

## The Potential Role of Metformin in Relieving Acne Vulgaris by Modifying the Impaired Cellular Signaling Pathway, Responsible for Acne Pathogenesis

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### Abstract

**Introduction:** Acne vulgaris is one of the most common skin disorders, which various factors are involved in its pathogenesis. Recent investigations on intracellular signaling pathway show that the over expression of mTORC1 complex (mammalian target of rapamycin), leads to increased sebum production and altered keratinization, therefore it has an important role in acne pathogenesis. Another studies also showed that the expression of mTORC1 is significantly increased in the skin cells of the patients, which confirm the linkage between acne pathogenesis and mTORC1 over expression. The aim of this study is to represent a way to confront the impaired endocrine signaling, in order to relieve the acne symptoms.

**Methods and Results:** The linkage between acne pathogenesis and endocrine signaling pathway was demonstrated through the collected signaling data from popular scientific databases such as [www.Kegg.Jp](http://www.Kegg.Jp). Insulin resistance is one of the major factors that leads to mTORC1 over expression. Metformin, a biguanide that increases the cell's sensitivity to insulin, is the drug of choice for this condition, as it is able to suppress mTORC1 over expression through AMPK (5' adenosine monophosphate-activated protein kinase) activation. So, applying a topical form of the drug on acne spots, may lead to relieve the symptoms. Topical semi solid formulation of metformin was prepared with the use of suitable thickening polymers and formulation was optimized through the point of viscosity and rheological behaviors of the aqueous gel, so the optimum ratio of the thickening polymers was determined.

**Conclusions:** Signaling pathways show that acne pathogenesis is mediated through mTORC1 over activation, so we were aimed to design a formulation which is able to suppress this over expression in order to relieve acne symptoms. Metformin, formulated in a topical form, is the drug of choice, as it is a safe drug which can suppress the mTORC1 over expression through AMPK activation in the skin of acne patients.

**Key words:** Metformin, mTORC1, Acne Vulgaris, AMPK

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