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Vitamin D network in Type-1 Diabetes and diabetic nephropathy in children

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Biography

Dr. Ritamaria Di Lorenzo is a Ph.D. at the R&D Cosmetics Laboratory of the Pharmacy Department at the University of Naples Federico II. Here she develops and conducts efficacy and activity tests for cosmetic products, researches aimed at identifying new APIs to be conveyed in skincare and haircare products. She authors several divulgation articles in Italian technical journals for cosmetic companies. In Spain, she is currently engaged at the DermoCosmetic center of the Institute of Advanced Chemistry of Catalonia, carrying out research projects in hair aging and interracial differences that regulate the different hair permeation of cosmetic treatments.

Abstract

Over time there has been an evolution in cosmetics to find substances that can minimize the signs of aging. In this scenario, peptides play an essential role in obtaining a lifted skin face. The most effective substance used as a lifting ally is the botulinum toxin; subsequently, to its discovery, several biomimetic peptides were synthesized to find other valid compounds. The developed SH-Pentapeptide-5 is an endorphin peptide associated with a delivery system based on Conjugated Linoleic Acid (CLA) amidified with Glutathione. This innovative system, tested in vivo compared to placebo through a single-blind clinical trial, carried out the following actions when applied topically on the panelists' skin face: 1) Soothing action: the CLA is a precursor of the anti-inflammatory PGE2 that gives an anti-aging effect linked to the micro skin inflammations relief. 2) Damaged skin repair: through interaction with the hemidesmosomes. The in vivo tested peptide causes the disassembly of the hemidesmosome chains favoring cell migration towards damaged skin areas to heal tissue wounds. 3) Botox-like effect for endorphin-like action: the peptide acts on the neuromuscular synaptic junction in the facial muscles, where through interaction with its target, delta-opioid receptor, it determines a hyperpolarizing effect on the presynaptic neuron. This hyperpolarization inhibits the acetylcholine release; in this way, muscle excitability is inhibited. As a result, the mimic muscle relaxes, and the expression lines are less visible. Conclusion & Significance: results show that the Gluthathione-CLA-SHPentapeptide-5 is a promising ally in treating typical aging dysfunctions. It can lift face wrinkles and firm the skin when applied twice a day topically for a month. In contrast with other peptides like the botulinum toxin, this system is not an injective treatment; consequently, it does not cause side effects, and in addition, it can be conveyed in cosmetic formulations without the need for medical intervention.

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Importance of Research

Diabetic nephropathy (DN) is one of the most frequent microvascular complications of diabetes mellitus, affecting 25 to 40% of patients with type 1 diabetes (T1D) . It is the single most common cause of end stage renal disease (ESRD) in adults in the Western world. Diabetic nephropathy is marked by pathological changes occurring in the renal glomeruli that lead to the development of albuminuria, hypertension, and progressive decline in renal function . Hypertension is both a feature of, and a risk factor for the progression of diabetic nephropathy . Studies using ambulatory blood pressure monitoring (ABPM) have examined early patterns of blood pressure abnormalities in individuals with diabetes and the link to renal disease progression. Lurbe et al. found that abnormal nocturnal dipping of systolic blood pressure (SBP) was linked to progression of microalbuminuria . while Marcovecchio et al. found that daytime diastolic blood pressure was most predictive of future microalbuminuria .

Traditionally, measurement of microalbuminuria (urine microalbumin/Cr ratio: 30 to 300 mg/g) has been used in the clinical setting to screen for diabetic nephropathy. However, evidence suggests that renal pathological changes such as nephromegaly and glomerular basement membrane thickening develop soon after diabetes diagnosis and much earlier than microalbuminuria can be detected . Several serum and urine markers are increased in children with T1D compared to healthy controls signaling the different aspects of pathophysiology involved in this complication. Of interest to our study, urinary neutrophil gelatinase-associated lipocalin (uNGAL) has been studied extensively as a marker of tubular damage in both acute and chronic kidney disease of various etiologies . Urinary pentosidine is an advanced glycation end product (AGE) that marks oxidative stress caused by tissue exposure to hyperglycemia, and levels of urine pentosidine are elevated in patients with T1D. Changes in the levels of these markers in the urine has been documented in patients with T1D. However, correlation with clinical features of diabetic nephropathy such as blood pressure patterns and with glycemic risk factors has not been fully established.

While the role of overall hyperglycemia, as measured by glycated hemoglobin (HbA1c), in the pathogenesis of diabetic kidney disease is well established , the role of glycemic variability (GV) is an area of debate. In-vitro studies have demonstrated that glycemic excursions are more deleterious to human endothelial cells than sustained hyperglycemia . GV has been linked clinically to the development of diabetic retinopathy and neuropathy in both T1 and T2 diabetes . Using self-measured blood glucose levels, earlier studies concluded that GV was not associated independently with diabetes complications . However, more recent studies using continuous glucose monitoring (CGM) data demonstrated a role for GV in diabetic nephropathy. The specific contribution of GV to the disease process in various stages of DN is yet to be elucidated.

About University:

Arfa Abrar Malik is a PhD research scholar at the Institute of Chemistry, Chinese Academy of Science Beijing China. Her research work is focused on the synthesis of transition metal complexes and the effect of their activities on ethylene polymerization. Her research focus for the duration of her Ph.D. is to synthesize organometallic complexes of Iron and Cobalt and correlate her experimental results with the models/simulations, which she computed during her MS research. She also managed to successfully publish her MS research based on the simulation and models of the transition metal complexes and their enhancement as catalysts in ethylene oligo/polymerization. Currently, she is working as an exchange researcher at the Department of Chemistry, Quaid-i-Azam University Islamabad, Pakistan. Apart from her philanthropic activities, Arfa is Co-Founder at WEmpower Pakistan and also affiliated with this international non-profit organization as the Chief Information Officer and works towards bridging the gap between competent students and academia. She advises students regarding their PhD applications and scholarships.

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