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Potential Enhancement of Metformin Hydrochloride in Lipid Vesicles Targeting Therapeutic Efficacy in Diabetic Treatment

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Abstract

The potential enhancement of metformin hydrochloride (MH) loaded in lipid vesicles targeting therapeutic efficacy on alloxan-induced diabetic rats was investigated. This involved lipid vesicles formulated with homogenously distributed nano-sized particles by a novel integrated process of multiple emulsification by membrane and solvent evaporation. The average diameter of the water-in-oil (W1/O), W1/O/W2 emulsion droplets, and lipid vesicles was 192 nm, 52 nm, and 173 nm, respectively. The entrapment yield of metformin hydrochloride (MH) in the prepared lipid vesicles was 40.12%. The metformin hydrochloride-loaded lipid vesicles (MH-LLVs) sustained the release of the entrapped drug over a 12-h period and reduced the plasma glucose level of diabetic rats by 77.4% compared with free MH solution (2-h period and 58.2%, respectively) after one week post-diabetic treatment through oral administration of MH-LLV and the free drug. The remarkable improvement in the biochemical parameters recorded in the MH-LLV-treated animals compared with those that received free MH solutions depicted an enhanced kidney function, liver function, as well as oxidative stress status. Pancreatic histology depicted a pancreas with intralobular ducts (ID) and exocrine secretory acini that characterize an intact pancreas, which suggests the ability of the MH-LLVs to restore pancreatic cells to normal, on a continued treatment. Overall, MH-LLV appears an encouraging extended-release formulation with enhanced bioavailability, sustained release, and improved antihyperglycaemic potentials.

Biography

Augustine Chidi Madueke was born in Imo State Nigeria, in 1989. He received his BS degree and master's degree in Biochemistry in 2016 and 2020 respectively (First class honors), from the University of Nigeria Nsukka. He was appointed a Graduate Assistant in the Department of Biochemistry, University of Nigeria Nsukka in 2019 and has currently risen to the level of Assistant lecturer in the same department. He currently secured three fully funded PhD scholarships in the United States of America to begin by fall 2021. He is co-author of 6 publications. His research interest is in the area of drug discovery, drug development and drug delivery. He is keen about understanding the transitions between normal physiology and pathophysiology as well as the molecular and biochemical principles that govern such transitions

Publications

1. Potential Enhancement of Metformin Hydrochloride in Lipid Vesicles Targeting Therapeutic Efficacy in Diabetic Treatment

2. Anti-Ulcerogenic Effect of Unripe Plantain (Musa Paradisiaca) Pulp on Indomethacin-Induced ulcer in Wistar Rat. Tropical Journal of Natural Product Research, 4(10):784-789.

3. Anti-Ulcerogenic Effect of Unripe Plantain (Musa paradisiaca) Pulp on Indomethacin-Induced Ulcer in Wistar Rat

4. Poly gamma glutamic acid nanoparticles in cancer immunotherapy

5. Phytochemical composition and free radical scavenging activity of Curcubita maxima fruit juice

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