Breeding Management : Male and female Reproductive System

Yogita Dumbare Poultry Management

INTRODUCTION

- CHICKEN reproductive system is heterosexual and required both male and female.
- Each contribute half of genetic constitution of the offspring.
- young are not carried in the hens body
- develop inside a fertilized egg outside the hens body
- Female contributes in ovum carried by the egg yolk produced by ovary.
- Ovum of chicken is called blastocyst, blastoderm, germ disk.
- After release from follicle on the ovary the yolk moves into the oviduct where it is fertilised and has added to it the albumen, shell membrane and she'll.
- begins with male placing the sperm into oviduct of the female
- male papillae deposits sperm in cloacal wall of female
- sperm have full fertilizing ability for about 6 days
- after then ability of sperm to fertilize egg is decreased

Structure and Function of the Reproductive System in Poultry



The reproductive anatomy of poultry differ when compared to that of other animal species.

Male Reproductive System in Poultry

The male poultry anatomy consists of two testes (each with an epididymis and vas deferens) that lead to papillae and a rudimentary copulatory organ.

- 1. Testes:
- Unlike other livestock species, the testes of poultry are located within the abdominal cavity along the backbone.
- One pair of testes each with vas deferent duct that lead from the testes to the cloaca.
- Testes are bean shaped bodies.
- Testes size is not constant and they become larger when the bird are actively mating.
- Left size testes is often larger than right.

2. Epididymis

The epididymis, which still functions in sperm storage, is relatively small in relation to the testes.

3. Vas deferens/ Deferent Duct

•The vas deferens extend from the epididymis to the cloaca and are located on each side of the vertebral column.

• duct is narrow at beginning but widen as it approach the colaca

4. Testes and sperm

- In testes very twisted tune called seminiferous tubules are found
- These tubules sperm are produced.
- Sperm carry half chromosome required to produce an embryo
- Male produced 3 to 5 million sperm
- Under microscope sperm is long pointed head with a long tail

5. *Cloaca* – the lower end of the avian digestive tract that provides a passageway for products of the urinary, digestive, and reproductive tracts.

6. *Papillae* – located at the end of the vas deferens and on the floor of the cloaca, the papillae emit semen into the cloaca of the female.

7. *Phallus* – a rudimentary copulatory organ that becomes engorged with lymph during mating, which allows semen to be deposited onto the female's everted cloacus; the phallus is more developed in ducks and geese.

Male Poultry Reproductive Tract





Androgen – the male sex hormone produced by the testes.

Functions of androgen include:

- Directing sexual activity and the
- Controlling secondary sexual and

production of sperm,

characteristics of the male,

• Influencing social rank or "peck order."

Secondary sexual characteristics of include comb growth, crowing or gobbling, spur development, and male feathering.



Female Reproductive System in Poultry

•The functional parts of the female poultry reproductive tract includes one ovary, an oviduct, and the cloaca.

•Mature female poultry have only one functional ovary; the right ovary and oviduct degenerate and cease functioning before the bird reaches sexual maturity.

•The ovary appears as a cluster of tiny, gray balls that are the oocytes.

•At maturity, the ovary contains up to 4,000 tiny oocytes from which ovum may develop over time.

•An ovum develops by collecting lipid particles from the blood to form the yolk

•The yolk contains fat for energy and some protein and other nutrients needed by the developing embryo, as well as, a small white dot called the blastodisc that contains the genetic information supplied by the female.

Ovary

• The ovary consists of a mass of yellowish, rounded objects called follicles, each containing an ovum or yolk. There are many such follicles but only a small number in comparison, will ever reach maturity to produce an egg. When the hen is in lay the ovary will be active. The size of the follicles will vary from very small to those approaching the normal yolk size in the egg which can be up to 40 millimetres in diameter, and will contain a fully matured yolk ready for release into the oviduct.

- It is possible to find five stages of development in the active ovary:
- Primary follicles follicles that have not yet commenced to grow
- Growing follicles
- Mature follicles follicles ready or nearly so for release
- Discharged follicles where the yolk has just been released

 \bigcirc Atretic follicles – those from which the yolk has been released some time ago

Yolk

• It takes approximately 10 days for a yolk to develop from the very small to the normal size found in eggs and during this time it is contained in the follicle.

• The follicle acts as a sack during this period of development supplying it with the nutrients required for its growth.

• When a mature follicle is examined an elongated area virtually free of blood vessels will be found on the distal surface of it.

• This area, called the stigma, is where the follicle normally splits to release the yolk into the oviduct.

• If, for some reason, the follicle splits at other than the stigma, the numerous blood vessels that rupture will result in free blood being found in the egg i.e. a blood spot will form

Female Poultry Reproductive Tract



When mature, the yolk is released by the follicle and engulfed by the infundibulum.

The oviduct is about 25 inches long and consists of five parts: the infundibulum, the magnum, the isthmus, the uterus, and the vagina.

Infundibulum – funnel-like part of the oviduct that receives the yolk and is the site of fertilization.

- It is up to 9 centimetres long in the laying hen and has the function of searching for and engulfing the yolk that has just been released from the follicle into the adjacent ovarian pocket or body cavity.
- If the infundibulum malfunction and does not engulf the yolk, the yolk will remain in the ovarian pocket from where normally they will be absorbed within three days. If the number of such occurrences reaches a high level, the yolks will accumulate in the ovarian pocket faster than they can be absorbed. Such birds' are called internal layers as the abdomen becomes distended and the hens adopt a very upright stance.

Magnum –

•second part of the oviduct that secretes the thick white or albumen.

•The magnum is the longest segment at up to 40 centimetres long.

•The chalazae are two twisted chords of albumen extending from the opposite sides of the yolk into the remaining albumen in the broken out egg.

•These two cords extend into the ends of the egg along the longitudinal axis and are parts of a very thin envelope of special albumen that surrounds the yolk and holds it in its position. The yolk has to remain centrally located for the survival of the embryo.

•The yolk turning or rotating as it passes along the oviduct causes the twisted effect of the chalazae.

Isthmus

• The isthmus is approximately 12 centimetres long and has the functions of adding approximately 20% of the albumen and the shell membranes to the egg.

There are two shell membranes:
The inner shell membrane – laid down first
The outer shell membrane – laid down last and about three times the thickness of the inner membrane
The isthmus takes approximately 75 minutes to carry out its tasks.

•While the egg is still in the oviduct the shell membranes appear as one over the total surface of the egg, so close, they are associated with each other. However, as the egg cools after it has been laid, the membranes separate, usually at the larger end to form the air cell. The air cell in the new laid egg is approximately 1.5 centimetres in diameter and approximately 0.5 centimetres deep. The isthmus also lays down the foundation for the shell by forming the first crystals of calcium carbonate on the outer shell membrane.

Uterus – the fourth part of the oviduct that secretes the thin white, the shell, and the shell pigment.

Vagina – the last part of the oviduct that holds the egg until it is laid.

From the oviduct, the egg passes to the cloaca and then out of the body through the vent at the time of laying.

In addition to producing ova, the ovary produces the female sex hormone, estrogen, and the hormone androgen.

The androgen hormone stimulates comb growth and works with other hormones in egg production.



- In poultry, the functions of estrogen include:
- stimulating the growth of the oviduct,
- increasing the size of the cloaca during egg laying,
- modifying feather shape and pigmentation of the female, and
- increasing the level of fat, phosphorus, and calcium in the blood.





Testicles: Produce sperm

Vas Deferens: Carries seminal fluid and sperm from testicles to cloaca

Papilla: The organ in the wall of the cloaca that places the sperm inside the female's reproductive tract







Ovary: Produces the ovum

Infundibulum: Receives yolk from ovary, where sperm is stored, and fertilization takes place

Magnum: Secretes the thick white of the egg 3 Hours

Isthmus: 2 shell membranes are placed around the yolk and thick white

$1\frac{1}{4}$ Hours

Uterus: Thin white and outer shell are added to the egg

20 Hours

Vagina: Completed egg is stored for a short time til laid

Total: 25-27 Hours





1 Infundibulum 2 Magnum inside) 2 Tetherese 4 Uterus 5 Vagina (with egg



Egg Processing Video



The Ovary And Yolk Formation

• The ovary is attached to the abdominal cavity wall by the mesoovarian ligament. It carries anything from 2,000 to 12,000 small ova in miniature follicles on its surface, plus hormone producing cells in its body. Not all of the ova found on the immature ovary develop and only approximately 200 to 350 reach maturity under normal modern commercial practice. Each yolk or ova takes about 10 days to grow and reach maturity when it is approximately 31% of the weight of the egg. • The yolk is laid down in concentric rings of darker and lighter coloured material, the colour being produced by xanthophylls that are yellow/orange/red pigments occurring in many plants, plant products and other naturally occurring materials. The bulk of the yolk material provides a source of food for the developing embryo that originates by the fertilising of the germ disc or blastoderm usually located on the upper surface of the yolk of the broken out egg. It lies in the surface segment of the latebra which is a vase-shaped segment of different yolk with its base in the centre of the yolk, the lips on the surface and the stem joining the base to the lips.

Ovulation

• The release of the yolk (the process of ovulation), is the major controlling factor influencing the subsequent steps in the formation and laying of the egg.

• As a consequence, factors that influence ovulation are of critical importance to the various aspects associated with egg production.

 The presence of a mature yolk in a follicle causes hormones from the ovary to stimulate the release of luteinising hormone (LH) by the pituitary gland.

• The presence of LH in the blood stream causes the follicle that contains the mature yolk to split along the stigma thus releasing it into the oviduct abdominal cavity adjacent to the oviduct.

Sexual Maturity

• Sexual maturity is reached when the hen lays the first egg in her life. Generally sexual maturity is genetically controlled, however, environmental factors play a very significant role. It will be in the age range of 18-24 weeks depending on fowl genotype, but it can be manipulated by controlled feeding practices, light intensity and day length management and other management practices.

• Initiation Of Ovulation

• The controlling mechanism setting the time of the day for the first ovulation is not fully understood. However, nervous and hormonal factors are important. Subsequent ovulations are, however, controlled largely by the time of the previous egg passing through the vent (being laid). Subsequent yolk release, if at all, occurs approximately 40-60 minutes after the previous egg has been laid.

Clutches

• Eggs laid on successive days are called a clutch. Clutches are separated by days when no eggs are laid. Clutch size is an individual characteristic and may vary in a flock from 2 up to 100 eggs. However, the normal clutch size is significantly less than that and ranges from 3-8 eggs. The larger the clutch size the better will be the total production. Small clutch size indicates an inferior laying performance and is usually associated with long breaks in between.

• Egg Formation Time

• The time taken from ovulation until when the egg passes through the vent varies with individuals within the range of 23 to 26 hours. If the time is longer than 24 hours then the time of laying will be progressively later in the day for each successive egg in the clutch. When eggs are laid at a late hour, an ovulation is missed and the start of a new clutch will be earlier in the next laying day.

Ovulation Time

• Hens that produce long clutches release the yolk very shortly after first light (whether natural or artificial light). Successive ovulations occur very shortly after the laying of the previous egg. Those that produce short clutches usually release the yolk later in the day and often have longer periods between laying time and the next ovulation.

Compare Mammalian and Poultry Reproduction

2 functioning ovaries	2 ovaries, but only LEFT ovary functions
Sperm cells are only viable for a short time after depositing into the female	Sperm cells live for atleast 6 days…and as long as 10-15 days!
Testicles are inside the scrotum on the OUTSIDE of body	Testicles are INSIDE the body cavity
Separate exits for the urinary, digestive, and reproductive tracts	ONE exit from the body (vent)

