Acne Vulgaris is Aggravated by Cow's Milk by Activating mTORC1 and Suppressing FoxO1 Pathways

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References

Background

- Acne vulgaris is a disease distinguished by inflammation of the sebaceous follicle and has detrimental effects on the quality of life (Zouboulis et al. 2003; Tanghetti 2013).
- Usually, acne is treated with topical and oral medications (Williams et al. 2012)
- The research investigates the connection between drinking milk and acne inflammation.

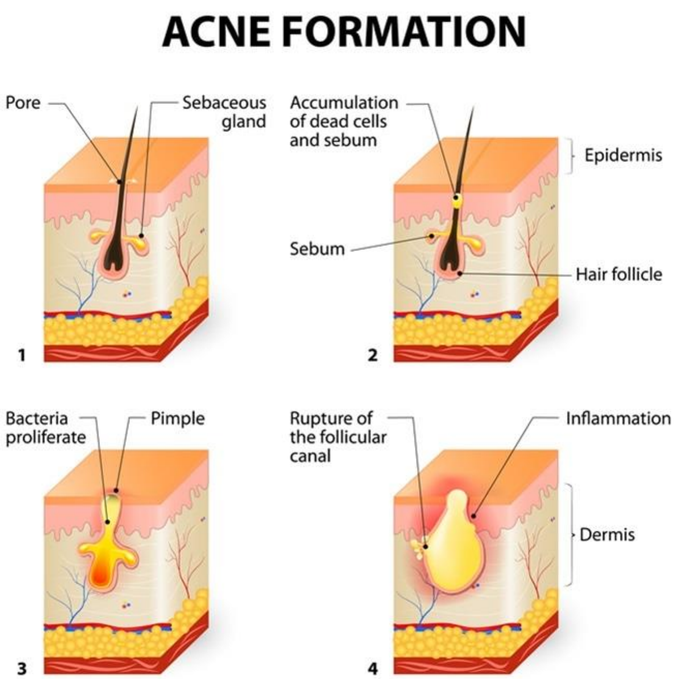

Figure 1. Acne formation in the sebaceous follicle (Bennet, 2018)

A **sebaceous follicle** consists of the **hair** follicle and **sebaceous gland** that secretes oil. When sebum and dead epithelial cells lining the sebaceous follicle **clog the pore**, **bacteria** start to grow in the sebum. The immune system recognizes bacterial markers and reacts with **inflammation** (Tanghetti 2013).

Methods

- Comprehensive literature review of 62 primary and secondary sources on the subject.

Results

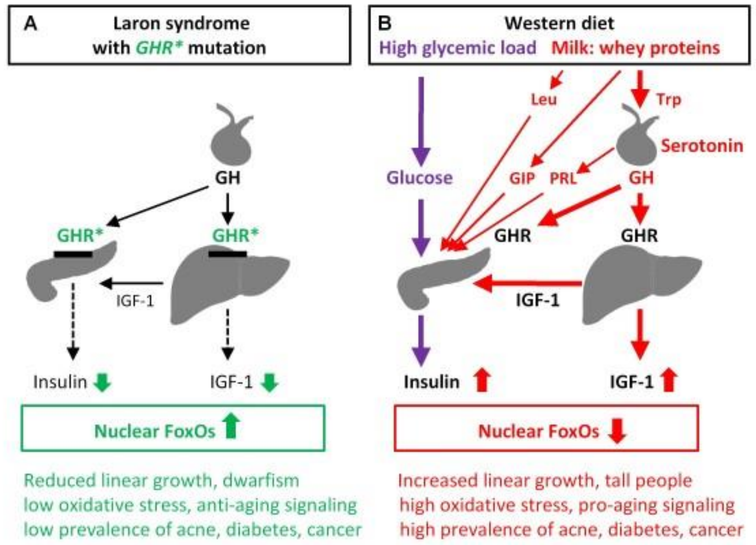

Figure 2. Impact of insulin/IGF-1 signaling in Laron syndrome (A) and Western diet (B) on FoxO-mediated gene regulation (Fig.1 from Melnik et al. 2011).

Milk proteins stimulate pituitary gland, liver and pancreas to **produce insulin and IGF-1**. Decreased **FoxO** nuclear regulator levels cause **increased acne prevalence**. In contrast, people with Laron syndrome (insensitivity to growth hormone) have **decreased levels** of insulin & IGF-1 and low acne prevalence (Melnik et al. 2011).

Milk proteins
- Studies report that drinking milk stimulates acne (Adebamowo et al. 2008).

Insulin IGF-1
- Whey and casein milk proteins influence insulin and IGF-1 levels (Hoppe et al. 2009).

FoxO1↓ mTORC1↑
- Stimulate lipid lipogenesis and keratinocyte growth (Melnik and Zouboulis 2013).

Results

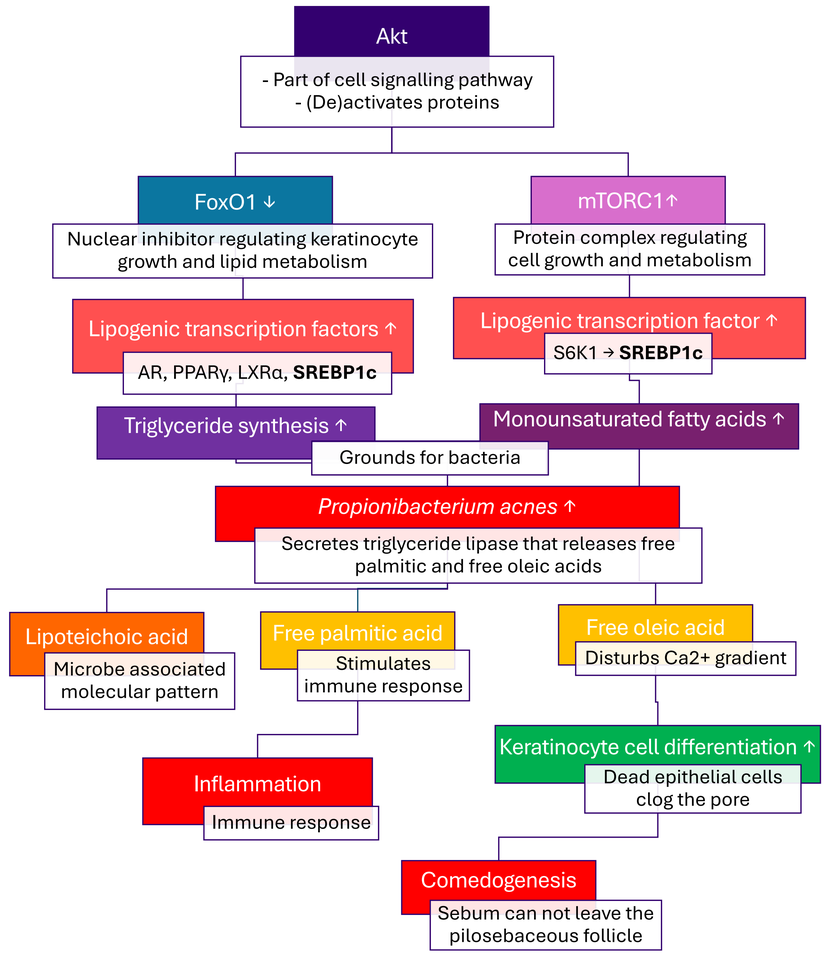

Figure 3. Detailed model of acne pathogenesis

Akt signalling pathway leads to **increased fatty acid** production, then **bacteria overgrowth**. Bacteria secretes markers recognized by **the immune system** and enzymes that releases **palmitic and oleic acids**. **Inflammation and comedogenesis** follow (Melnik 2016).

Conclusion

- All four factors: excessive sebum secretions, increased keratinocyte differentiation, bacterial overgrowth, and inflammation of the *acne vulgaris* disease are influenced by milk consumption (Tanghetti 2013).
- Limiting milk intake can help patients control mild & moderate acne, which constitutes most cases (Williams et al. 2012).