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Original Research Article

Comparative Physiological Study of Pancreas in Eurasian Collared Dove (Streptopelia Decaocto) and Buzzard (Beuteo Beuteo Vulpinus)

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Abstract: ***Background***: Domestic dove, often known as city dove or rock dove, is a subspecies of the rock dove. Domesticated birds began with dove. The massive buzzard (Buteo buteo) inhabits in many ecosystems across the globe. The Accipitridae family and Buteo genus include it. Buzzards hunt and eat alone, however they may gather in flocks during migration or when food is plentiful. ***Aim to study***: The aim of this research to comparative physiological study of pancreas in collared dove (Sterptopelia decaota) and Buzzard (beuteo vulpinus). ***Methods***: This research employed 10 healthy adult Dove (Streptopelia decaocto) and buzzard (Beuteo beuteo vulpinus) per feeding method. Babylonian tradesmen traded birds. These birds of each species for used on the physiological studies. Results: Mean insulin, glucagon, and somatostatin levels in Buzzard and Dove were compared, and the findings indicated a substantial difference. Buzzard had a higher mean insulin level difference (603.59 ± 25.0) than Dove (414.73 ± 29.2). However, buzzard had a higher mean difference in glucagon levels (373.80 ± 16.3) compared to Dove (303.65 ± 32.3). Additionally, Buzzard had a higher mean difference in somatostatin levels (454.89 ± 24.1) compared to Dove (368.80 ± 28.6). ***Conclusion***: The results showed that insulin, glucagon, and somatostatin were all significantly different from one another.

Keywords: Pancreas, insulin, glucagon, somatostatin.

INTRODUCTION

High blood glucose causes the pancreas to produce insulin. It mainly promotes hepatic glycogen production. Insulin suppresses liver gluconeogenesis and glycogenolysis. It helps store extra glucose as glycogen (Rahman *et al.*, 2021). Glucagon, another pancreatic hormone, opposes insulin. It increases blood glucose by stimulating hepatic glycogenolysis and gluconeogenesis. This boosts blood glucose during fasting or low energy (Adeva-Andany *et al.*, 2019). Adrenal cortisol regulates glucose metabolism. It boosts hepatic gluconeogenesis to maintain glucose levels under stress or fasting. Cortisol also reduces inflammation, which might affect liver function (Kwon, 2021). Thyroid hormones affect liver function and metabolism. They boost hormones like insulin and regulate hepatic lipid metabolism. Thyroid hormones affect metabolic pathway enzyme expression (Sinha *et al.*, 2018). Growth hormone increases liver IGF-1 synthesis. IGF-1 promotes bone and tissue growth. It also increases protein synthesis and decreases protein degradation (Barclay *et al.*, 2019). Estrogen and testosterone affect liver function. They affect lipid metabolism and hepatic protein production and secretion. Estrogen raises HDL cholesterol (Palmisano *et al.*, 2017). Adipose tissue produces leptin, which controls hunger and energy. It modulates insulin sensitivity and lipid metabolism, altering liver function. Leptin levels are related to body fat, and leptin signaling disorders may harm the liver (Friedman, 2019). Endocrine hormone-liver interactions regulate glucose, lipid, and protein metabolism and other physiological processes necessary for homeostasis. Liver and metabolic health depend on hormonal balance (Sinha *et al.*, 2017). The pancreas is exocrine and endocrine. Endocrine function includes the release of hormones into the circulation, particularly insulin and glucagon, which regulate glucose metabolism (Sans *et al.*, 2020). Beta cells in Langerhans' islets generate and release insulin.

Its main function is to help cells absorb glucose and store it as glycogen to manage blood glucose levels. Insulin inhibits pancreatic insulin production when blood glucose levels increase after a meal. This feedback maintains glucose homeostasis (Huising, 2020). Pancreatic islet alpha cells secrete glucagon. It opposes insulin and promotes hepatic glucose release (glycogenolysis) and gluconeogenesis. Although glucagon does not directly affect the pancreas, its effects on hepatic glucose production help maintain blood glucose levels. Low blood glucose inhibits glucagon release, whereas high amounts promote it (Müller *et al*., 2017). Pancreatic islet delta cells make somatostatin. It inhibits insulin and glucagon. Somatostatin regulates insulin and glucagon secretion to reduce blood glucose swings. It is essential for balancing insulin and glucagon (Rorsman & Huising, 2018). The gallbladder releases bile into the small intestine. This bile emulsifies lipids for digestion and absorption (Wang *et al*., 2019). These hormones work together to maintain metabolic homeostasis, balancing energy generation and expenditure. These hormonal systems may be dysregulated, causing metabolic diseases such hypothyroidism and hyperthyroidism, which change metabolic rate (Cani *et al*., 2019).

The aim of this research to Comparative physiological Study of Pancreas in Collared Dove (Sterptopelia decaota) and Buzzard (beuteo vulpinus).

MATERIALS AND METHODS

Ten healthy adult Dove (Columba livia) and Buzzard (Beuteo beuteo vulpinus) separated by food type were employed in this investigation. Local vendors in Babylon province sold birds. 5ml blood samples were taken from each bird for measurement of levels of insulin, levels of glucagon and levels of somatostatin by used Chicken ELISA Kits.

Statistical Analysis

The information was evaluated statistically with SPSS (26.0). All numerical results have been presented as means SE. Statistician Ronald Fisher used analysis of variance (ANOVA) to determine the level of statistical significance between groups. The cutoff point for significance was $P \geq 0.05$.

RESULTS AND DISCUSSION

In this study, the mean difference of hormones levels (insulin, glucagon and somatostatin) in Buzzard and Dove were studied, the results showed that, there were significant difference between three hormones and study groups (Buzzard and Dove). The mean difference of insulin level was increased in Buzzard (603.59 ± 25.0) more than the mean difference of insulin level in Dove (414.73 ± 29.2). However, the mean difference of glucagon level was increased in Buzzard (373.80 ± 16.3) more than the mean difference of glucagon level in Dove (303.65 ± 32.3). In addition, the mean difference of somatostatin level was increased in Buzzard (454.89 ± 24.1) more than the mean difference of somatostatin level in Dove (368.80 ± 28.6). All these results were shown in Table (1), Figures (1, 2 & 3).

Table 1: Mean difference of hormones levels (insulin, glucagon and somatostatin) in Buzzard and Dove

Birds Hormones	Buzzard	Dove	p-value
	Mean ± S.E		
Insulin	603.59 ± 25.0	414.73 ± 29.2	0.001**
Glucagon	373.80 ± 16.3	303.65 ± 32.3	0.021*
Somatostatin	454.89 ± 24.1	368.80 ± 28.6	0.037*

-* refer to significant difference at $p \leq 0.05$.
-** refer to significant difference at $p \leq 0.01$.

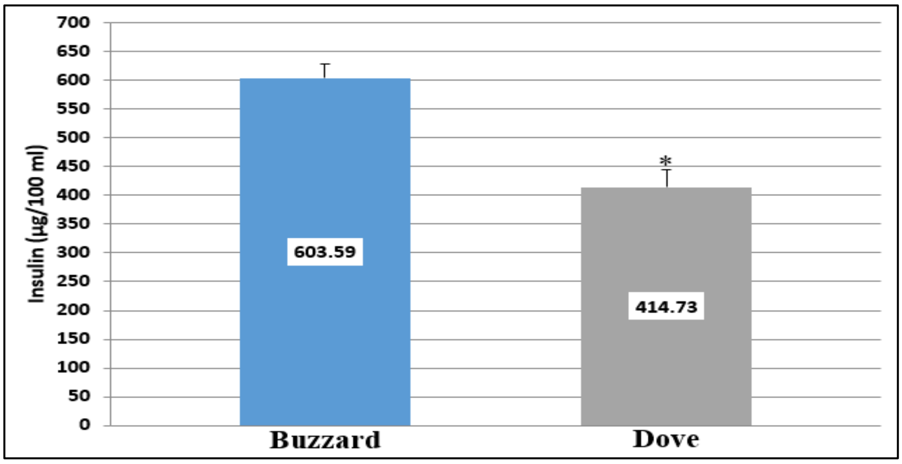

Figure 1: Mean difference of insulin hormone between buzzard and dove

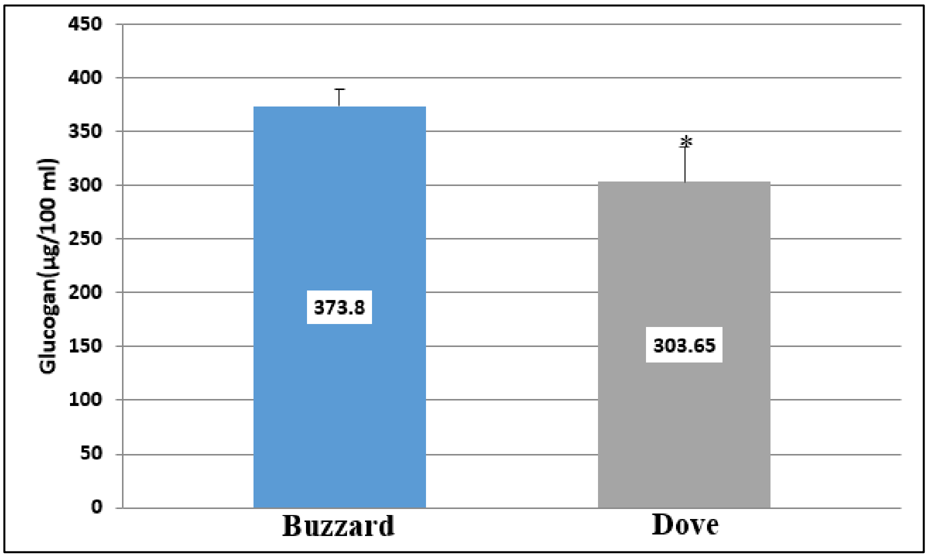

Figure 2: Mean difference of glucogan hormone between buzzard and dove

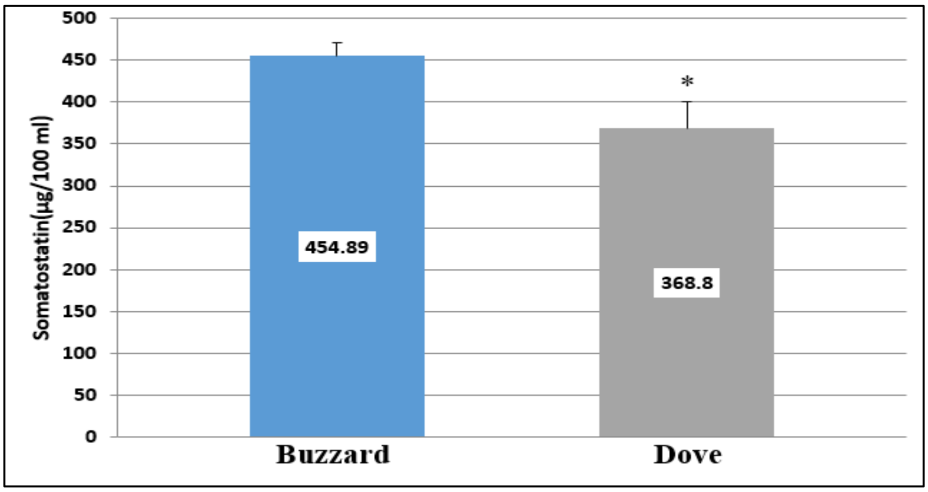

Figure 3: Mean difference of somatostatin hormone between buzzard and dove

Consistent with the findings of Regan *et al*., (2020) who discovered that, any species might experience a rise in insulin levels for a variety of causes, including dietary changes, it is possible that buzzards ate foods that triggered an increase in insulin synthesis. Insulin secretion may be stimulated by carbohydrate-heavy diets. The body's reaction to physiological stress, such as disease, injury, or changes in the environment, may include elevated insulin levels, as shown by the findings of the study (Stefanaki *et al*., 2018). Diabetes, insulin resistance, and other metabolic illnesses and disorders may all cause insulin levels to become dysregulated, leading to an increase. In a prior research, Aguayo-Mazzucato *et al*., (2019) it was shown that insulin levels may vary between communities or people due to genetic predispositions that affect insulin production and control. Furthermore, environmental factors, toxic exposure, and changes to habitat may influence insulin production, as well as metabolism and hormone control. A research of Thomas *et al*., (2023) indicated that the macronutrient ratio, in particular, may affect glucagon levels. Glucagon release may be induced by a protein-rich or carbohydrate-poor diet. It was discovered by that when energy needs were high, including during exercise, stress, or exposure to cold, glucagon levels rise. Glucagon aids in the mobilization of glycogen and other energy reserves to fulfill these needs. Nevertheless, it was discovered by Müller *et al*., (2017) that glucagon was crucial for keeping blood glucose levels balanced. Hypoglycemia, or low blood glucose levels, may trigger an increase in glucagon secretion, which in turn promotes gluconeogenesis, or the creation of glucose from non-carbohydrate sources, and glycogenolysis, the release of glucose from the liver's storage. Glucagon production was regulated by a complex network of hormones that were involved in glucose and energy metabolism. These include insulin, catecholamines, cortisol, and others (Nirmalan & Nirmalan, 2020). Diabetes mellitus and pancreatic diseases were among the medical conditions that might cause glucagon levels to become dysregulated. For instance, hyperglycemia may occur in diabetes due to decreased insulin secretion or action, which can cause unopposed glucagon secretion (Kulina & Rayfield, 2016). In line with these findings, Ampofo *et al*., (2020) it was determined in that somatostatin was a hormone that regulates several physiological processes, including the release of other hormones like insulin and glucagon. A rise in somatostatin levels may occur in reaction to increased levels of insulin and glucagon, since these hormones play a role in negative feedback loops that govern the production of numerous other substances that help keep homeostasis in check. Somatostatin levels may be triggered by neuronal activity or other stimuli; it controls the release of other neurotransmitters in the central nervous system (Liguz-Lecznar *et al*., 2016). Stress hormones like cortisol may affect somatostatin levels; in reaction to stress, the body may secrete more somatostatin, which can alter hormone levels and physiological processes (Tsigos *et al*., 2020). Somatostatin had a role in regulating inflammatory reactions and the immune system as a whole. Inflammation and immune system activation were two potential causes of elevated somatostatin levels (Afsal *et al*., 2018).

CONCLUSIONS

It was conclude that, there were significant difference between three hormones (insulin, glucagon and somatostatin).

Conflict of Interest: None

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