



# Metformin in Modern Diabetes Care: A Comprehensive Perspective

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## DESCRIPTION

Metformin is one of the most widely prescribed medications for the management of type 2 diabetes, valued for its effectiveness, safety profile, and long history of clinical use. Derived from a compound originally found in the plant known as French lilac, this medication has evolved from a botanical observation into a central component of glucose-lowering therapy across the world. Its widespread adoption reflects decades of clinical experience and research demonstrating its ability to improve blood sugar control while offering additional metabolic benefits.

The primary action of metformin is to reduce glucose production in the liver. In people with type 2 diabetes, the liver often releases excessive amounts of glucose into the bloodstream, particularly during fasting periods. Metformin decreases this hepatic glucose output, helping to lower overall blood sugar levels. It also improves insulin sensitivity, allowing muscle and fat tissues to absorb and utilize glucose more effectively. Unlike some other diabetes medications, metformin does not stimulate the pancreas to produce more insulin, which reduces the likelihood of causing hypoglycemia when used alone.

Another notable feature of metformin is its effect on body weight. Many glucose-lowering drugs are associated with weight gain, which can complicate diabetes management. In contrast, metformin is generally weight-neutral and may even support modest weight reduction in some individuals. This characteristic makes it particularly suitable for patients who are overweight or obese, conditions frequently associated with type 2 diabetes. By improving insulin sensitivity and reducing circulating insulin levels, metformin may help limit fat storage and contribute to improved metabolic health.

Metformin is typically administered orally in tablet form, with doses gradually increased to minimize gastrointestinal side effects. Common reactions include nausea, diarrhea, abdominal discomfort, and a metallic taste in the mouth. These symptoms often subside as the body adjusts to the medication, especially when it is taken with meals. Extended-release formulations are available and may improve tolerance for individuals who

experience persistent digestive issues with immediate-release tablets.

Beyond blood glucose control, metformin has demonstrated potential cardiovascular benefits. Studies have indicated that patients taking metformin may experience lower rates of certain cardiovascular events compared to those treated with some alternative therapies. While the exact mechanisms remain under active investigation, improved lipid profiles, reduced insulin resistance, and modest weight changes are believed to contribute to these outcomes. Because cardiovascular disease is a leading cause of illness and death among individuals with type 2 diabetes, medications that support heart health are particularly valuable.

Metformin has also been studied in conditions beyond type 2 diabetes. It is commonly prescribed for women with Polycystic Ovary Syndrome (PCOS), a hormonal disorder associated with insulin resistance, irregular menstrual cycles, and fertility challenges. By enhancing insulin sensitivity, metformin can help regulate menstrual patterns and improve ovulatory function in some patients. Additionally, research continues to explore its potential applications in areas such as prediabetes, gestational diabetes, and even aging-related metabolic changes.

Another consideration is vitamin B12 deficiency, which has been observed in some long-term users of metformin. Reduced absorption of this vitamin may lead to anemia or nerve-related symptoms if left unaddressed. Periodic assessment of B12 levels is recommended, particularly in patients who develop unexplained fatigue, neuropathy, or cognitive changes. Supplementation can correct deficiencies when detected early.

## CONCLUSION

Metformin occupies a central position in the treatment of type 2 diabetes due to its efficacy, safety record, and additional metabolic advantages. By reducing hepatic glucose production and enhancing insulin sensitivity, it addresses fundamental physiological processes associated with hyperglycemia. Its potential cardiovascular and reproductive health benefits further

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broaden its clinical relevance. While careful monitoring is necessary in specific populations, metformin remains a widely trusted option that continues to play a vital role in modern

metabolic care. In clinical practice, metformin is frequently used as an initial pharmacological therapy for type 2 diabetes unless contraindications exist.