The Synthesis, Properties, & Application of Salicylic Acid in the Treatment of Acne

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Introduction

 настоящее салициловая кислота — название происходит от Salix (латинское название осины);

 настоящее органический — химически синтезирован и биосинтезирован;

 настоящее функционирует как гормон в растениях — защита от патогенов;

 настоящее обширный набор преимуществ и использование

 • применение в пищевой химии, текстильной, медицинской, косметической, дерматологической

 ❈ пищевой химии — консерванты

 ❈ текстильной — синтез красителей; используется для его антибактериальных свойств

 ❈ медицинской — облегчение лихорадки и боли

 ❈ косметической — консерванты; имеет отшелушивающие и очищающие свойства

 ❈ дерматологической — себорейная дерматит, вирусныеwart, psoriasis, acne vulgaris, и т.д.
Background

4000 BC – Assyrians used the extracts of willow leaves to treat painful musculoskeletal joint pain conditions, as well as an antipyretic drug to reduce fever.

400 BC – Hippocrates (Greek physician; known as the “father of Western medicine”) used willow bark extract to treat fever and relieve pain associated with childbirth.

1828 – Johann Buchner was the 1st to extract and purify salicin (later determined to be the pharmacological active compound in 1935 by Raffaele Piria) from willow bark.

1859 – Kolbe & Schmitt discovered the Kolbe-Schmitt reaction to chemically synthesize salicylic acid from phenol, allowing for it to be produced on a large commercial scale.

1893 – Felix Hoffman was the 1st to synthesize pure and stable acetylsalicylic acid (known as aspirin).
Synthesis of Salicylic Acid

_synthesis from natural sources_  

_synthesis from industrial sources_  

Chemical reactions:

1) CO₂, NaOH
2) H₂SO₄
Salicylaldehyde from Meadowsweet Flowers (Filipendula ulmaria)

- Extracted by Pagenstecher (Swiss pharmacist) as early as 1835.
- Oxidized by Lowig (German chemist).

![Salicylaldehyde and Salicylic Acid](image.png)
Industrial Synthesis from Phenol

Kolbe-Schmitt Reaction by Hermann Kolbe & Rudolf Schmitt in 1859
Chemical Properties

- **Common Name:** Salicylic Acid
- **Molecular Formula:** \( C_7H_6O_3 \)
- **Molecular Weight:** 138.12074 g/mol
- **IUPAC Name:** 2-hydroxybenzoic acid → \( \alpha \)-hydroxy acid
- **Appearance:** Colorless Crystalline Powder to White Needle-Shaped Crystals
- **Odor:** Odorless
- **Taste:** Acrid
Beneficial Properties

- Antibacterial
- Antifungal
- Antiseptic
- Antipyretic
- Anti-Inflammatory
- Keratolytic
- Comedolytic
- Bacteriostatic
What is Acne Vulgaris?

It’s a common chronic disease of the pilosebaceous unit of the skin, affecting more than 80% of adolescents and often persists into adulthood.

Cause – obstruction of the pilosebaceous canal

Characteristics

- oily skin (excess sebum production)
- non-inflammatory lesions (open/closed comedones)
- inflammatory lesions (papules, pustules, and nodules)

Normally affects the face, upper chest, and back – areas that have the densest amount of sebaceous follicles.
PATHOGENESIS OF ACNE

A. Early comedone
   - Infundibulum
     - hyperkeratosis
     - corneocyte cohesiveness
   - Androgen stimulation of sebum secretion

B. Later comedone
   - Accumulation of shed keratin and sebum
   - Formation of whorled lamellar concretions

C. Inflammatory papule/pustule
   - Propionibacterium acnes proliferation
   - Sebaceous lobule regression
   - Mild inflammation

D. Nodule/cyst
   - Marked inflammation
   - Scarring
Salicylic Acid – Acne Treatment

Salicylic acid is applied topically to the skin affected by acne vulgaris.

- strong keratolytic and comedolytic agent
- increases penetration of other products
- has a slight anti-inflammatory effect
- bacteriostatic and fungistatic at low concentrations – competitive inhibition of pantothenic acid
Designing an experiment that incorporates the synthesis of salicylic acid from a natural source, such as the flowers of the meadowsweet plant, wintergreen plant, or bark from the willow tree, and utilizing the salicylic acid to make a more natural product used to treat acne, rather than using industrially synthesized salicylic acid.
References