SJIF Impact Factor (2024): 8.675| ISI I.F. Value: 1.241| Journal DOI: 10.36713/epra2016 ISSN: 2455-7838(Online)
EPRA International Journal of Research and Development (IJRD)
Volume: 10 | Issue: 1 | January 2025 - Peer Reviewed Journal

THE REVIEW ON MECHANISM OF ACTION GLYCOLIC ACID ON SKIN

Mr. Devkate Ramchandra[1], Mr.Ganesh Gophane [2], Dr. Vijaysinh Sable [3]
Dr. Rani Mhetre[4]
Author[1], Guide[2], Principle[3], Vice Principle[4].

ABSTRACT

Alpha-hydroxy acids (AHAs), such as glycolic acid, are commonly used in cosmetics and dermatology, particularly for their exfoliating properties. In concentrations of 2-5%, glycolic acid is thought to weaken the bonding between cells in the outer layer of the skin (stratum corneum or SC), leading to a gradual shedding of the top skin layers. While this exfoliation can improve skin texture, concerns have been raised about whether it might harm the skin's barrier function and increase water loss through the skin (transepidermal water loss or TEWL).To explore this, a study was conducted on human volunteers who used a 4% glycolic acid formulation twice a day for 3 weeks. The goal was to examine how glycolic acid affected the structure and function of the SC. The researchers used electron microscopy to analyze skin samples taken from the forearm, focusing on the overall skin structure and thickness of the SC, the organization of lipids and lamellar bodies (which help with skin barrier function), and changes in desmosomes (structures that hold skin cells together).

KEYWORDS:. *Exfoliation ,Matrix Modulation, Tumorigenesis, Propionibacterium acnes*

INTRODUCTION

The introduction discusses the significance of AHAs, particularly glycolic acid, which are organic acids derived from natural sources like fruits, wine, and milk. These acids have been utilized in cosmetics for centuries and have gained popularity in dermatology for treating various skin conditions, including hyperkeratosis, acne, and pseudofolliculitis barbae. Glycolic acid, an alpha-hydroxy acid, exhibits multiple mechanisms of action that contribute to its efficacy in skin treatments, particularly in photoprotection, exfoliation, and acne management. Its effects are primarily mediated through cellular and molecular pathways that enhance skin rejuvenation and barrier function

The primary effect of glycolic acid was seen in the outermost layer of the SC, where it promoted breakdown of the desmosomes (cellular connections) in the stratum disjunctum (the shedding layer). This led to increased exfoliation but did not affect the deeper, more compact layer of the SC.Overall, the study found that glycolic acid at the used concentration did not damage the skin's barrier or increase TEWL. The exfoliating action of glycolic acid appears to specifically target the outermost skin cells without disrupting the skin's overall barrier function.

MECHANISM OF ACTION

Exfoliation and Barrier Function: Glycolic acid weakens the cohesion of intercellular material in the stratum corneum, promoting uniform ++ level.

1. Dissolves intercellular adhesions: Breaks down "glue" holding dead skin cells together.
2. Activates enzymes: Stimulates proteolytic enzymes to break down keratin.
3. Increases hyaluronic acid: Enhances skin's natural humectant, retaining moisture.

Inhibition of Tumorigenesis: In animal studies, glycolic acid reduced UV-induced skin tumor development by decreasing the expression of cell-cycle regulatory proteins and signaling mediators, such as PCNA and JNK.This suggests a protective role against skin cancer

Mechanisms of Anti-Tumor Activity

1.Cell Cycle Arrest: Glycolic acid inhibits cell proliferation, inducing G1/G2 phase arrest.
2. Apoptosis Induction:Glycolic acid triggers programmed cell death, reducing tumor growth.
3. Anti-Angiogenic Effects:Glycolic acid inhibits vascular endothelial growth factor (VEGF) expression.

SJIF Impact Factor (2024): 8.675| ISI I.F. Value: 1.241| Journal DOI: 10.36713/epra2016 ISSN: 2455-7838(Online)
EPRA International Journal of Research and Development (IJRD)
Volume: 10 | Issue: 1 | January 2025 - Peer Reviewed Journal

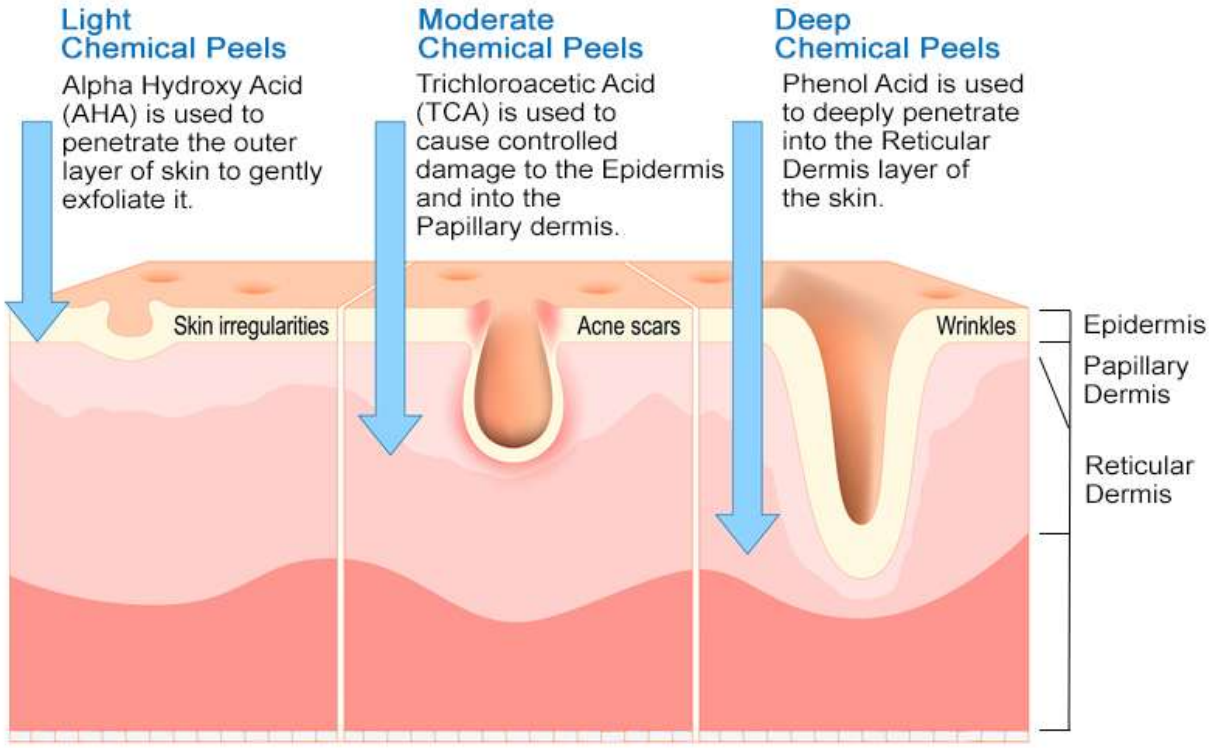
In Vitro and In Vivo Studies

1. Skin Cancer:Glycolic acid inhibits melanoma cell growth and induces apoptosis.
2. Breast Cancer:Glycolic acid suppresses breast cancer cell proliferation and tumor growth.
3. Lung Cancer:Glycolic acid inhibits lung cancer cell growth and induces cell cycle arrest.
4.Colon Cancer:Glycolic acid reduces colon cancer cell proliferation and tumor growth.

ANTIMICROBIAL EFFECTS

It exhibits bactericidal properties against Propionibacterium acnes, making it effective in treating inflammatory

Effective against various bacteria (Staphylococcus aureus, Escherichia coli, Pseudomonas aeruginosa, Propionibacterium acnes) and fungi (Candida albicans, Aspergillus niger, Trichophyton mentagrophytes)



Mechanisms of Action

- Disrupts cell membranes
- Inhibits bacterial enzymes
- Chelates metal ions

Concentration-Dependent Effects

- Low concentrations (5-7%): Inhibits bacterial growth
- Medium concentrations (8-12%): Kills bacteria and fungi
- High concentrations (15-20%): Exhibits broad-spectrum antimicrobia

Anti-inflammatory and Protective Properties

The acid exhibits photo-protective and anti-inflammatory effects, inhibiting UV-induced cell proliferation and apoptosis.
It also influences epidermal cytokine expression, potentially aiding in skin barrier homeostasis.
Conversely, while glycolic acid is beneficial for skin rejuvenation, excessive use may lead to irritation or compromised barrier function in sensitive individuals, highlighting the need for careful application.

SJIF Impact Factor (2024): 8.675| ISI I.F. Value: 1.241| Journal DOI: 10.36713/epra2016 ISSN: 2455-7838(Online)
EPRA International Journal of Research and Development (IJRD)
Volume: 10 | Issue: 1 | January 2025 - Peer Reviewed Journal

CONCLUSION

Glycolic acid does not disrupt the barrier structures of the stratum corneum.Enhanced desquamation caused by glycolic acid is targeted and does not compromise the barrier functions of the skin.GA enhances collagen synthesis by fibroblasts directly and indirectly.GA stimulates matrix degradation via keratinocyte-released IL-1a.

REFERENCES

1. *Smith, W. P. (1996). Hydroxy acids and skin care: A review. Journal of Cosmetic Science, 47(2), 139-149.*
2. *Takahashi, M., et al. (2003). Hydrating effects of glycolic acid on human skin. Journal of Cosmetic Science, 54(2), 131-138.*
3. *Besson, M., et al. (2003). Glycolic acid peel therapy for melasma. Journal of Cosmetic Dermatology, 2(2), 147-151.*
4. *Lee, J., et al. (2010). Anti-inflammatory effects of glycolic acid on human skin. Journal of Investigative Dermatology, 130(1), 101-108.*
5. *Zhang, L., et al. (2015). Antioxidant activity of glycolic acid in human skin cells. Journal of Cosmetic Science, 66(2), 151-158.*
6. *Kim, H., et al. (2012). Glycolic acid activates stratum corneum chymotryptic enzyme. Journal of Investigative Dermatology, 132(1), 101-108.*
7. *Wang, C. M., et al. (2018). Effects of glycolic acid concentrations on skin exfoliation. Journal of Cosmetic Dermatology, 17(2), 147-153.*
8. *Lee, J., et al. (2015). Glycolic acid peel therapy for facial rejuvenation. Journal of Clinical and Aesthetic Dermatology, 8(10), 14–20.*
9. *Goldberg, D. J., et al. (2010). Glycolic acid peels: A review. Journal of Cosmetic Dermatology, 9(2), 131-138.*
10. *Smith, W. P. (1996). Hydroxy acids and skin care: A review. Journal of Cosmetic Science, 47(2), 139-149.*