Molecular Mechanism Of Punica Granatum On Early Childhood Caries

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Purpose

To infer the molecular mechanism, through network pharmacology, by which *Punica granatum* (pomegranate) acts in early childhood caries (ECC).

Introduction

Early childhood caries is a major public health problem in Mexico and around the world. Despite the treatments currently available for this disease, it continues to affect a large part of the population. Therefore, it is important to search for new compounds that help control this disease. *Punica granatum* (pomegranate) appears to be a promising option due to its antimicrobial and remineralizing properties..

Methods

Genes associated with early childhood caries were searched (DisGeNET), and based on the molecular composition of pomegranate (IMPPAT 2.0), therapeutic targets against proteins were sought. A gene-composite network analysis and a gene ontology analysis (Cytoscape and StringApp) were finally performed to validate these results *in silico*.

Results

Fifty genes associated with Early childhood caries were identified. The interactome of these genes showed that the three molecules with the most interactions were related to the immune system (IL6, TNF, and CXCL8). Gene ontology enrichment demonstrates that genes and their products influence dietary preferences, taste, immune system, biomineralization, and extracellular matrix components. Most of the compounds in *Punica granatum* were terpenoids and fatty acids (Fig 1); its molecular targets associated with ECC were ALOX15, TNF, CA6, MMP13, CXCL8, MMP16, and MMP9 (Fig. 2). Additionally, citric acid and ascorbate bind to Streptococcus mutans proteins, affecting metabolic pathways related to the metabolism of the citric acid cycle and amino acids, among others.

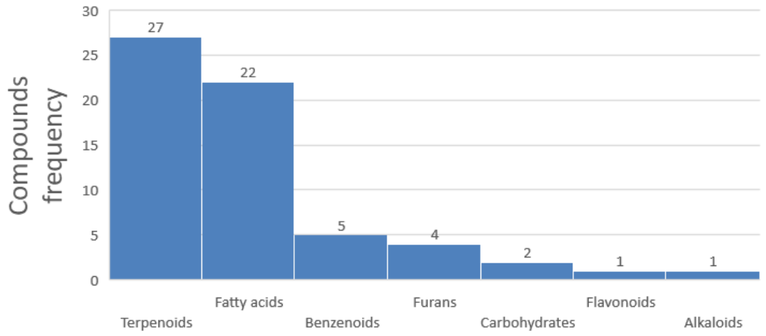

Figure 1. Compounds present in *Punica granatum*

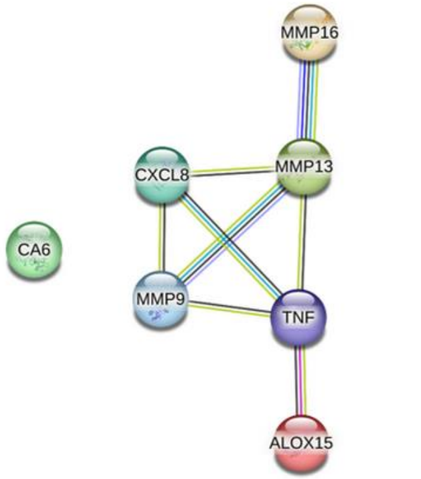

Figure 2. Genes in common between the molecular targets of *Punica granatum* compounds and the genes associated with ECC.

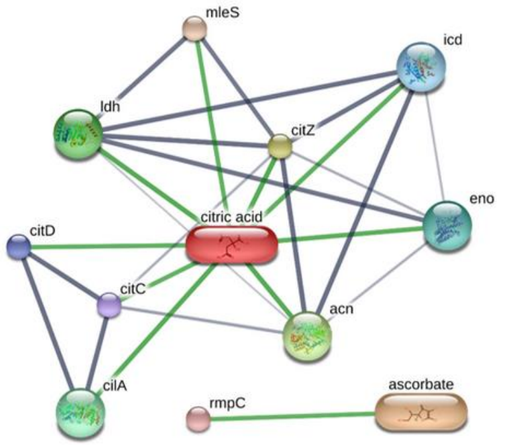

Figure 3. Interactome between two compounds from *Punica granatum* (citric acid and ascorbate) and proteins from Streptococcus mutans.

Conclusions

Pomegranate has many active compounds that contribute to treating ECC. In addition, citric acid and ascorbate affect *Streptococcus mutans*, one of the main cariogenic bacteria (Fig. 3).