

Fatty acid desaturation in red blood cell membranes of patients with type 2 diabetes is improved by zinc supplementation

By: [Hernandez, MC](#) (Catalina Hernandez, Maria)^{1,1}; [Rojas, P](#) (Rojas, Pamela)^{1,1}; [Carrasco, F](#) (Carrasco, Fernando)^{1,1}; [Basfi-fer, K](#) (Basfi-fer, Karen)^{1,1}; [Valenzuela, R](#) (Valenzuela, Rodrigo)^{1,1}; [Codoceo, J](#) (Codoceo, Juana)^{1,1}; [Inostroza, J](#) (Inostroza, Jorge)^{1,1}; [Ruz, M](#) (Ruz, Manuel)^{1,1}

[View Web of Science ResearcherID and ORCID](#)

JOURNAL OF TRACE ELEMENTS IN MEDICINE AND BIOLOGY

Volume: 62

Article Number: 126571

DOI: 10.1016/j.jtemb.2020.126571

Published: DEC 2020

Document Type: Article

[View Journal Impact](#)

Abstract

Background/Objective: Membrane flexibility can be a determining factor in pathophysiological mechanisms of type 2 diabetes (T2D). As a cofactor of delta-5 desaturase (D5D) and delta-6 desaturase (D6D), and gene expression regulator, zinc may play a role modulating membrane flexibility by increasing membrane polyunsaturated fatty acids (PUFA) abundance. The objective of this study was to evaluate the effect of a 24-month zinc supplementation (30 mg elemental zinc) on membrane fatty acid composition in patients with T2D.

Subjects/methods: Sixty patients with T2D were evaluated. Thirty were randomly assigned to the zinc supplemented group and thirty to the placebo group. Fatty acid composition in red blood cell (RBC) membranes was determined by gas chromatography. Expression of gene encoding for D5D (FADS1), and D6D (FADS2) were evaluated in peripheral blood mononuclear cells by real-time polymerase chain reaction.

Results: After 24 months of supplementation, a greater abundance of docosapentaenoic acid (C22:5 n-3), arachidonic acid (C20:4 n-6), adrenic acid (C22:4 n-6), and total n-6 PUFA was found ($p = 0.001$, $p = 0.007$, $p = 0.033$, $p = 0.048$, respectively). The unsaturated fatty acids/saturated fatty acids ratio, and unsaturation index was increased in the zinc supplemented group at month 24 ($p = 0.003$ and $p = 0.000$, respectively). FADS1 gene was upregulated in the zinc group in relation to placebo at month 12 ($p = 0.020$).

Conclusions: Supplementation with 30 mg/d elemental zinc during 24 months in patients with T2D had

an effect on the composition of RBC membranes increasing PUFA abundance and in turn, improving membrane flexibility. This effect may be mediated by induction of D5D gene expression.

Keywords

Author Keywords: [Diabetes](#); [Zinc](#); [Polyunsaturated fatty acids](#); [Humans](#); [Desaturases](#)

KeyWords Plus: [DELTA-5-AND DELTA-6-DESATURASE ACTIVITIES](#); [ARACHIDONIC-ACID](#); [INSULIN-SECRETION](#); [PLASMA ZINC](#); [RAT-LIVER](#); [DEFICIENCY](#); [RISK](#); [DISEASE](#); [HEALTH](#); [METABOLISM](#)

Author Information

Reprint Address:

Universidad de Chile Univ Chile, Fac Med, Dept Nutr, Independencia 1027, Santiago, Chile.

Corresponding Address: Ruz, M (corresponding author)

+ Univ Chile, Fac Med, Dept Nutr, Independencia 1027, Santiago, Chile.

Addresses:

+ [1] Univ Chile, Fac Med, Dept Nutr, Independencia 1027, Santiago, Chile

E-mail Addresses: mruez@med.uchile.cl

Funding

Funding Agency Show details	Grant Number
Comision Nacional de Investigacion Cientifica y Tecnologica (CONICYT) CONICYT FONDECYT	1120323 1160792
National Agency for Research and Development (ANID)/Scholarship Program/DOCTORADO NACIONAL	2016-21160453

[View funding text](#)

Publisher

ELSEVIER GMBH, HACKERBRUCKE 6, 80335 MUNICH, GERMANY

Journal Information

- **Impact Factor:** [Journal Citation Reports](#)

Categories / Classification

Research Areas: Biochemistry & Molecular Biology; Endocrinology & Metabolism

Web of Science Categories: Biochemistry & Molecular Biology; Endocrinology & Metabolism

Document Information

Language: English

Accession Number: [WOS:000586028000012](#)

PubMed ID: 32534376

ISSN: 0946-672X