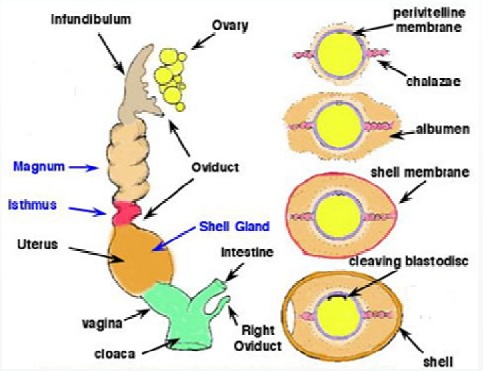
Canary Reproductive System



The Canary Reproductive System—Research

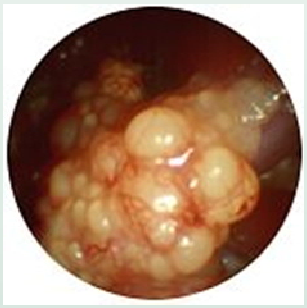
From cell to egg to a baby bird, is an amazing process. With the unity of a sperm cell to an ovum, a single cell develops into an embryo and a new life begins. I will begin with the reproductive organs.

Male Reproductive Organs

Male birds have a pair of testes that resemble a bean shape and each are located in front of the top lobe of the kidneys. During non-breeding season the testes are difficult to locate due to their small size, but during breeding season they may grow as much as several hundred times their non-breeding size.
As in mammals, the sperm cells of birds cannot develop fully at high temperatures that are found within the body cavity. Some birds experience a nightly drop in body temperature that allows the sperm cells to develop, while other birds have a swelling at the end of the tube (vas deferens). This tube connects the testes to the cloaca, and functions like a mammal's scrotum holding the sperm away from the higher body temperatures that are within the abdomen.

Most bird species rub their cloaca areas together to transfer the male's sperm but ostriches, rheas, flamingos, ducks and a few other families actually have an erectile grooved penis on the back wall of the cloaca to transfer sperm.

Female Reproductive Organs



The female organs consist of the ovary and the oviduct that leads to the cloaca. With most bird species, the ovary is on the left side with the right side being underdeveloped and non functional. It is thought that being only one sided reduces body weight and eliminates the possibility of carry two large, fragile eggs in the abdomen cavity at the same time.
The ovary when mature looks like a cluster of grapes. It may contain up to 4,000 small ova that can develop into yolks. Yolk protein, lipids and fats are manufactured in the liver and travel through the bloodstream to the immature ovum, during the maturation stage. Each yolk is attached to the ovary by a thin membrane sac or follicle having a fine network of blood vessels. The germinal disc of a developing yolk contains the single ovum cell which, after fertilization develops into a chick. The ovary enlarges during breeding season as much as fifty times its non-breeding weight.
The oviduct is a large coiled tube where all parts of the egg are formed except the yolk. It consists of several sections. Starting from the top: ostium, infundibular funnel, magnum area, isthmus, uterus and the vagina. They each play a part in the development of the egg.
When the brain's pituitary gland releases a luteinizing hormone, LH, ovulation begins. The sac around the yolk ruptures and releases the yolk from the follicle; the yolk is kept intact by a fine membrane called the vitelline. The yolk is than engulfed by the infundibulum, with its thin, funnel-like lips. If the infundibulum cannot pick up the yolk, it is usually absorbed by the abdominal cavity or can cause peritonitis, an inflammtion of the lining of the abdominal cavity. Once inside the infundibulum fertilization can begin. The sperm have been stored in glands or nests, located in the infundibulum and are released as the yolk passes by. The sperm cell must penetrate the thin vitelline membrane and reach the female cell to complete fertilization. A unique property of the avian oviduct is to store sperm for a prolonged period. The sperm storage tubules (SST) are located in the utero-vaginal junction of the oviduct, where sperm can be stored and survived for a few weeks after insemination or natural mating. The immune system in the oviduct is essential to prevent tissue infection by various microorganisms, and it may also affect the fate and survivability of sperm in the oviduct. Anti-sperm immunoresponses including infiltration of leukocytes may be induced in the vagina of the oviduct. Sperm that will participate in fertilization may be selected by these immunoresponses. However, sperm stored in the SST may be protected from the immunoresponse by SST structures and transforming growth factor beta, whose expression is increased during sperm storage in the SST. In this review, the mechanism of sperm survivability with reference to the regulation of anti-sperm immunoresponses in hen oviduct is emphasized

The yolk then travel immediately into the magnum section for a stay of approximately three hour. In this time the egg white is added to the ovum. It is a protein substance containing mucin, globulin and albumen including sodium, magnesium and calcium. This serves as a shock absorber and feed the developing embryo.

The uterus is a thick-wall membrane where the egg will spend 20 hours. Through the shell membranes, water and salts are added which plump out the egg. The shell is added here and has three layers. The inner layer is first produced and called the mammillary layer. The middle layer is called testar and is the thickest and the outer layer is made of dried mucous. The shell is composed of calcium carbonate. In the vagina the stay is short. A coating called “bloom” is added to keep harmful bacteria and or dust from entering the egg. The soft egg is shaped in the vagina depending on the shape of the bony pelvis.
The egg than travels to the cloaca and is laid. When the egg is laid, it is the same temperature as the hen and fills the shell. As it cools, it loses volume and the density changes slightly, creating a pressure, which draws air into the egg and forms the air cell. The shell hardens as it cools and dries. This whole process from start to finish has taken approximately 24 hours. A brood spot develops on the hen and can develop on some males. The temperature rises on the brood spot due to a large amount of blood collecting in that area. Incubation of the eggs is usually 14. About 15% of an eggs original weight is lost due to evaporation in the incubation process. The eggs incubate at 99.5 degrees Fahrenheit with humidity between 50 and 53%.

Evidence during the tests revealed that the cycle of egg production is such that once the first egg of a clutch has been laid further sperm through mating has no effect on the fertilisation process. When the hen is ready to commence the cycle again usually thought to be 21 days after first egg hatches, evidence found that in fact the hen is at most receptive at the 19—20 days point after first egg hatches. Male sperm at this point is taken in to the SST and waits for the ovum to pass through and become fertilised. The life span of the male sperm in the SST depends on the fitness of the male canary and strength of the sperm. Tests provided evidence that male sperm can live for 2 complete cycles of breeding; we mated canary to canary to result in canary offspring and then a linnet to same female canary for second cycle resulting in three canary chicks and 2 linnet chicks in same nest. Our conclusion was that once first egg is laid there is no requirement to re-mate.