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**EMERGING TECHNOLOGIES FOR ORAL INSULIN DELIVERY**

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Diabetes mellitus is a chronic health condition that affects how the body processes blood sugar (glucose). It is characterized by high levels of glucose in the bloodstream, which can lead to serious health complications if not managed properly. There are two main types: type 1 diabetes and type 2 diabetes. The only treatment for diabetes type 1 is lifelong daily parenteral insulin replacement therapy. Insulin therapy is essential for effectively managing diabetes.

Oral delivery of insulin is favored over subcutaneous administration because of its better patient compliance, non-invasiveness, simplicity, and versatility. However, this method faces challenges from various gastrointestinal barriers that lead to low drug bioavailability and reduced therapeutic effectiveness. To address the challenges of low bioavailability and obstacles to oral insulin absorption, innovative strategies in oral drug delivery and administration have emerged through the integration of various fields within nanoscience and nanotechnology, including nanomedicine, nanobiochemistry, and nano-pharmacy. Key emerging technologies include: nanoparticle systems, microencapsulation, smart polymers, lipid-based delivery systems, peptide conjugation, oral mucosal delivery, tablet and film formulations, 3D printing.

Oral insulin delivery is a promising approach for managing diabetes, aiming to improve patient compliance and convenience. There is no doubt that research on optimizing technologies aimed at improving the effectiveness of oral insulin therapy is necessary to improve the compliance of diabetes treatment and thereby improve the patient's quality of life.