

## NOVEL APPROACHES FOR INSULIN DELIVERY: CURRENT STATUS

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### ABSTRACT

Diabetes mellitus is a serious pathologic condition which is responsible for major healthcare problems worldwide and costing billions of dollars annually. Insulin replacement therapy has been used in the clinical management of diabetes mellitus for more than 84 years.

Insulin has remained indispensable in the management of diabetes mellitus since its discovery in 1921. Comparatively, a large percentage of world population is affected by diabetes mellitus, out of which approximately 5-10% with type 1 diabetes while the remaining 90% with type 2.

The present mode of insulin administration is by the subcutaneous route through which insulin is introduced into the body in a non-physiological manner having many challenges. Hence novel approaches for insulin delivery are being explored.

Challenges that have adverse effect on oral route of insulin administration mainly includes: rapid enzymatic degradation in the stomach, inactivation and digestion by proteolytic enzymes in the intestinal lumen and poor permeability across intestinal epithelium because of its high molecular weight and lack of lipophilicity.

Approaches such as liposome, micro emulsions, nanocubicle, insulin chewing gum and so forth have been prepared to ensure the oral delivery of insulin. Attempts have been made to achieve oral insulin delivery using various systems. Scientists have been able to protect the insulin delivery systems from acidic environment of the stomach and target it to the intestine.

Limitations to the delivery of insulin have not resulted in fruitful results to date and there is still a

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### INTRODUCTION

Insulin is a hormone with intensive effects on metabolism and several other body systems (e.g.; vascular compliance). Insulin causes most of the body's cells to take up glucose from the blood (including liver, muscle and fat tissue cells), storing it as glycogen in the liver and muscle and stops use of fat as an energy source. When insulin is absent (or low), glucose is not taken up by most body cells and the body begins to use fat as an energy source (i.e. transfer of lipids from adipose tissue to the liver for mobilization as an energy source). As its level is a central metabolic control mechanism, its status is also used as a control signal to other body systems (such as amino acid uptake by body cells). It has several other anabolic effects throughout the body. When control of insulin levels fails, diabetes mellitus results.<sup>(1,2)</sup>

Diabetes mellitus is a common disease and its complications are responsible for excess morbidity and mortality, loss of independence, and reduced quality of life. Diabetes mellitus is a serious pathologic condition that is responsible for major healthcare problems worldwide and costing billions of dollars annually.

Diabetes develops due to a diminished production of insulin (in type 1) or resistance to its effects (in type 2 and gestational). Both lead to hyperglycemia, which largely energy causes the acute signs of diabetes: excessive urine production, resulting compensatory thirst and increased fluid intake, blurred vision, unexplained weight loss, lethargy and changes in energy metabolism. Monogenic e.g. MODY, constitute 1-5 % of all cases.

Through more convenient drug delivery methods, pharmaceutical companies, regulatory bodies and other government institutions can introduce better diabetes care and reduce costs related to diabetic complications caused by poor compliance." At present, several methods of non-

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