcal/kg)	3,400	3,400	3,400	3,400	3,400	3,400
ME content of diet (kcal/kg)	3,265	3,265	3,265	3,265	3,265	3,265
Estimated feed intake (kg/day)	4.31	5.35	6.40	3.56	4.61	5.66
Crude protein (%)	16.3	17.5	18.4	17.2	18.5	19.2

Factors affecting the Nutrient Requirements

- **Genetics**- species, breed or strain of bird and swine
- **Age** - body weight and the stage of maturity.
- **Sex** - sexes have only small differences in their nutrient requirements.
- **Reproductive state** - level of egg production in hens & sexual activity in males.
- **Ambient temperature** - increased energy requirements to maintain normal body temperature in cold temperatures and the opposite in hot conditions.
- **Housing system** - housing system will influence the activity level and therefore their energy requirements.
- **Health status** - disease conditions require an increase intake of some nutrients, commonly vitamins.

Discussions.....

Questions, if any.....??

THANKS