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Systematic Search and Review on Specialties of Organ Systems in Pigeons

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ABSTRACT

In order to run a loft commercially, need to know the functions of various physiological functions of pigeons. Many specialties in these organ systems of pigeons enrich us to maintain them properly. Own experiences, oral communication with the pigeon breeders, and adequate verified information from various corners on pigeons especially English tipplers, racing homers, and king pigeons were used in this systematic review. Out of 10 different organ systems of pigeons, from integumentary to reproductive system showed many specialties especially powerful flight, crop milk, many air sacs, and neurotransmitters of pigeons. In addition, at the time of pigeon flying of tippler and racing homer pigeons it was possible to observe their flying endurance, and king pigeons were significant for their overall growth in many lots of Bangladesh.

Keywords: Pigeons, Organ Systems, Specialties.

INTRODUCTION

After hatching of many fancy pigeons, it shows numerous colorful pigmentations as various tracts. The skin of pigeon is divided into outer epidermis and inner dermis [1]. Feral pigeons in the rock-pigeons group showed other pigmentation as well. Local and crossbreds are used as squab meat for human consumption everywhere. In the meat or hen group, king, carneau, maltese, and runt are reared as meat. In Bangladesh, king pigeons are reared as fancy but actually this is a meat breed in the world [2]. Learning functions are highly similar in avian and mammalian brains [3]. Pigeons cardiac muscle is dense and active for evolutionary trends for many years. To know the physiology of pigeons, blood parameters need to be diagnosed especially in racing homer pigeons [4]. Birds eat a lot of feed because they have a very high rate of metabolism. Their diet consists mostly of seeds although a small number of plants and insect. The crop is a holding gland and its glandular proventriculus and muscular gizzard are useful for the digestion of complex food. Crowley, Deakin University of Australia, said that pigeons, flamingoes, and male emperor penguins produce a milk-like substance (crop milk) to feed their young. Different ratio of feed is mandatory in different stages of pigeons [5]. The pigeon has a high metabolic rate and have an efficient respiratory system [6]. Skull, humerus, clavicle, keel (sternum), pelvic girdle, lumbar and sacral vertebrae are the pneumatic bones of pigeon. Within the epiphyses of

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the long bones cancellous bone (spongy bone), smaller bones, and spleen produce blood corpuscles of pigeons, said Veterinarian Julia K. Whittington, Medical Director of the Wildlife Medical Clinic at the University of Illinois, College of Veterinary Medicine in Urbana. Serotonin and GABA (gamma aminobutyric acid) neurotransmitters are responsible for the tumbling tendency of tumbler pigeons [7]. These tumbling activities are harmful for them but selection on this breed has provided them more performances either in the sky or on the ground [8]. Unlike mammals, birds have no urethra or bladder, they excrete metabolized nitrogenous compounds in the form of nitric acid. In most birds, both ovaries are present during embryonic development, finally, the left one becomes functional [1]. The objective of this review is to focus specialties in organ systems of pigeons in order to keep them physiologically active.

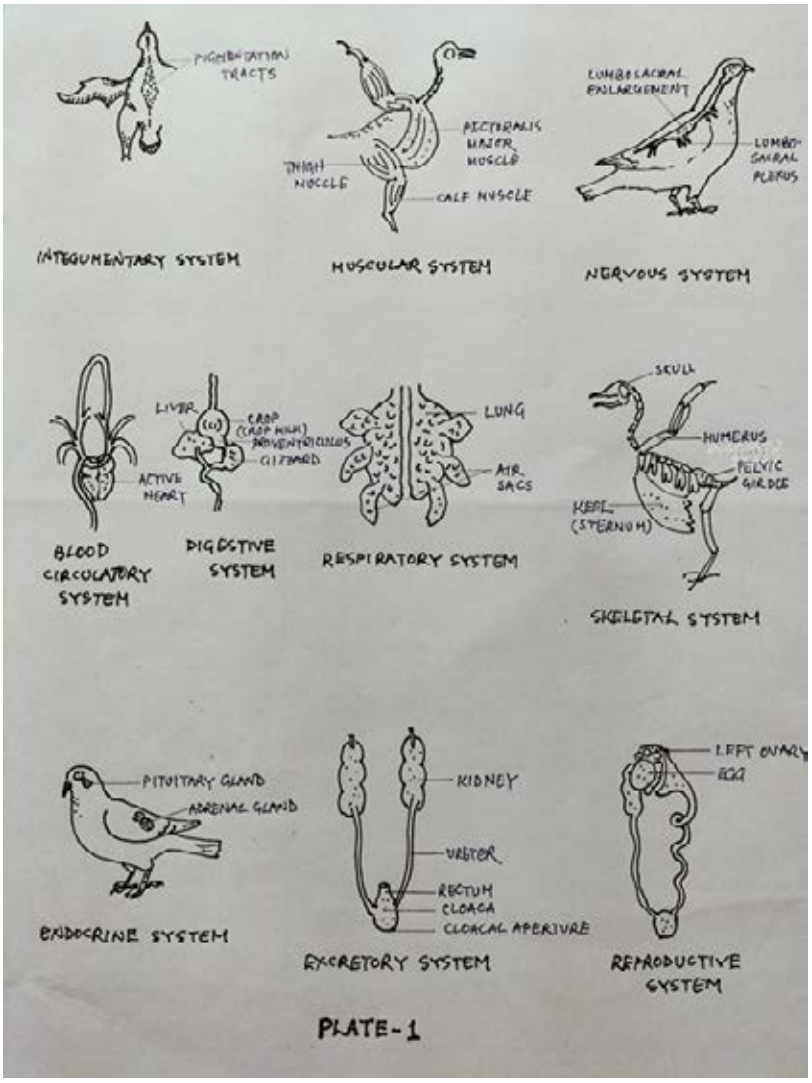
MATERIALS AND METHODS

Tumbler and roller group of pigeons: This is a significant group of pigeon in the world with numerous types like Birmingham roller, Oriental roller, parlor roller, Iranian tumbler, Uzbek tumbler, etc. Its flying endurance is noteworthy and in Bangladesh most breeders have this type of pigeon. The performance of these pigeons is excellent in the sky [8]. Breeders always provided them nutritious feed for regulating such physiological activities.

Racing homers: This racing homer is the best flying performer pigeon in the world. This bird is found all the cities with remarkable numbers, and Bangladesh is not an exception with this pigeon. Breeders used to fly this pigeon as competition from the very beginning [9]. From this racing homer, first squabbing homer then utility homer is reared as meat.

King pigeons: This pigeon is an important bird as meat. In the USA, they have pigeon plant (king pigeons) for supplying squab meat. In Bangladesh, this pigeon is reared as fancy pigeon [2]. It needs sufficient feed for productive growth.

Features of organ systems: After slaughtering some of above pigeons, knowledge from other breeders, and online images helped to sketch all of the organ systems of pigeons, and was significant to mention such specialties and compare with other birds (Plate 1).



RESULTS AND DISCUSSION

Integumentary system: Skin of pigeons is dry, loose, and hard as well and is layered by outer epidermis and inner dermis [10]. In all rock-pigeons group, some common different colors (spread black, rusty, white) easily observed. Due to domestication of rock-pigeons, and their feral tendencies helped to achieve these color genetics. Regulatory or other genes may be responsible for the color polymorphism of feral pigeons [11]. Color deviation of owl and frill pigeons need to cut through culling [10]. Bird wings consist of highly complex with their flexibility and porous surfaces [12].

Muscular system: The flesh of king pigeons is accepted throughout the world. The muscular weight of pigeons is included nearly 1/5 of the total weight [1]. Some villagers rear local pigeons with poultry for their protein demand [13]. The average weight of English tipper is 350 g, racing homer 315 g, and king pigeon 570 g respectively. Homer pigeons are remarkable in flying with powerful muscles [9]. Crossed indigenous pigeons are suitable for squab meat and these birds are good fostering also [14].

Nervous system: The size of avian brain is roughly ten times than the reptiles and mammals [1]. Learning and executive functions are highly similar in avian and mammalian brains, and these explain their common ancestry [3]. Nervous system of tumbler pigeons is very active due to continuous selection [9].

Circulatory system: Pigeons are active bird, so normally they do not suffer heart- or blood-related diseases at all. To know the physiology of pigeons, some blood parameters need to be diagnosed especially in racing homer pigeons [4].

Digestive system: Birds have a very high rate of metabolism. Their diet consists mostly of seeds although a small amount of greenery is consumed as well as the occasional insect. Sometimes, grits could be a source of many fungi that leads to aspergillosis. The crop is a holding area and can retain a considerable amount of 'pigeon milk' to feed the squabs. Feed travels down the esophagus to the proventriculus and gizzard. Feed at various stages (growing, incubation, hatching, molting, racing, etc.) need to be maintained by the breeders [5]. Like other birds, pigeons have no gall bladder [15]. Feral pigeons have enough pancreatic protease allow them to use effectively on the nutrients [16]. Many breeders of Bangladesh shared that since the beak length of squab of owls and frills are comparatively large and at the time of serving 'pigeon milk' by their parents, through complete mouth opening, squabs get sufficient feed.

Respiratory system: The pigeon has a high metabolic rate and have an efficient respiratory system [6]. Birds do not have tiny air sacs nor do they have a diaphragm. Not only the lungs, but also into 9 air sacs and some bones are useful for their proper breathing. The lung-air sac of birds is one of the possible solutions to attain life in the fast lane [17].

Skeletal system: Since pigeons have many air sacs, and its spreading branches are surrounded from anterior to posterior vertebral column, so bones of this area comprise pneumatic bones. Light, thin, and plate-like keel bone is suitable for easy and quick flight. Avian skeleton serves an opportunity to gain knowledge on bones, muscles, tendons, nerves, etc. [18]. Ostriches and emus have hollow femur. Not all bones in a bird's body are hollow, and the number of hollow bones varies among species. Penguins, loons, and puffins do not have any hollow bones. Actually, hollow bones do not make a bird lighter, this is a common thought in people [19].

Endocrine system: Serotonin hormone acts to initiate tumble and GABA (gamma aminobutyric acid) is responsible to stop this act [7]. Since, these tumbling activities are harmful for them but selection on this breed is increasing rapidly [8].

Excretory system: Unlike mammals, birds have no urethra or bladder, they excrete metabolized nitrogenous compounds (nitric acid). The color and volume of feces indicate many diseases of pigeons [20].

Reproductive system: In most birds, both ovaries are present at their early development, but finally left one becomes functional in the adult [1]. An effective method of sex identification in pigeons is CHD1 (chromodomain helicase DNA binding protein-1), which is present both in Z and W chromosome (Maciej et al., 2017) [21].

Table 1. Organ systems of pigeons

Organ systems	Specialties
Integumentary system	Higher pigmentation in some fancy pigeons
Muscular system	Powerful flight muscle (pectoralis major) due to racing
Nervous system	Powerful memory
Circulatory system	Active heart; birds lack lymphatic glands
Digestive system	Crop gland produces 'pigeon milk' for the squabs; unlike some other birds, it has no gall bladder; glandular proventriculus and muscular gizzard are responsible for digestion of compact feed
Respiratory system	More air sacs with both lungs
Skeletal system	Skull, humerus, clavicle, keel (sternum), pelvic girdle, lumbar and sacral vertebrae all are pneumatic bones of pigeons. Spongy bone, smaller bones, and spleen produce blood corpuscles
Endocrine system	Some neurotransmitters have extra-ordinary functions especially serotonin and GABA (gamma aminobutyric acid) for the tumbler pigeons
Excretory system	Good manure for the crops; it does not have urinary bladder
Reproductive system	Left ovary is active for bearing light body weight; lack of prostate gland

Table 2. Features and references on different organ systems of pigeons

Features	Examples	References
Integumentary system	There is higher pigmentation in some fancy breeds.	[1,10-12]
Muscular system	Pectoralis major or main flight muscle is highly powerful in pigeons.	[1,9,13,14]
Nervous system	Due to prehistoric domestication, it has gained notable learning behavior.	[1,3,9]
Circulatory system	Heart is active; lack of lymphatic glands.	[4]
Digestive system	Pigeons produce 'crop milk' within their crop.	[5,15,16]
Respiratory system	Both lungs have 18 air sacs.	[6,17]
Skeletal system	Long bones, skull, clavicle, keel, pelvic girdle, lumbar and sacral vertebrae are pneumatic bones.	[18,19]
Endocrine system	Serotonin and gamma aminobutyric acid plays a significant role on tumbling behavior of pigeons.	[9]
Excretory system	Pigeons do not have urinary bladder.	[20]
Reproductive system	Only left ovary bears light body weight; lack of prostate gland.	[1,21]

CONCLUSIONS

The maximum pigeon breeders of Bangladesh are not well-known about all of the organ systems of pigeons except digestive and reproductive system, but a mentionable point is that through serving nutritious feed and proper medications ensure the sound fitness of their pigeons. Proper diet ensures to continue all of the physiological activities at all. Nonetheless, it is recommended to all breeders of the country should know the scientific mechanism of all organ systems of their birds. Based on commercial aspects, knowledge of this paper will make them more efficient in their lofts.

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