Oral Delivery of Glucagon-Like Peptide-1 and Analogs: Alternatives for Diabetes Control?

Francisca Araújo, M.Sc.,1,2 Pedro Fonte, M.Sc.,1,3 Hélder A. Santos, Ph.D.,4 and Bruno Sarmento, Ph.D.1,2,5

Abstract

Type 2 diabetes mellitus (T2DM) is one of the most prevalent diseases worldwide. Current treatments are often associated with off-target effects and do not significantly impact disease progression. New therapies are therefore urgently needed to overcome this social burden. Glucagon-like peptide-1 (GLP-1), an incretin hormone, has been used to control T2DM symptomatology. However, the administration of peptide or proteins drugs is still a huge challenge in the pharmaceutical field, requiring administration by parenteral routes. This article reviews the main hurdles in oral administration of GLP-1 and focuses on the strategies utilized to overcome them.


Author Affiliations: 1Department of Pharmaceutical Sciences, Centro de Investigação em Ciências da Saúde, Health Sciences Research Center, Instituto Superior de Ciências da Saúde, CESPU, Gandra, Portugal; 2Instituto de Engenharia Biomédica, University of Porto, Porto, Portugal; 3Department of Chemistry, Faculty of Pharmacy, REQUIMTE, University of Porto, Porto, Portugal; 4Division of Pharmaceutical Technology, Faculty of Pharmacy, University of Helsinki, Helsinki, Finland; and 5Department of Pharmaceutical Technology, Faculty of Pharmacy, University of Porto, Porto, Portugal

Abbreviations: (AUC) area under the curve, (DPP-4) dipeptidyl peptidase-4, (GI) gastrointestinal, (GLP-1) glucagon-like peptide-1, (GLP-1R) glucagon-like peptide-1 receptor, (PEG) polyethylene glycol, (PLGA) polylactide-co-glycolide, (T2DM) type 2 diabetes mellitus, (TJ) tight junction

Keywords: exenatide, glucagon-like peptide-1, glucagon-like peptide-1 analogs, liraglutide, oral delivery systems, type 2 diabetes mellitus

Corresponding Author: Bruno Sarmento, Ph.D, Department of Pharmaceutical Technology, Faculty of Pharmacy, University of Porto, Rua Aníbal Cunha, 164, 4050-047 Porto, Portugal; email address bruno.sarmento@ff.up.pt