INVESTIGATION OF INSULINOMIMETIC ACTION OF COBALT COMPOUNDS WITH PHYSIOLOGICAL SUBSTRATES FOCUSING ON ADIPOGENESIS

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Diabetes mellitus (DM) represents a group of metabolic diseases, with a common feature being high blood glucose levels. Specifically, Type 2 Diabetes mellitus or noninsulin-dependent diabetes is a complex heterogeneous metabolic disorder and is characterized by insufficient insulin production (insulin deficiency) or/and insulin resistance. Insulin resistance raises the need for new compound development in Type 2 Diabetes mellitus substituting insulin. A pivotal effect of insulin on adipocyte tissue is the induction of adipogenesis. Adipogenesis drives pre-adipocytes toward differentiation to mature adipocytes capable of catabolising and storing glucose. The process is a fundamental tenet of research in our Laboratory and is directly related to the discovery of bio-inspired metal-organic materials affecting metabolic pathways in adipogenesis.

To date, metal ions, such as vanadium (V), zinc (Zn) and chromium (Cr), coordinated to physiological substrates, have already been studied and shown positive results inducing adipogenesis in 3T3-L1 in vitro cultures. To that end, the focus of this study is the discovery of new hybrid metal-organic materials based on Co(II) ions. In this context, Co(II)-based material synthesis, with cobalt ions coordinated to α-hydroxy carboxylato ligands, especially the low molecular mass citric acid, emerge with higher solubility and bioavailability. All such bio-based materials have been well-characterized physicochemically in the solid and liquid state. The ultimate goal was that all such bio-materials a) must be atoxic, and b) capable of inducing pre-adipocyte differentiation (adipogenesis).

The collective results project insulinomimetic action of hybrid cobalt-organic compounds, in line with their structure, thus lending credence to metal-induced adipogenesis and raising the need for development of modern biotechnological approaches to treat noninsulin-dependent diabetes mellitus.

Keywords: Metal-organic compounds, bio-based hybrid materials, structure-function correlation, adipogenesis, insulinomimetic action

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