Unit 6

Feeding of Laboratory & wild animals and Metabolic Disorders

1. Feeding Practices for Swine
2. Feeding Practices for poultry
3. Feeding Practices for laboratory animals
4. Metabolic Disorder & symptom

1. Feeding Practices for swine

- VFA- 35-45% maintenance requirements (60% in ruminants)
- Crude Fibre- growing- 6-7% and 10-12% adult pig.
- Feed efficiency- 30-40% , Best feed efficiency
- ME = 0.96 DE
- 1st limiting AA- lysine
- Essential amino acid in pigs: 9
- Iron dextran injection (i/m) = on 4th and 14th day of age to prevent piglet anemia.
- FeSO- 42% of feed

Feeding of piglets:

1. Colostrum feeding
   - first milk and an essential source of energy, nutrients & immunity
   - It is important to maximize colostrum intake in the first six hours after birth (**150-280 ml/kg of birth BW**)
2. Milk replacer:
   - **extra nutrients** and energy
   - higher quality and easily digestible

Creep feed:

- **sucking piglets** for faster growth
- introduced at **7-14 days** of age and are fed till weaning.
- Piglets fed on creep ration attain **12-15 kg body weight at 8 weeks** of age.
- creep feed is generally mixed with **ferrous sulfate at the ratio of 9:1 to prevent anemia**.
- Composition of creep feed (BIS, 1986): **CP, min = 20%** and ME (kcal/kg), min = 3265

Grower ration:

- **18% CP** and 3170 kcal/kg ME value.

Finisher/breeder ration:

- contain **16% CP** and 3170 kcal/kg ME value.

Feeding of pregnant sow:

16% CP and 3000 kcal/kg ME value with 0.7% lysine.

Feeding of lactating sows:

2.0 kg of meal with 200g meal per piglet

1. Crude protein percentage of growing/ finishing ration is **JKPSC - 2019**

(A) 10-12
(B) 14-16
(C) 18-20
(D) None of the above

2. Which one of the amino acids is of greater practical importance in the diet of swine? RPSC 2019

(1) Leucine

(2) Lysine
(3) Cystine
(4) Methionine

3. A practical way to supplement iron and copper to the newborn piglets to prevent piglet anemia is RPSC 2019

(1) Giving injections of copper to newborn piglets.

(2) Giving injections of Vitamin E to newborn piglets.
(3) Painting the udder of sow with a thick solution of copper and iron sulphate.
(4) Allowing the newborn piglets to access soil

4. Pre starter broiler ration contain critical methionine: opsc 2018-19

(A) 3%

(B) 2%

(C) 1.2%

(D) None of the above

5. Where does fermentation primarily occur in pigs, which are hindgut fermenters?

a) Stomach

b) Caecum and Colon

c) Small intestine

d) Rumen

6. At what age should creep feed be introduced to piglets?

a) At birth

b) 7-14 days

c) 2 weeks

d) 8 weeks

7. What is the recommended crude protein (CP) content in a grower ration for pigs?

a) 16%

b) 18%

c) 20%

d) 14%

8. What injection should be given to piglets on the 4th and 14th day of age to prevent anemia?

a) Iron dextran injection

b) Vitamin D injection

c) Calcium supplement

d) Zinc sulfate injection

9. Which amino acid is the first limiting factor in pig growth and development?

a) Methionine

b) Arginine

c) Leucine

d) Lysine

10. What is the recommended weaning age for piglets in India?

a) 4 weeks

b) 6 weeks

c) 8 weeks

d) 10 weeks

2. Feeding Practices for poultry

Types of poultry feed
15 types of chicken feeds (BIS, 2007)

Bird type	Types of feed	Period
Broiler	Broiler pre – starter feed (BPSF)	**from 1 to 7 days.**
	Broiler starter feed (BSF)	**from 8 to 21 days.**
	Broiler finisher feed (BFF)	**from 22 to finish (42 days)**
Broiler breeder	Breeder chick for Broiler (BCFB)	from 0 to 4 weeks.
	Breeder grower Feed for Broiler (BGFB)	from 5 to 22 weeks
	Breeder layer feed for broiler (BLFB)	from 23 weeks onward.
	Breeder broiler feed for male (BBFM)	from 23 weeks onward.
Layers	Chick feed for layer (CFL)	from 0 to 8 weeks.
	Grower feed for layer (GFL)	from 9 to 20 weeks or until laying commences
	Layer Feed for Phase I (LFP-I)	from 21 weeks to 45 weeks
	Layer Feed for Phase II (LFP-II)	from 46 weeks to 72 weeks
Layer breeders	Chick feed for layer breeder (CFLB)	from 0 to 4 weeks
	Grower Feed for layer breeder (GFLB)	from 5 to 22 weeks
	Breeder layer feed (BLF)	from 23 weeks onward
	Breeder layer feed for male (BLFM)	from weeks 23 onward

Nutrients requirement in Broilers feeds as per BIS (2007)

Characteristic	Requirement for broiler feed		
	Pre-starter	Starter	Finisher
Moisture % by mass, Max.	11	11	11
CP % by mass, Min.	**23**	**22**	**20**
EE % by mass, Min.	3.0	3.5	4.0
CF % by mass, Max.	**5.0**	**5.0**	**5.0**
AIA % by mass, Max.	2.5	2.5	2.5
Salt (NaCl) % by mass, Max.	0.5	0.5	0.5
Ca % by mass, Min.	1.0	1.0	1.0
Total P % by mass, Min.	0.7	0.7	0.7
Available P % by mass, Min.	**0.45**	**0.45**	**0.45**
Lysine % by mass, Min.	1.3	1.2	1.0
Methionine % by mass, Min.	0.5	0.5	0.45
ME (kcal/kg), Min.	**3000**	**3100**	**3200**
Aflatoxin B_1 (ppb)	**20**	**20**	**20**

Nutrients requirement in Layer feeds as per BIS (2007)

Characteristic	Requirement for laying birds feed			
	Chick	Grower	Layer Phase I	Layer Phase II
Moisture % by mass, Max.	11	11	11	11
CP % by mass, Min.	**20**	**16**	**18**	**16**
EE % by mass, Min.	2.0	2.0	2.0	2.0
CF % by mass, Max.	7.0	9.0	9.0	10.0
AIA % by mass, Max.	4.0	4.0	4.0	4.5
Salt (NaCl) % by mass, Max.	0.5	0.5	0.5	0.5
Ca % by mass, Min.	**1.0**	**1.0**	**3.0**	**3.5**
Total P % by mass, Min.	0.65	0.65	0.65	0.65
Available P % by mass, Min.	0.40	0.40	0.40	0.40
Lysine % by mass, Min.	1.0	0.7	0.7	0.65
Methionine % by mass, Min.	0.40	0.35	0.35	0.30
ME (kcal/kg), Min.	**2800**	**2500**	**2600**	**2400**

Requirement of broiler breeder feeds as per BIS (2007)

Characteristic	Requirement for broiler breeder feed			
	Chick	Grower	Layer	Male
Moisture % by mass, Max.	11	11	11	11
CP % by mass, Min.	20	16	16	15
EE % by mass, Min.	2.5	2.5	2.5	2.5
CF % by mass, Max.	7.0	9.0	9.0	9.0
AIA % by mass, Max.	4.0	4.0	4.0	4.0
Salt (NaCl) % by mass, Max.	0.5	0.5	0.5	0.5
Ca % by mass, Min.	1.0	1.0	3.5	1.0
Total P % by mass, Min.	0.70	0.70	0.70	0.70
Available P % by mass, Min.	0.45	0.45	0.45	0.40
Lysine % by mass, Min.	1.0	0.8	0.85	0.80
Methionine % by mass, Min.	0.45	0.45	0.40	0.40
Metabolizable energy (kcal/kg), Min.	2800	2750	2800	2750

Requirement of layer breeder feeds as per BIS (2007)

Characteristic	Requirement for broiler breeder feed			
	Chick	Grower	Layer	Male
Moisture % by mass, Max.	11	11	11	11
CP % by mass, Min.	**20**	**16**	**17**	**16**
EE % by mass, Min.	2.0	2.0	2.0	2.0
CF % by mass, Max.	7.0	9.0	9.0	9.0
AIA % by mass, Max.	2.50	2.5	2.5	2.5
Salt (NaCl) % by mass, Max.	0.5	0.5	0.5	0.5
Ca % by mass, Min.	1.0	1.0	3.5	1.0
Total P % by mass, Min.	0.65	0.60	0.60	0.60
Available P % by mass, Min.	0.45	0.40	0.40	0.40
Lysine % by mass, Min.	0.95	0.70	0.70	0.80
Methionine % by mass, Min.	0.40	0.40	0.40	0.40
Metabolizable energy (kcal/kg), Min.	2800	2600	2600	2600

Nutrients requirements of poultry:

Energy requirement:

- Based on ME
- High-energy cereal grains are the principal energy sources.
- Fat at levels of 3-8% to increase dietary energy concentrations.

Protein requirement:

- Poultry requires the 11 essential AAs.
- Increase in Temp. = decrease in feed intake = increase in protein requirement
- Some AAs can be met by other AAs: Cystine = methionine, Tyrosine → phenylalanine, Glycine = Serine

1. Energy requirement (Kcal/Kg feed) in broiler finisher ration as per 815, 2007 is: PUNJAB 2016

a) 2800
b) 2900
c) 3100
d) 3200

2. Which of the following is not an essential amino acid for poultry: PUNJAB 2016

a) Arginine
b) Glycine
c) Valine
d) Glutamate

3. As per BIS (1992), CP and ME content of broiler starter feed should be **MPSC 2011**

(1) 20%, 2900 kcal/kg
(2) 23%, 2800 kcal/kg
(3) 20%, 2800 kcal/kg
(4) 23%, 2600 kcal/kg

4. Maximum level of inclusion of maize in poultry ration is RPSC 2019

(1) 50%

(2) 60%

(3) 70%

(4) 80%

5. What is the optimum Ca ratio for laying hens to support bone and shell formation?

a) 1:1

b) 1:1.2

c) 1:4

d) 1:2

6. What happens to poultry feed intake as environmental temperature increases?

a) It increases

b) It decreases

c) It remains constant

d) It fluctuates unpredictably

7. What is the recommended crude protein (CP) content in a pre-starter broiler feed?

a) 23%

b) 20%

c) 18%

d) 16%

8. Which vitamin deficiency can lead to slipped tendon disease in poultry?

a) Vitamin D

b) Vitamin A

c) Manganese

d) Vitamin C

9. What is the effect of light exposure on egg production in hens?

a) Decreases feed intake

b) Increases egg production

c) Decreases stimulation of the pituitary gland

d) Causes a decrease in body weight

10. At what age does egg production typically peak in laying hens?

a) 20-22 weeks

b) 28-30 weeks

c) 35-40 weeks

d) 60 weeks

Metabolic Diseases

1) Fatty liver
2) Ketosis
3) Acidosis (SARA)
4) Laminitis
5) Milk fever
6) Downer cow
7) Retained placenta
8) Bloat
9) Grass tetany
10) LDA
11) Udder edema

Fatty Liver

• Common metabolic disorder during transition period.

• Reason- Over conditioned animals during dry period (BCS>4.5)

• body fat is mobilized from adipose tissue into the bloodstream in the form of NEFA

• NEFA are taken by the liver, accumulate NEFA as triglycerides within the liver.

Preventatives for fatty liver

- Avoid excessive fattening
- **Glucogenic sub- glycerol, propylene glycol, monensin.**
- B-complex vitamins
- Vitamin E and selenium- as their antioxidant effects

Ketosis (Acetonemia)

- In dairy cows, ketosis is a lactation disorder usually associated with intense milk production and NEBAL (6-8 wk postpartum)
- An increase of "ketone bodies" in blood until they eventually begin to spill over into urine and (or) milk.
- Acetone, Acetoacetate, and β-Hydroxybutyrate
- Acetone: smell from breath

❑ Source of Ketones

1) From butyrate produced in the rumen and converted to beta-hydroxybutyrate by rumen mucosa during absorption
2) From metabolism in liver of LCFA primarily released from adipose tissue during energy deficit

1.Energy Deficit: Ketosis occurs during energy deficits (e.g., fasting, prolonged exercise, lactatic when glucose availability is low, prompting the body to utilize fat stores for energy.

2.Release of LCFAs: In energy deficits, hormone-sensitive lipase (HSL) in adipose tissue is activated, mobilizing stored triglycerides and releasing long-chain fatty acids (LCFAs) into the bloodstream.

3.Metabolism of LCFAs: Released LCFAs are transported to the liver and undergo β-oxidation ir mitochondria to produce acetyl-CoA. This acetyl-CoA can enter the tricarboxylic acid (TCA) cycle for energy or be diverted into ketogenesis.

4.Ketogenesis: When acetyl-CoA levels exceed the capacity of the Krebs cycle (due to low glucose), it is converted into ketone bodies (such as acetoacetate and β-hydroxybutyrate which are released into the bloodstream as alternative energy sources for tissues like the brain and muscles

- OAA is a key intermediate in the Krebs cycle and can be converted into aspartate through transamination reactions. Aspartate can subsequently be converted into glutamate, which is one of the most abundant neurotransmitters in the central nervous system.

Predisposing factors

- Glucose deficiency (NEBAL)- 60 to 85% of the available glucose drained as lactose in milk. Glucose demand exceeds gluconeogenesis in liver resulting in increased ketogenesis.
- Excessive fattening/ BCS- pre-partum
- Lactation demand- conducive to excess fat mobilization, which contributes to ketosis.
- Deficiency of ACTH- impaired gluconeogenesis
- Deficiency of OAA- Gluconeogenic
  - Inefficient utilization of mobilized FA- converted to ketones

Sign and symptoms

- Loss of appetite, refuse grain and eating only small amounts of roughage, acetone smell in breathe.
- A few affected cows will show nervous symptoms.
- Characterized by hypoglycemia- from a normal of 50 to 60 to as little as 25 mg/100 ml.
- Hyperketonemia- from a normal of less than 10 to as high as 50 mg/l00 ml blood
- Other frequently observed changes include increases in NEFA, decrease in liver glycogen and increases in liver lipid that can lead to liver damage.

Treatment

- Intravenous injection of glucose (50% dextrose)
- Intramuscular glucocorticoid (Isoflupredone)
- Gluconeogenic precursor- Sod. Propionate, glycerol, propylene glycol
- Supportive- vitamins

Ruminal Acidosis

high yielding cows with high grain ration.

Grain engorgement

Acidosis vs SARA

- Ruminal acidosis (pH<5.5)-
- SARA (pH<6)- excessive VFA production

Prevention

- Balancing the diet for starch and effective fibre.
- Avoid sudden changes of feed
- Roughages should be provided with grain/molasses.
- Buffers such as sodium bicarbonate also counteract acidosis

Milk fever/Parturient Paresis (hypocalcemia)

• An afebrile hypocalcemic disease in high producing animals when the demand of calcium for milk production exceeds the body's potential to mobilize calcium reserves.

Etiology:

• in older dairy cows (reduced ability to mobilize calcium from bone and in high milk producing breeds due to exhausted reserves)

• Lactation (usually first 72 hr postpartum)- Ca drain (10 mg/dl to 5 mg/dl)

• Parathyroid inactivity and dietary Ca supplementation during dry period

Clinical Signs

- Body temperature - subnormal (100-101oF)
- **Neck curved towards the flank**
- Occasionally, hyperexcitability

Prevention and treatment

- DCAD diet
- Restoration of Ca– half i/v and half s.c. in multiple sites - Retreat 8-12 hr later, if needed.
- Vit. D- 8 days before calving, s.c.

Downer cow syndrome/complex

- complication of periparturient hypocalcemia in cows that do not fully respond to calcium therapy and are unable to rise for >24 hr after initial recumbency.
- Develop a secondary recumbency from pressure damage to muscles and nerves.

Grass tetany/ Hypomagnesaemia

- Associated with early lactation grazing on lush green pastures
- Lush green pastures are deficient in Mg.
- Magnesium is essential for normal muscle function and nerve impulse transmission. A deficiency can lead to impaired muscle contractions and neuromuscular function.

- Tetanic or paretic type and subclinical types with depression of appetite and milk yield, slight nervousness, anemia.
- **Treatment-**
- Restoring normal Ca and Mg homeostasis and muscle relaxant
- 15-30 g of Mg supplement (MgO) per day

LDA

- Dislocation of abomasum to the left (LDA) or to right (RDA)
- Approx. 80-90% of incidences are LDA

  Most frequent in high producing cows in the first 4 weeks postpartum

- Low ruminal VFA absorption (papillae)- escape to abomasum, reduce abomasal motility, development of atony and onset of displaced abomasums.

Prevention-

- maintaining the forage to concentrate ratio
- Grain intake after calving should be increased slowly (0.25 kg/day)

1. In milk fever, body temperature of animal remains **Punjab 2023**

(a) Subnormal
(b) Elevated
(c) Highly elevated
(d) Normal

2. Ketosis occurs due to: **Punjab 2023**

(a) Positive energy balance in body
(b) Negative energy balance in body
(c) Positive protein balance in body
(d) None of the above

3. Eclampsia in dog is caused by deficiency of **Punjab 2023**

(a) Iron
(b) Phosphorus
(c) Calcium
(d) Copper

4. Basic biochemical defect in PPH **Punjab 2023**

(a) Hypocalcemia

(b) Hypoglycemia

(c) Hypophosphatemia

(d) None of the above

5. Following drug is specifically recommended in the treatment of post-parturient haemoglobinuria

Punjab 2023

(a) Calcium borogluconate

(b) 50% Dextrose

(c) Sodium acid phosphate

(d) 10% Magnesium sulphate

6. Lactic acidosis is caused by

(1) Accidental ingestion of large quantities of wheat grains

(2) Excessive intake of green fodder

(3) Excessive ingestion of dry fodder

(4) Excessive intake of Urea

7. Fatty liver disease is often associated with Punjab 2021

(A) Choline
(B) Niacin
(C) Thiamine
(D) Pyridoxine

8. Post parturient haemoglobinuria or Red Water Disease is basically caused due to acute deficiency of which mineral in the blood? **RPSC 2013**

(1) Copper
(2) Magnesium
(3) Phosphorus
(4) Calcium

9. Prepartum feeding of which of the following diets will significantly minimize the occurrence of parturient paresis in dairy cows? **MPPSC 2023**

[A] Negative DCAD diet
[B] High energy diet
[C] Positive DCAD diet
[D] Low roughage diet

10. Milk fever can be grouped as a disease of: **OPSC 2018-2019**

(A) Deficiency disease
(B) Infectious disease
(C) Metabolic disease
(D) Toxicological condition

Thank you