DISTURBANCES IN GROWTH

- Aplasia
- Hypoplasia
- Atrophy
- Hypertrophy
- Hyperplasia
- Metaplasia
- Anaplasia
- Dysplasia
- Model Questions
APLASIA/AGENESIS
Aplasia or agenesis is absence of any organ (Fig. 4.1).

HYPOPLASIA
Hypoplasia is failure of an organ/tissue to attain its full size (Fig. 4.1).

Etiology
- Congenital anomalies e.g. Hypoplasia of kidneys in calves.
- Inadequate innervation.
- Inadequate blood supply.
- Malnutrition
- Infections e.g. Cerebral hypoplasia in Bovine viral diarrhoea.

Macroscopic features
- Organ size, weight, volume reduced

Microscopic features
- Reduced size of cells
- Reduced number of cells
- Connective tissue and fat is more

ATROPHY
Atrophy is decrease in size of an organ that have reached their full size (Fig. 4.2 & 4.3).

Etiology
- Physiological e.g. Senile atrophy.
- Pressure atrophy
- Disuse atrophy e.g. Atrophy of immobilized legs.
- Endocrine atrophy e.g. Atrophy of testicles.
- Environmental pollution e.g. Atrophy of lymphoid organs.
- Inflammation/ fibrosis

Macroscopic features
- Size, weight, volume of organ decreased.
- Wrinkles in capsule of organ.

Microscopic features
- Size of cell is smaller.
- Cell number is less.
- Fat and connective tissue cells are more.

HYPERPLASIA
Hyperplasia is increase in number of cells leading to increase in size of organ/tissue (Fig. 4.5).

Macroscopic features
- Increase in size, weight of organ.
- Nodular enlargement of organ.

Microscopic features
- Increased number of cells.
- Displacement of adjacent tissue.
- Lumen of ducts/ tubules obstructed.

METAPLASIA
Metaplasia is defined as transformation of one type of cells to another type of cells (Fig. 4.6 & 4.7).
Fig. 4.1. Diagram showing Aplasia and Hypoplasia

Fig. 4.2. Photograph of spleen showing atrophy (c)

Fig. 4.3. Diagram showing atrophy (a) normal (b) decrease in size and (c) decrease in number of cells

Fig. 4.4. Diagram showing hypertrophy (a) Normal (b) Hypertrophy

Fig. 4.5. Diagram showing hyperplasia (a) Normal (b) hyperplasia

Fig. 4.6. Diagram showing Metaplasia

Fig. 4.7. Photograph showing Metaplasia

Fig. 4.8. Diagram showing anaplasia (a) Normal (b) Anaplastic cells

Fig. 4.9. Diagram showing dysplasia (a) Normal (b) Dysplasia
Etiology
- Prolonged irritation *e.g.* Gall stones cause metaplasia of columnar cells to stratified squamous epithelial cells in wall of gall bladder.
- Endocrine disturbances *e.g.* In dog columnar epithelium of prostate changes into squamous epithelium.
- Nutritional deficiency *e.g.* Nutritional roup. In poultry, cuboidal/columnar epithelium of esophageal glands changed into stratified squamous epithelium.
- Infections *e.g.* Pulmonary adenomatosis

**Macrosopic features**
- Mucous membrane becomes dry in squamous metaplasia.
- Presence of nodular glands on oesophageal mucous membrane due to vitamin A deficiency in chickens also known as “Nutritional roup”.

**Microscopic features**
- Change of one type of cells to another type.
- In place of columnar cells, there are squamous epithelial cells.
- In place of endothelial cells, cuboidal or columnar cells in alveoli giving it glandular shape. *e.g.* pulmonary adenomatosis.

**ANAPLASIA**

Anaplasia is defined as reversion of cells to a more embryonic and less differentiated type. It is a feature in neoplasia. Neoplasia is uncontrolled new growth, serves no useful purpose, have no orderly structural arrangement and is of undifferentiated or less differentiated in nature with more embryonic characters of the cells (Fig.4.8).

Etiology
- Chemicals
- Radiation
- Viruses *e.g.* Oncogenic Viruses.

**Macrosopic features**
- Enlargement of organ/ tissue.
- Nodular growth of tissue, hard to touch.

**Microscopic features**
- Presence of pleomorphic cells and less or undifferentiated cells
- Hyperchromasia
- Size of cells increases
- Size of nucleus and nucleolus increases.
- Presence of many mitotic figures.
- Seen in neoplastic conditions.

**DYSPLASIA**

Abnormal development of cells/tissues which are improperly arranged. It is the malformation of tissue during maturation (Fig.4.9). *e.g.*

1. Spermatozoa head and tailpiece are structurally abnormal or aligned in improper way.
2. Fibrous dysplasia in bones.
3. In gastrointestinal tract, disruption of cellular orientation, variation in size, and shape of cells, increase nuclear and cytoplasmic ratio and increased mitotic activity.
MODEL QUESTIONS

Q. 1. *Fill in the blanks with suitable word(s).*
1. Dysplasia is ………development of cells which are ……………arranged during ………….
2. In hypoplasia the size of organ remains…………….and does not attain its …………..
3. The number of cells are …………………in atrophy.
4. In atrophied tissue the fat and connective tissues cells are …………………..
5. Papule in pox is an example of …………………growth disturbance.
6. Increase in size of cells in known as………………which occurs as physiological reaction in …………..during pregnancy.
7. Metaplasia is defined as …………………. of one type of cells to another type.
8. In anaplasia, the cells are more …………………. and less ………………….
9. Hyperchromasia is a feature of …………………. growth disturbance.
10. Pulmonary adenomatosis is an example of …………………growth disturbance.

Q. 2. *Write True or False against each statement. Correct the false statement.*
1. ………Anaplasia is a feature of neoplasia.
2. ………Metaplasia is increase in size and shape of the cells.
3. ………Dysplasia is malformation in which the cells are arranged in an improper way.
4. ………Hyperplasia is increase in size of cells.
5. ………Atrophy includes the reduction of size of an organ/ tissue.
6. ………Cerebral hypoplasia in calves is caused by an adenovirus.
7. ………In Hypertrophy, the weight of organ does not affect much.
8. ………Atrophy is reduction in size of cells while hypoplasia is decrease in number of cells.
9. ………Wrinkles in capsule of spleen are example of atrophy.
10. ………Increased size of nucleus and nucleolus with increase in size of cell occurs in anaplasia.

Q. 3. *Define the followings.*
1. Anaplasia 6. Dysplasia
2. Metaplasia 7. Atrophy
3. Senile atrophy 8. Hyperchromasia

Q. 4. *Write short notes on.*
1. Nutritional roup
2. Pulmonary adenomatosis

Q. 5. *Select most appropriate word(s) from the four options given with each statement.*
1. Cerebral hypoplasia in calves is caused by………………
   (a) Adenovirus  (b) Rotavirus  (c) Bovine viral diarrhoea virus  (d) Coronavirus
2. Increase in size of cells leading to size of organ is known as………………
   (a) Atrophy  (b) Hyperplasia  (c) Hypertrophy  (d) Metaplasia.
3. Fibrosis may lead to …………………
   (a) Atrophy  (b) Hyperplasia  (c) Dysplasia  (d) Hypertrophy
4. Transformation of one type of cells to another cell type is known as ………
   (a) Hypoplasia  (b) Dysplasia  (c) Anaplasia  (d) Metaplasia
5. Reversion of cells towards embryonic type is known as………
   (a) Anaplasia  (b) Neoplasia  (c) Metaplasia  (d) Hypoplasia
6. Spermatozoa with defective head and tail piece is an example of ………
   (a) Dysplasia  (b) Anaplasia  (c) Neoplasia  (d) Metaplasia
7. Hyperchromasia in cells with their enlargement is known as ……….. 
   (a) Hyperplasia  (b) Hypertrophy  (c) Metaplasia  (d) Anaplasia
8. Increased number of cells leading to increase in size and weight of organ is known as………. 
   (a) Hypertrophy  (b) Anaplasia  (c) Hyperplasia  (d) Metaplasia
9. Environmental pollution may lead to ………. of lymphoid organs.
   (a) Atrophy  (b) Aplasia  (c) Agenesis  (d) Hypoplasia
10. Failure of an organ to develop its full size is known as ……..
    (a) Hyperplasia  (b) Aplasia  (c) Neoplasia  (d) Hypoplasia