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BIGUANIDES IN DIABETES MANAGEMENT: EFFICACY, MECHANISMS, AND FUTURE PERSPECTIVES

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Annotation: Biguanides, particularly metformin, play a crucial role in the pharmacological management of type 2 diabetes mellitus (T2DM), offering significant benefits in glycemic control, cardiovascular risk reduction, and potential implications beyond glucose metabolism. This thesis aims to explore the pharmacological properties, mechanisms of action, clinical efficacy, safety profile, and emerging therapeutic avenues of biguanides in the treatment of diabetes.

Keywords: Diabet**,** biguanides**,** T2DM**.**

Introduction:

Type 2 diabetes mellitus (T2DM) represents a global health challenge, characterized by insulin resistance, impaired glucose metabolism, and increased risk of cardiovascular complications. Biguanides, notably metformin, have emerged as first-line pharmacological agents in the management of T2DM due to their favorable efficacy, safety profile, and pleiotropic effects. This thesis seeks to delve into the multifaceted role of biguanides in diabetes care, shedding light on their mechanisms of action, clinical applications, and potential implications for future therapeutic strategies.

Body:

1. Pharmacological Properties of Biguanides:

- Examination of the chemical structure, pharmacokinetics, and pharmacodynamics of biguanides, with a focus on metformin.

- Overview of the bioavailability, distribution, metabolism, and excretion of metformin in human physiology.

2. Mechanisms of Action:

- Exploration of the various mechanisms through which metformin exerts its effects on glucose metabolism, including inhibition of hepatic gluconeogenesis, enhancement of peripheral glucose uptake, and modulation of insulin sensitivity.

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- Discussion of metformin's impact on cellular energy metabolism, mitochondrial function, and AMP-activated protein kinase (AMPK) activation.

3. Clinical Efficacy and Safety Profile:

- Analysis of clinical trials and observational studies evaluating the efficacy of metformin in glycemic control, reduction of HbA1c levels, and prevention of diabetes-related complications.

- Assessment of the safety profile of metformin, including gastrointestinal side effects, lactic acidosis risk, and potential drug interactions.

4. Cardiovascular Benefits and Beyond:

- Examination of the cardioprotective effects of metformin, including its role in reducing cardiovascular events, improving endothelial function, and mitigating atherosclerosis.

- Exploration of emerging evidence suggesting potential non-glycemic effects of metformin, such as anti-inflammatory, anti-cancer, and neuroprotective properties.

5. Future Perspectives and Therapeutic Implications:

- Discussion of ongoing research efforts to optimize the use of biguanides in diabetes management, including combination therapies, novel formulations, and personalized treatment approaches.

- Consideration of the potential role of metformin in the prevention of T2DM, gestational diabetes, polycystic ovary syndrome, and other metabolic disorders.

Conclusion:

Biguanides, particularly metformin, represent a cornerstone in the pharmacological armamentarium for the management of type 2 diabetes mellitus. Through their multifaceted mechanisms of action, clinical efficacy, and favorable safety profile, biguanides offer significant benefits in glycemic control, cardiovascular risk reduction, and potential implications beyond glucose metabolism. Continued research efforts are warranted to further elucidate the therapeutic potential of biguanides and optimize their use in diabetes care.

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