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Review Article

Beyond Beauty: The Emerging Role Of Snail Slime In Healthcare And Cosmetics

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ABSTRACT

Snail slime (SS), also known as snail mucin or snail secretion filtrate, has emerged as a promising natural bioactive substance with extensive applications in cosmetics, pharmaceuticals, and nutraceuticals. Secreted by snails for locomotion, protection, and hydration, SS contains a unique combination of glycoproteins, glycosaminoglycans, hyaluronic acid, glycolic acid, allantoin, collagen, elastin, peptides, vitamins, and essential minerals. These bioactive constituents exhibit moisturizing, antioxidant, anti-inflammatory, antimicrobial, wound-healing, and regenerative properties, making snail mucin a valuable ingredient in modern skincare formulations. Scientific studies suggest that SS enhances skin hydration, stimulates collagen synthesis, improves elasticity, reduces wrinkles, accelerates wound healing, and minimizes acne scars and hyperpigmentation. Beyond dermatological applications, emerging evidence indicates its potential therapeutic role in managing burns, ulcers, inflammatory disorders, and tissue regeneration, although further clinical validation is required. Ethical and sustainable production practices, including non-lethal extraction methods and responsible snail farming, have become increasingly important to ensure product safety and animal welfare. Recent investigations have also highlighted the nutritional and prebiotic potential of SS, supporting its classification as a nutraceutical or pharmafood. Despite its growing popularity, additional standardized research is needed to establish its long-term efficacy, safety, and therapeutic applications. Overall, snail slime represents a multifunctional natural biomaterial with significant potential in healthcare, skincare, and functional food industries.

INTRODUCTION

For millennia, people have been fascinated by snails, which are slow-moving molluscs with

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spiral shells. These amazing animals can be found in a variety of settings, from gardens to the ocean. Despite being perceived as garden pests, snails are essential to ecosystems as decomposers and sources of food for a variety of animals.[1] Over millions of years, their distinctive anatomy which includes a protective shell and a muscular foot for movement—has developed. In addition to their ecological significance, snails have been incorporated into human culture through their use in food, art, and even beauty and health products. Their seemingly straightforward existence conceals a sophisticated biochemistry that still fascinates both scientists and nature lovers.[2]

Scientifically referred to as snail mucin or snail serum, snail slime (SS), a naturally occurring mucus released by snails for protection and movement, has become an unlikely star in the health and beauty industry.[3] Because of its potential advantages, SS has become very popular in the health and beauty product industries. A viscous secretion derived from various snail species is called snail slime (SS).[4]

Snail mucin is most frequently used in moisturisers, serums, and essences for skin care. These products frequently promise to solve several skin issues at once, such as dryness, dullness, uneven texture, and fine wrinkles. With consistent use, some consumers experienced better skin healing, less acne scars, and a more luminous complexion.[5] Complex, high-molecular glycoproteins found in snail slime include polysaccharides, hyaluronic acid, elastin, collagen, allantoin, and vitamins C, E, A, B6, and B12. The popularity of snail slime in the cosmetics sector can be attributed to its rich composition.[6] Because slime can absorb water, it keeps wrinkles from forming. These compounds remove dead skin cells, reduce inflammation and allergic reactions, and fight the signs of ageing skin. They aid in the healing of wounds and the reduction of wrinkles, stretch marks, and scars.[7]

Others stated that regular use improved general skin health, reduced fine wrinkles, and improved skin texture. Snail mucin products have been especially popular in Korean and Japanese skincare regimens, which have had a big impact on worldwide beauty trends. It is a mainstay in anti-aging formulas due to its capacity to moisturise, heal, and revitalise skin.[8]

SS has potential uses in medicine in addition to cosmetics. According to some research, its growth factor levels and antibacterial qualities may help speed up wound healing and lessen scarring.[9] This has sparked interest in using it to heal burns, small cuts, and even skin diseases like rosacea and eczema. It is crucial to remember that although there is a lot of anecdotal evidence, there are presently few thorough clinical research on these uses.[10]

Because of their advantageous dermatological qualities, the secretions of the molluscs *Cornu aspersum* (previously *Helix aspersa* and *Cryptomphalus aspersa,* or common brown garden snail) and Achatina fulica (African giant land snail) are frequently found in various cutting-edge skincare products.[11]

Characteristics of Snail Mucus: [12]

1. antiviral, antifungal, and antibacterial properties.
2. The healing of wounds and burns.
3. Stomach ulcer activity.
4. Atopic dermatitis activity, and 5. Chronic bronchitis action.
5. Action in rheumatic conditions, toothaches, and bone fractures and regeneration.
6. Activity in the treatment of cancer, including breast, lung, colon, bladder, and skin (melanoma).

7. The role of antioxidants in the ageing of skin.
8. Action to repair scars, wrinkles, and skin blemishes (water pulling).
9. Mucus's antibacterial and anti-inflammatory properties in complexes with zinc and precious metals (colloidal nano silver and nanogold).

Table 1: Various food composition of snail slime [13]

Species	Nutritional value
H. pomatia	12.3% crude protein, 0.7% fat, 1.9% ash, 79.4 moisture, 33% edible portion.
Achatina (African achatina)	protein 0.12%, fiber 4.06%, fat 0.78%, ash 2.00%, NFE 93.04%, zinc 9.83 mg/l, manganese 4.31 mg/l, copper 6.47 mg/l, iron 251.23 mg/l
H. fulica	protein 0.30%, fiber 3.93%, fat 0.38%, ash 10.00 mg/l, NFE 82.36%, zinc 8.02 mg/l, manganese 16.98 mg/l, copper 5.51 mg/l, iron 37.04 mg/l
H. lucorum	Protein 8.77–10.8%, Fat 1.5–4.2%.

Literature Review:

Wong KC et.al., (2026): [14]

This review demonstrated that snails served as a promising source of antimicrobial peptides and proteins with broad-spectrum activity against Gram-positive, Gram-negative, and multidrug-resistant pathogens. The identified peptides exhibited diverse structures and multiple antimicrobial mechanisms, highlighting their potential applications in medicine, aquaculture, and cosmetics for combating antimicrobial resistance.

Max Oscherwitz et.al., (2024): [15]

Studied that snail mucin is a multifunctional natural biomaterial with promising applications in dermatology and regenerative medicine. Its diverse composition and biological activities support its use in wound healing, skin repair, anti-aging therapies, and cosmetic formulations. Continued research is expected to further expand its therapeutic applications and strengthen its role in modern pharmaceutical and dermatological practice.

Turgut AC (2023): [16]

This review showed that mollusks were recognized for their ecological and economic importance and as a source of bioactive compounds for cosmetic applications. The Indian cosmetic industry increasingly adopted snail mucin because of its hyaluronic acid, glycoproteins, and antimicrobial peptides, which improved skin hydration, reduced wrinkles and acne scars, and enhanced overall skin health, thereby driving market growth.

Objectives:

1. To review the composition and bioactive constituents of snail slime.
2. To summarize the methods of extraction, production, and processing of snail mucin.
3. To critically evaluate the current evidence on the therapeutic, dermatological applications of snail mucin.
4. To identify the current challenges, safety considerations.

Extraction and Production [17,18,19,20,21,22]

The growing demand for snail mucin in pharmaceuticals and cosmetics has drawn a lot of

interest to SS extraction and production in recent years. From snail farming to extraction and processing, there are multiple steps in this process, each with its own set of procedures and moral considerations.

The most often farmed species for mucin production in heliciculture, or snail farming, the basis of SS production, is *H. aspersa.* Environmental elements including temperature (20°C–25°C), humidity (75%–95%), and light exposure must be carefully controlled for snail farming to be successful. Usually, enclosed systems with soil-filled pens or plastic containers are used to keep snails. To maintain optimum health and mucin synthesis, their diet consists of vegetables high in calcium and specifically prepared feeds. Maintaining a healthy snail population requires effective disease control and cleanliness.

Snail mucin can be extracted using a variety of processes, from conventional to more contemporary. One non-lethal technique is stimulated production, in which snails are stimulated with acid to create mucin. Sadly, certain deadly techniques—such as crushing entire snails or employing solvent extraction, mechanical stimulation, or centrifugation—remain in use, raising serious ethical questions.

The raw mucin goes through a number of processing stages after extraction. These usually comprise lyophilization (freeze-drying) to create a stable powder form, centrifugation to separate various mucin components, filtration to remove debris and impurities, and sterilisation to guarantee product safety for usage in cosmetics or pharmaceuticals. To separate particular bioactive substances from the mucin, sophisticated methods like chromatography and ultrafiltration may be used.

Adopting sustainable practices is crucial for the industry's long-term survival and to reduce its negative effects on the environment. This entails improving agricultural conditions to minimise resource use, creating more effective and compassionate extraction techniques, and looking into ways to make use of snail farming byproducts. Several ethical issues are brought up by the mining and manufacturing of SS. Non-lethal extraction techniques are favoured to reduce damage to snails, with animal welfare being the top priority. The introduction of non-native species into local ecosystems could result from improperly managed snail farming, which raises further environmental concerns. Sustainable farming methods are therefore essential to reducing this danger.

The cosmetics industry is under increasing pressure to be transparent about the origins and manufacturing processes of snail mucin. For their snail mucin products, certain businesses (like Lumacheria Italiana srl.) have created a novel "cruelty-free" Cherasco process. Furthermore, the manufacturing of snail mucin for medicinal or cosmetic purposes must adhere to all applicable laws and safety requirements. This involves making certain that dangerous pollutants are not introduced by extraction and processing techniques.

Composition of Snail Slime [23,24,25,26,27]

Water (90%–99.7%) and a variety of other chemicals make up the majority of SS, a complex bioactive material. Usually, the dry weight consists of 1.3%–1.6% mucopolysaccharides, 3%–5% GAGs, and 5%–9% proteins. Glycollic acid (GA) (up to 4%), hyaluronic acid (HA) (<1 mg/g), and allantoin (0.3%–0.5%) are important constituents. Collagen, elastin, and other glycoprotein enzymes are also present in the slime, all of which contribute to its alleged skincare advantages. GA improves skin texture and

encourages cell turnover by acting as a mild exfoliator. HA is a potent humectant that attracts moisture to the skin and aids in maintaining hydration because it can hold up to 1000 times the water of its weight.

This ingredient plumps up and lessens the appearance of fine wrinkles by deeply hydrating the skin. The moisturising qualities of SS-based cosmetics are frequently attributed to the presence of HA. While the proteins and peptides in mucin may promote the formation of collagen and skin suppleness, allantoin is well-known for its calming and restorative qualities. SS also contains collagen and elastin, two proteins essential for skin elasticity and structure. These proteins are critical for preserving the suppleness of the skin and minimising the visibility of wrinkles and fine lines. They are found in snail mucus, which is why many anti-aging medications contain them. The components of this natural material act in concert to promote skin regeneration, increase collagen formation, and deliver high antioxidant benefits, resulting in a robust blend of moisturising, exfoliating, and healing capabilities.

SS also contains trace levels of vitamins A, C, and E as well as mineral salts Ca, Mg, Zn, Cu, and Fe. Their bioactive qualities are influenced by copper and antimicrobial peptides. The kind of snail, the environment, and the extraction technique all affect the precise makeup.

Why Do Snails Make Mucus? [28]

Mucus is produced by snails for a variety of reasons. For example, a snail's foot mucus facilitates its movement.

Snails can hang upside-down thanks to the glue-like properties of snail mucus. Additionally, slime trails are used by snails to locate one another and occasionally prey. Because snail mucin has antibacterial qualities, it aids snails in preventing infection.

How Snail Mucin Is Used [29]

Once you've selected a moisturiser or serum that contains snail mucin, follow the guidelines on the package.

Experts in skin care typically advise the following morning routine:

- Cleaner
- Serum
- Cream for the eyes
- A moisturiser
- Sunscreen

Exfoliation, repair, and hydration should be the main goals of your nightly regimen.

Give your regular time to work and exercise patience.

How frequently should snail mucin be used?

Snail mucin was used once or twice daily in the majority of trials examining its effects.

Is Mucin from Snails Safe?[30]

You run the risk of experiencing discomfort or an allergic response whenever you incorporate a new product into your skin care regimen. Dermatologists advise you to test any new products on a tiny area of skin to see your reaction. A test patch works well on your inside elbow.

Snail slime in nutrition and diet

Due to its distinctive makeup, which includes glycoproteins, glycollic acid, hyaluronic acid, and different enzymes, interest in the nutritional potential of SS has grown in recent years.[31] Skin care is one of the most well-documented applications of SS. Although topical treatments

have been the main emphasis, ingesting SS may help improve skin health from the inside out. However, more investigation is needed to support these assertions in people. According to studies, snail mucin has anti-inflammatory qualities that may help lessen conditions linked to inflammation. [32] Including snail slime in the diet may be beneficial for health because inflammation is a contributing factor to many chronic illnesses, especially those involving inflammatory bowel disease (IBD). By functioning as a prebiotic and encouraging the growth of advantageous gut flora, the mucin in SS may promote digestive health.[33] Snail slime may help maintain a healthy gut flora, which is essential for general health. Proteins and peptides, glycosaminoglycans, allantoin, glycolic acid, collagen, essential and non-essential amino acids, and trace minerals are among the complex mixture of bioactive substances that are responsible for this. It is a potentially valuable source of protein, with a protein concentration ranging from 40% to 50% of dry weight. The review revealed that the biological value of snail mucin proteins is similar to that of certain traditional protein sources. The amino acid profile is appropriate for dietary supplementation since it contains all of the necessary amino acids, with glycine and proline having very high concentrations.[34] SS can be promoted as a natural source of nutrients as a new nutritional supplement, especially in health drinks and smoothies. Although consumer acceptance and knowledge of suitable dosages continue to be obstacles, its integration may offer a distinctively flavoured supply of proteins and beneficial chemicals. Although SS is frequently used in cosmetics, its culinary uses have received less attention. Some cultures eat wild snails, which may contain mucin. To take use of SS's nutritional qualities and improve its culinary profile, infusions or extracts could be created. However, it is important to carefully control customer perceptions about food derived from snails as well as regulatory constraints.

It is clear that consuming SS will be an intentional endeavour to gain its pharmacological activity in the body, in accordance with scientific evidence regarding its medical applications. As a result, SS can be categorised as a nutraceutical or pharmafood.[35] Studies have indicated that eating SS may have prebiotic effects, despite the paucity of literature; nevertheless, these findings are mostly based on in vitro research. More research is needed to determine the effect on the human gut flora. In the meanwhile, the collagen and elastin content may improve joint health similarly to how it affects the skin.[36]

Snail mucin's applications in skin

Snail mucin's widespread media appeal stems from its skincare benefits, which include antiaging, acne, scarring, hyperpigmentation, and hydration, among other things.

Anti-aging

Snail mucin's antiaging properties have been mentioned in a number of ways. The body naturally produces less collagen and elastin as it ages, however certain glycoproteins and peptides have been shown to increase fibroblast production of these substances. A decrease in the glycosaminoglycans and proteoglycans that make up skin and an increase in matrix metalloproteinase production are two factors that have been linked to the ageing process of skin. This gives the skin more suppleness and a more young, firm appearance. In addition, a Helix Complex preparation was made using purified snail mucin from Helix aspera muller mucus, a common species utilised in cosmetic products. When this Helix Complex was added to fibroblast cultures, it both directly and indirectly indicated for fibroblast growth by rearranging the

cytoskeleton and releasing cytokines. It also helped shield cells from apoptosis. Mucin from the other common snail species, *Cryptomphalus aspersa*, also induced fibroblasts by maintaining the actin cytoskeleton and regulating metalloproteinase activity. In a study involving 25 patients, mucin from this species improved coarse periocular and fine facial rhytids when used daily for 8 and 12 weeks. The silicone skin imprints taken before and after application also showed an improvement in skin texture.[37]

Hydration:

Snail mucin's capacity to hold onto moisture in the skin is highlighted by the presence of hyaluronic acid, a potent humectant. Hyaluronic acid is a glycosaminoglycan that stabilises the extracellular matrix and retains hydration because of its special helical coil, which enables it to retain 1000 times its weight in water. Trans epidermal water loss (TEWL) was measured using a Tewameter and corneometer probe in healthy Caucasian female participants to examine the hydration properties of H. aspera mucin. TEWL was shown to be reduced immediately after application, after one hour, and at twenty-four hours. [38]

Anti-acne:

Snail mucins previously mentioned antibacterial and anti-inflammatory properties are partly responsible for its anti-acne advantages. Patients with mild-to-moderate "maskne," or acne brought on by mask use, were used to test a combination serum made of snail secretion filtrate, Calendula officinalis, and Glycyrrhiza glabra root extract. Although there were no changes in the erythema score, noninflammatory lesions, or sebum levels, the therapy group showed a higher percent reduction in inflammatory acne lesions after 12 weeks. Glycolic acid and lactic acid, two exfoliative acids included in snail mucin, can also aid in unclogging pores and lowering the production of sebum, which is a factor in the pathophysiology of acne.[39]

Scarring and hyperpigmentation

Snail mucin is used cosmetically to treat skin damage or acne scars that are frequently left behind, much like wound healing. Human keratinocytes and fibroblasts were observed to proliferate and migrate more when exposed to snail mucin from *Cryptomphalus Aspersa* in a dose-dependent and time-dependent manner. Additionally, an increase in the expression of the adhesion proteins vinculin, β-catenin, E-cadherin, and β1-integrin was noted, indicating the probable pathophysiology of scar repair. [40] Exfoliative alpha-hydroxy acids, like lactic acid, are another substance frequently used to heal scars. These acids work by releasing connections between desmosomes in the epidermis, allowing other treatments to penetrate deeper. Although they are not the main components of snail mucin, lactic acid and glycolic acid are also present in trace amounts, suggesting a potential treatment for scars. Because of its keratolytic qualities and ability to stimulate the growth of new skin cells, glycolic acid targets atrophic acne scars and post-inflammatory hyperpigmentation.[41]

CONCLUSION:

The benefits of snail mucin are being investigated and incorporated into cosmetic and pharmaceutical products at an exponential rate. Other naturally occurring compounds cannot match the special constituent mix and bio adhesive structure. Economic forecasts highlight the potential for both scientists and beauty producers to include snail mucus into their products. Prior to broad use, the snail mucin field must address the requirement for ethical extraction, appropriate

counselling and treatment by healthcare providers, and clinical research to validate effects.

Abbreviation:

TEWL: Tewameter; SS: Snail slime; IBD: inflammatory bowel disorders; HA: Hyaluronic acid; GA: glycolic acid;

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