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PANCREATIC FUNCTION AND DIABETES MELLITUS IN DOGS, CATS AND EXPERIMENTAL RODENTS: IMPLICATIONS FOR THE EVALUATION OF PLANT-DERIVED HYPOGLYCEMIC COMPOUNDS – A NARRATIVE REVIEW

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Abstract: Diabetes mellitus (DM) is a complex metabolic disorder characterized by persistent hyperglycemia resulting from impaired insulin secretion, insulin resistance, or both. This narrative review examines pancreatic physiology, the pathophysiological differences between canine and feline diabetes, and the relevance of experimental rodent models for evaluating natural hypoglycemic compounds. Canine diabetes is predominantly associated with pancreatic β-cell dysfunction and insulin deficiency, whereas feline diabetes frequently involves obesity-related insulin resistance and potentially reversible β-cell dysfunction. Experimental models induced by streptozotocin or alloxan primarily investigate β-cell injury, while combined dietary and chemical models reproduce selected features of type 2-like diabetes. Plant-derived bioactive compounds may influence insulin signaling, glucose metabolism, oxidative stress, and pancreatic function. However, preclinical findings require cautious interpretation before potential clinical applications can be established.

• Introduction

The pancreas plays an essential role in glucose homeostasis through the secretion of insulin and glucagon. Diabetes mellitus develops when insulin availability or tissue sensitivity becomes insufficient to maintain normal blood glucose concentrations.

Although dogs and cats share similar clinical manifestations, their underlying diabetic mechanisms differ considerably. Experimental rodent models provide valuable opportunities to investigate these mechanisms and evaluate the potential glucose-lowering effects of natural bioactive compounds.

• Material and method

This narrative review synthesized information from veterinary textbooks, clinical guidelines, scientific reviews, and experimental and clinical studies.

The literature was organized into four main areas: pancreatic endocrine physiology, canine and feline diabetes mellitus, experimental rodent models, and plant-derived compounds with potential hypoglycemic activity.

Particular attention was given to pancreatic β-cell function, insulin resistance, oxidative stress, and the translational relevance of experimental findings.

No new animal experiments or systematic meta-analysis were performed.

• Results and discussions

Canine diabetes mellitus: Predominantly characterized by substantial pancreatic β-cell dysfunction or loss, resulting in insulin deficiency and usually requiring lifelong insulin treatment. Pancreatitis and hormonal disturbances may contribute to disease development.

Feline diabetes mellitus: Frequently resembles human type 2 diabetes, involving obesity-associated insulin resistance, glucotoxicity, and progressive β-cell dysfunction. Diabetic remission may occur following improved metabolic control.

Experimental rodent models: Streptozotocin and alloxan induce pancreatic β-cell injury, whereas high-fat diets combined with low-dose streptozotocin reproduce selected characteristics of type 2-like diabetes. Each model has limitations regarding the translation of experimental findings to spontaneous disease.

Natural hypoglycemic compounds: Plant-derived bioactive substances may exert glucose-lowering effects through β-cell protection, improved insulin signaling, inhibition of intestinal carbohydrate-digesting enzymes, and antioxidant or anti-inflammatory activities. However, favorable preclinical results do not necessarily translate into clinical benefits. A randomized clinical trial involving 84 participants did not demonstrate significant improvements in primary glycemic outcomes following 16 weeks of *Ganoderma lucidum* supplementation.

• Conclusions

Diabetes mellitus exhibits important species-specific pathophysiological differences, with insulin deficiency predominating in dogs and insulin resistance playing a major role in cats.

Experimental rodent models are valuable for investigating diabetic mechanisms and evaluating natural hypoglycemic compounds, but no single model fully reproduces spontaneous disease.

Comprehensive metabolic, biochemical, and histopathological assessments, together with further controlled clinical studies, are necessary to establish the therapeutic relevance of plant-derived compounds in veterinary medicine.