

Metformin in the Management of Type 2 Diabetes Mellitus: Past, Present, and Future

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Abstract: Metformin has been the cornerstone of type 2 diabetes mellitus (T2DM) management for over six decades. This biguanide medication has demonstrated remarkable efficacy, safety, and cost-effectiveness, maintaining its position as the first-line pharmacological therapy for T2DM worldwide. This comprehensive review examines the historical development of metformin, its mechanisms of action, current clinical applications, safety profile, and emerging therapeutic possibilities. We explore metformin's journey from botanical origins to modern medicine, its pleiotropic effects beyond glycemic control, and potential future applications in various disease states. Understanding metformin's multifaceted pharmacology provides insights into optimizing diabetes care and developing novel therapeutic strategies.

Keywords: Metformin, Type 2 Diabetes, Biguanide, Glucose Metabolism, Cardiovascular Protection, AMPK

