Review Article

Role of Polyethylene Glycol in Dermatology

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Abstract

Background: Polyethylene glycol (PEG) is commonly used in dermatology due to its excellent solubility, nontoxic nature, and compatibility with various therapeutic agents. Its applications extend from moisturizing creams to chemical peels, improving skin hydration and facilitating drug delivery. Despite its broad utility, PEG is associated with hypersensitivity reactions, including rare cases of anaphylaxis, that necessitates a thorough assessment of its safety profile. This review evaluates PEG's therapeutic roles, safety, and dermatological applications, focusing on its pharmacokinetics, chemical properties, and potential adverse effects. **Methods:** A comprehensive literature search was conducted in PubMed, SciVerse, and EMBASE databases to identify studies on PEG's dermatological uses, including its role in treating psoriasis, acne, ichthyosis, fungal infections, wound healing, and cosmeceuticals. Studies addressing PEG's allergenic potential were also reviewed, focusing on cutaneous reactions and rare anaphylactic events. Articles in English, published until June 2024, were included in this narrative review. **Results:** PEG's emollient and humectant properties make it valuable in treating psoriasis, where it enhances corticosteroid delivery and reduces erythema and scaling. In acne, PEG-based salicylic acid peels offer controlled exfoliation with minimal irritation. PEG's hydrating properties also benefit ichthyosis and wound healing by maintaining moisture and delivering antibacterial agents. In cosmetics, PEG functions as an emulsifier, surfactant, and conditioner. However, hypersensitivity risks, including urticaria and anaphylaxis, require cautious use, especially for allergy-prone individuals. **Conclusion:** PEG's properties make it a useful dermatological component, though awareness of hypersensitivity risks is essential for safe clinical use. Further studies are needed to understand PEG-induced hypersensitivity and to guide safety protocols.

Keywords: *Dermatological applications, drug delivery, hypersensitivity reactions, pharmacology, skin hydration*

Introduction

Polyethylene glycol (PEG) is a versatile polymer widely used in medicine due to its solubility, low toxicity, and compatibility with active compounds.[1] Its varied molecular weights and customizable properties make it a valuable excipient in drug delivery systems, especially as an ointment base or solubilizing agent.[2] In dermatology, PEG is pivotal for its humectant properties, retaining moisture in the skin and enabling the controlled delivery of therapeutic agents.[3] It also plays a crucial role in chemical peeling preparations like salicylic acid formulations, enhancing exfoliation and rejuvenation.[4] Despite its utility, there are concerns about hypersensitivity reactions and potential allergic responses.[5] This review aims to summarize PEG's therapeutic roles, safety profile, and dermatological implications.

A comprehensive literature search was conducted using PubMed, SciVerse, and EMBASE databases. The search queries included terms related to dermatology, such as 'psoriasis,' 'ichthyosis,' 'chemical peeling,' 'acne,' 'fungal infection,' 'wound healing,' 'cosmetics,' and other dermatological diseases. Additionally, terms like 'allergy,' 'allergic,' 'anaphylaxis,' 'cutaneous allergy,' 'urticaria,' and 'angioedema' were searched in association with 'polyethylene glycol,' 'PEG,' or 'macrogol.' Articles published till June 2024 in the English language were included in the review. The article is written as a narrative review.

Chemistry: Structure and properties

Chemical structure

PEG is a synthetic polymer with repeating ethylene oxide units and terminal hydroxyl

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groups H-(OCH_2CH_2)$_n$-OH, where 'n' represents the number of these units [Figure 1]. For instance, PEG 75 contains 75 ethylene oxide units.[2,6]

Properties

PEG's physical state varies with molecular weight, from viscous liquids at lower weights to waxy solids at higher ones. Molecular weights range from 200 to 35,000 g/mol, affecting solubility, viscosity, and melting point. Low-weight PEGs (<600 Da) are used in cosmetic formulations like creams and lotions for their solvent properties, while higher-weight PEGs (>600 Da) are solid, making them ideal for ointment bases.[3] PEG is versatile due to its amphiphilic property (solubility in both water and organic solvents), thermal stability, electrical neutrality across diverse pH ranges, biocompatibility, and its ability to form covalent or hydrogen bonds with various molecules, making it an excellent solubilizer and stabilizer for pharmaceutical formulations.[7,8]

Pharmacokinetics

Absorption and distribution

The absorption of PEG in the gastrointestinal tract and its penetration through the skin are influenced by its molecular weight. When PEG 400 is administered orally, it is efficiently absorbed in the gastrointestinal tract, with approximately half being eliminated through the kidneys within 24 hours [Figure 2].[9] Oral absorption decreases as the molecular weight increases, with 57% bioavailability for PEG 500, 9.8% for PEG 1000, and none for PEG 6000.[10] PEGs are minimally absorbed through intact skin, with higher molecular weights (≥4000 Da) showing no absorption. PEGs under 3350 g/mol can penetrate the skin and enhance the absorption of other chemicals.[11] Skin injury may increase PEG penetration regardless of molecular weight.[12]

Metabolism and excretion

Once in the systemic circulation, PEG undergoes gradual oxidation of its hydroxyl groups, resulting in the formation of carboxylic acid, diacid, and hydroxy acid metabolites, a process facilitated by alcohol dehydrogenase and cytochrome P-450 enzymes.[13,14] PEG forms a hydrophilic barrier around drug molecules, protecting them from enzymatic degradation and renal clearance, particularly benefiting protein and peptide drugs. However, these parenteral formulations lead to the introduction of higher molecular weight PEGs into the systemic circulation. PEG molecules with a molecular weight of 20,000 Da or less are predominantly excreted via the kidneys, whereas those between 20,000 and 50,000 Da are primarily eliminated through bile [Figure 2].[15,16] Larger PEGs (>50,000 Da) are cleared by liver macrophages.[15,16] Urinary excretion increases with molecular weight.[10]

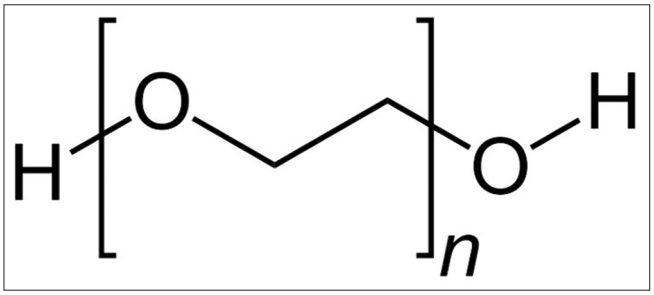

Figure 1: Chemical structure of PEG. HO- represents the terminal hydroxyl group on one end of the PEG molecule. (CH2-CH2-O)$_n$ represents the repeating ethylene oxide units, where "n" signifies the number of these repeating units. Each unit consists of two carbon atoms (CH2) connected by a single bond and an oxygen atom (o). This is a simplified 2D representation, and the actual conformation of the PEG molecule may vary depending on the number of repeating units (n)

Dermatological uses

PEGs serve as solvents in various formulations due to their ability to enhance solubility and stability. For biologics, PEGylation (covalent attachment of PEG molecules) increases molecular weight, prolongs circulation time, and shields drugs from the immune system, enhancing their therapeutic efficacy.[17] For example, certolizumab pegol is PEGylated to improve its pharmacokinetic profile, reducing the frequency of dosing and minimizing immune reactions.[18] Drugs such as paclitaxel, doxorubicin, and interferon α-2a are PEGylated to improve solubility and bioavailability.[17,19,20]

PEG is essential in dermatological therapy for its emollient and humectant properties. As an emollient, it creates a barrier that prevents trans-epidermal water loss and retains hydration.[3] In moisturizing formulations, PEG combines with other ingredients to optimize skin moisture retention. It also serves as a base in ointments and lubricating gels,[2] ensuring smooth application and better absorption of active ingredients due to its hygroscopic nature.

PEG retains moisture in the skin by forming hydrogen bonds with water molecules, enabling it to hold onto water and gradually deliver it to the skin for long-term hydration.[1] Its barrier-forming properties also reduce water evaporation. This dual action is particularly beneficial for treating dry skin conditions, where PEG-based formulations help restore the natural barrier function. The dermatological uses include:

1. Psoriasis: It is utilized in psoriasis to improve corticosteroid delivery. In a study by Lu *et al*.,[21] PEG ointment was shown to improve psoriasis-like inflammation in a mouse model by downregulating the functions of T helper 17 (Th17) cells and myeloid-derived suppressor cells (MDSCs). This translational research found that PEG ointment could reduce erythema, scaling, and epidermal thickness, thereby improving the appearance of psoriasis lesions. The PEG ointment also inhibited the proliferation of keratinocytes and reduced the expression of inflammatory markers such as IL-23, IL-22, IL-6, and

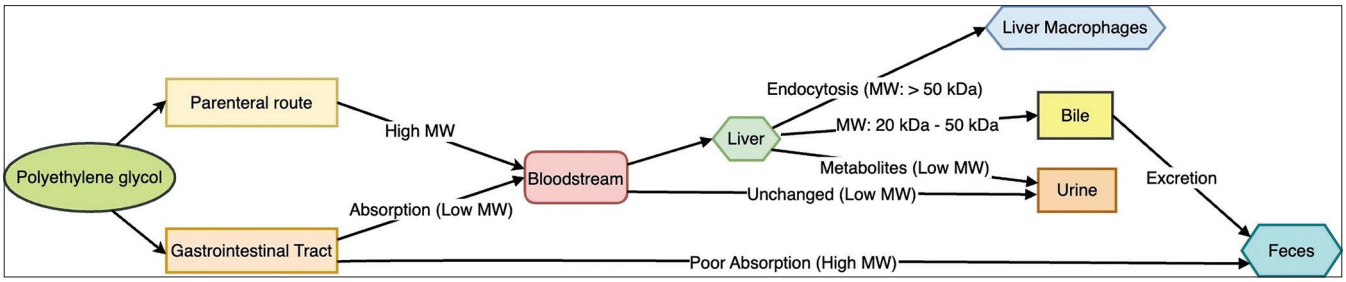

Figure 2: This schematic diagram illustrates the absorption, metabolism, and excretion pathways of polyethylene glycol (PEG) based on its molecular weight (MW) and route of administration. PEG can enter the body through the parenteral route, directly reaching the bloodstream, or via the gastrointestinal (GI) tract, where only low MW PEG undergoes absorption, while high MW PEG is poorly absorbed and excreted in the feces. Once in the bloodstream, PEG is transported to the liver, where its fate depends on its MW. High MW PEG (>50 kDa) undergoes endocytosis by liver macrophages, while intermediate MW PEG (20–50 kDa) is partially processed in the liver. Low MW PEG either remains unchanged or is metabolized into smaller compounds. Excretion occurs through two primary pathways: biliary excretion, where PEG is secreted into bile and eliminated in feces, and renal excretion, where low MW PEG and its metabolites are filtered out via urine. This metabolic process highlights the influence of PEG's molecular weight on its absorption, processing, and elimination pathways

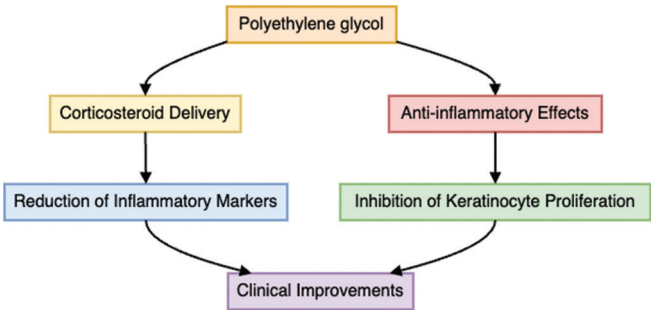

Figure 3: Flowchart illustrating the mechanism of action of PEG in psoriasis. PEG ointment, when applied to the skin, enhances corticosteroid delivery to the affected area. This leads to the downregulation of T helper 17 (Th17) cells and myeloid-derived suppressor cells, resulting in reduced expression of inflammatory markers such as IL-23, IL-22, IL-6, and IL-17. PEG also inhibits the proliferation of keratinocytes, leading to clinical improvements including reduced erythema, scaling, and epidermal thickness, thereby improving the overall appearance of psoriasis lesions

IL-17 [Figure 3]. In the mouse model, these PEG-based nanoparticles improved the delivery and effectiveness of cyclosporin A (CsA) by enhancing drug penetration and reducing inflammation in psoriatic skin.[22] In contrast, PEG-IFN-α therapy, commonly used to treat chronic hepatitis C, can induce or exacerbate psoriasis, including its pustular form.[23]

2. Acne: PEG is effectively used in the treatment of acne, particularly in the formulation of salicylic acid peels. Dainichi *et al*.[4] have shown that salicylic acid in a PEG vehicle provides uniform exfoliation with minimal irritation. It avoids the stinging and burning often associated with ethanol-based peels, making it suitable for patients with sensitive skin. Application of a 30% salicylic acid in PEG vehicle (SA-PEG) resulted in significant improvement in acne lesions, including the reduction of comedones and papules, without adverse effects like erythema, bleeding, or post-inflammatory hyperpigmentation.
3. Ichthyosis: PEG is used in ichthyosis to reduce scaling and dryness and in dry skin (xerosis) to provide hydration and improve skin barrier function.[3,21] PEG is used to treat ichthyosis due to its hygroscopic properties.[24] Specifically, Macrogol 400, a type of PEG, can penetrate the skin and effectively retain moisture, making it useful in managing dry, scaly conditions like ichthyosis. TMB-001, a topical isotretinoin PEG-based formulation, demonstrated significant improvements in skin hydration and reduction in scaling without significant systemic absorption or irritation.[25,26] PEG's mild keratolytic effectiveness and ability to maintain hydration without irritation make it a suitable component in topical treatments for ichthyosis, especially in formulations where it constitutes 20–30% of the base.[24] However, there is an ongoing debate about use of PEG in the first and second years of life.[24] PEG, particularly in 40–60% aqueous solutions with occlusion, is effective for treating ichthyosis, including X-linked recessive ichthyosis and ichthyosis vulgaris. This occlusive treatment rapidly clears scaling and can be used intermittently for maintenance, helping to manage symptoms over the long term [Figure 4].[27]
4. Superficial fungal infections: PEG 400 significantly enhances the trans-ungual delivery of antifungals. *In vitro* permeation studies with 10% PEG 400 showed a 6-fold increase in drug delivery and a 2-fold increase in drug loading in the nail plate compared to the control.[28] As both an emollient and humectant, PEG is a valuable ingredient in dermatological products, promoting improved skin health through optimized moisture retention.
5. Wound healing: PEG ointments also aid in wound healing by forming a protective layer that retains moisture while delivering antibacterial agents to prevent infection.[1] Ointments formulated with nitazole and white streptocide in a PEG base effectively target aerobic and anaerobic infections, significantly reducing the duration of hospitalization for surgical wound patients while lowering reliance on prolonged systemic antibiotic therapy.[29] The release of rosoxacin and oxolinic acid is best achieved with

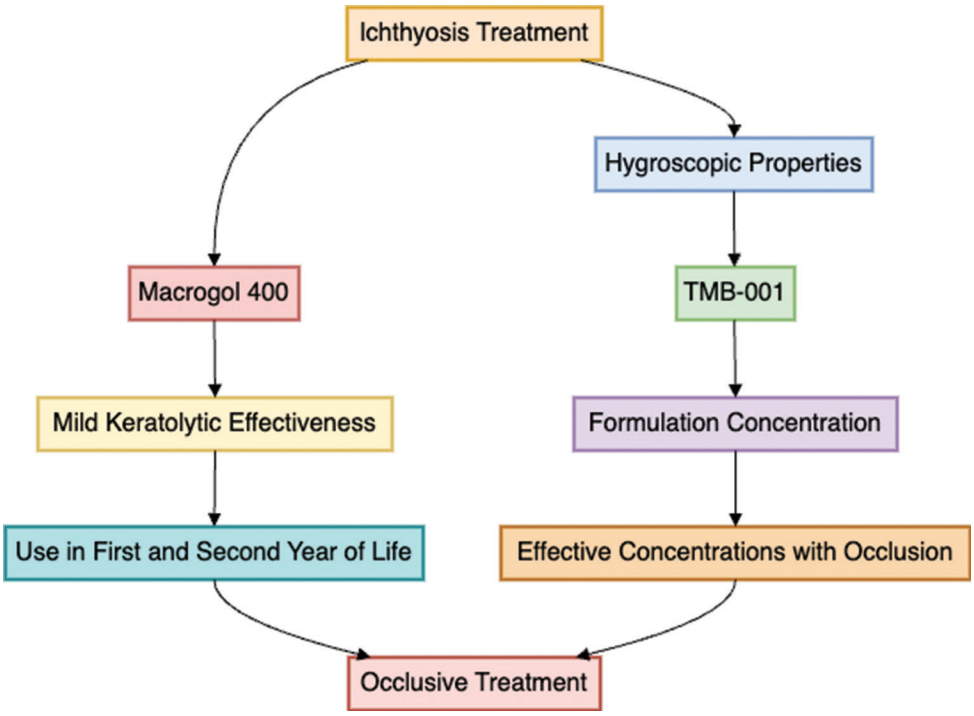

Figure 4: Flow diagram illustrating the use of PEG in the treatment of ichthyosis. PEG is employed to reduce scaling and dryness, particularly in ichthyosis and xerosis, by utilizing its hygroscopic properties to retain moisture. Macrogol 400, a type of PEG, effectively penetrates the skin, aiding in moisture retention for dry, scaly conditions. TMB-001, a topical isotretinoin PEG-based formulation, shows significant improvements in skin hydration and reduction in scaling with minimal systemic absorption or irritation. PEG's mild keratolytic properties maintain hydration without causing irritation, making it a suitable component in topical treatments, often constituting 20–30% of the base. The use of PEG in the first and second years of life remains debated. PEG, particularly in 40–60% aqueous solutions with occlusion, effectively treats ichthyosis, including X-linked recessive ichthyosis (XLRI) and ichthyosis vulgaris. This occlusive treatment rapidly clears scaling and can be employed intermittently for long-term maintenance

a water-washable base. Incorporating 10% PEG 200, N, N-dimethylacetamide, or ethanol into oleaginous and emulsion bases further enhances the release rates of these antibiotics, optimizing their therapeutic effects. Although PEG itself lacks direct antimicrobial properties, its structure enhances antibiotic delivery and creates a controlled release environment, thereby improving treatment outcomes.[30]

6. Chemical peels: PEG is vital in salicylic acid formulations for chemical peels, providing uniform exfoliation with minimal irritation. PEG-based salicylic acid effectively suppresses tumor incidence and growth, protecting against UV-induced skin cancers by reducing irritation and inflammation.[4] Compared to ethanol-based peels, salicylic acid in a PEG base evenly distributes the peeling agent while also moisturizing the skin. This combination reduces acne severity and hyperpigmentation, showing significant improvement. In a case series involving 16 patients, PEG-based salicylic acid peels effectively treated comedogenic acne with 75% efficacy and minimal irritation.[31] Studies confirm that PEG vehicles enhance the delivery and efficacy of treatments.[4,31,32]
7. Dermal fillers: Hyaluronic acid fillers containing PEG showed superior viscoelastic properties and enhanced stability and longevity. The PEG cross-linking method had longevity. This PEG–hyaluronic acid combination provided effective dermal augmentation lasting over 8 months. However, these studies lack direct comparisons with other bases.[33] Despite this, the PEG structure offers promising mechanical stability and biocompatibility, making it a valuable alternative to traditional dermal fillers.
8. Nanotechnology: PEG plays a pivotal role in nanotechnology applications within dermatology due to its unique properties that enhance drug delivery. PEGylation, the process of attaching PEG chains to nanoparticles, is widely used to improve the stability, solubility, and bioavailability of therapeutic agents. This modification helps nanoparticles evade the immune system, prolonging their circulation time and enhancing their ability to penetrate biological barriers such as the skin's extracellular matrix (ECM). One notable drug used in the PEGylated form is paclitaxel, that is commonly used in the treatment of various cancers, including skin cancer. PEGylation of paclitaxel enhances its delivery and efficacy.[34]
9. Cosmeceuticals: PEG compounds and their derivatives are used in cosmetics. PEG ethers, such as PEG-2 almond glycerides, PEG-2 hydrogenated tallowamine, PEG-3 castor oil, PEG-4 rapeseedamide, PEG-7 glyceryl cocoate, and PEG-8 stearate, function as emulsifiers, surfactants, and conditioning agents. PEG fatty acids, including PEG-2 laurate, PEG-4 laurate,

PEG-8 oleate, PEG-10 laurate, and PEG-12 laurate, serve as emulsifiers, dispersing agents, and surfactants in creams, lotions, and bath oils. PEG castor oils like PEG-40 hydrogenated castor oil and PEG-60 hydrogenated castor oil are used as solubilizers, emulsifiers, and conditioners in personal care products such as lotions, creams, and hair care items. PEG amine ethers, such as PEG-2 soyamine and PEG-5 cocamine, are used as emulsifiers, anti-irritants, neutralizing agents, antistatic agents, foam boosters, and mild detergents in formulations like shampoos and hair-dye creams. Additionally, other PEG derivatives like PEG soy sterols and PEG beeswax function as emollients, moisturizers, and stabilizers in cosmetic formulation.[3]

PEG itself is not directly associated with photosensitivity in patients. However, it plays a crucial role in photosensitive drug delivery systems. When incorporated into photogels containing anthracene-capped star-shaped PEG, it enhances the photosensitivity and modifies the drug release profile. PEG acts as a crosslinker, stabilizing the gel matrix and enabling controlled drug release upon UV light exposure.[35] Overall, PEG's compatibility with active ingredients and its unique properties in exfoliation and drug delivery make it a valuable component in dermatology, providing safe and effective treatments for a range of skin conditions.

Adverse effects

PEG has a long history as a safe ingredient in topical products. Early studies established PEG's general safety, particularly in low-molecular-weight forms used extensively in dermatology.[1] These findings led to the widespread adoption of PEG, including moisturizers and wound dressings, due to its biocompatibility and ability to enhance the delivery of active ingredients.[1] Occupational exposure to PEGs commonly occurs in healthcare settings through the use of medications, ointments, and medical devices, while non-occupational exposure arises from everyday items like cosmetics, lotions, shampoos, and some food products.[6] Due to its low incidence, specific clinico-epidemiological data on contact dermatitis from PEGs are scarce, with only a few case reports available. A 2016 review documented 37 reported cases referred to as "PEG allergy," accounting for a total of 74 reactions. Over half of these cases were linked to laxatives, which were among the most common allergens in the series with PEG-3350 being an ingredient found in over 1,000 approved medications.[36] Cases also reported of contact urticaria with application of clotrimazole and tolnaftate with PEG 400 as a base. Allergic contact dermatitis (ACD) caused by PEG copolymers, particularly methoxy PEG-17 and PEG-22/dodecyl glycol copolymers, has been increasingly recognized in cosmetics.[37–40] Despite their high molecular weight, these copolymers can cause skin sensitization, as seen in cases where patch tests and repeated open application tests (ROATs) confirmed allergic reactions.[38–43] A 43-year-old woman developed ACD after using a moisturizing milk containing methoxy PEG-17/dodecyl glycol copolymer, with ROAT confirming the allergy.[37] Impurities like 1,4-dioxane from the polymerization process may contribute to the sensitization.[37]

Recently, PEG-related hypersensitivity has been reported [Figure 5], such as IgE-mediated anaphylaxis triggered by PEG exposure.[5] The route of exposure to PEG and the corresponding hypersensitivity reactions varies significantly. Oral administration is the most common route and is linked to a higher rate of hypersensitivity, with 81% of cases involving oral exposure. Severe reactions, including anaphylaxis, occur notably in cases of injection (intramuscular, intra-articular, or intravenous). Topical exposure rarely leads to anaphylaxis, indicating that skin absorption rates are lower, especially with higher-molecular-weight PEGs that are less likely to penetrate the skin.[6] Regarding PEG concentration and molecular weight, lower molecular weights (below 400 g/mol) are more readily absorbed and have a higher potential for causing hypersensitivity reactions.[8,44] Cross-reactivity is a significant concern with PEG as it shares structural similarities with other compounds like polysorbates (used in pharmaceutical and cosmetic products), that can also lead to hypersensitivity reactions. This cross-reactivity complicates patient exposure and risk profiles, making it challenging to pinpoint and avoid potential allergens.[6] The sensitization potential of PEG varies based on its molecular weight and formulation. Macrogols with low molecular weights (200–700) are liquid and have been associated with reactions such as contact dermatitis, contact urticaria, and anaphylaxis. High molecular weight macrogols (1000–7500), which are solid and minimally absorbed by the gastrointestinal tract (about 0.2%), have also been linked to certain cases of anaphylaxis.[5] Lotem *et al*.[45] noted potential irritant effects, particularly at higher concentrations or with pre-existing skin conditions. For patients allergic to both PEG and polysorbates, poloxamer offers a viable alternative. This non-ionic polymer, commonly used in pharmaceutical and cosmetic products, is associated with fewer hypersensitivity reactions. However, there is a risk of cross-reactivity.[46] Nevertheless, the benefits of PEG-based formulations generally outweigh the risks when used appropriately.

For diagnosing PEG hypersensitivity, the skin prick test is the most reliable method. It involves using various PEG concentrations to check for immediate allergic reactions, with intradermal tests recommended if prick tests are negative but hypersensitivity is still suspected. Patch tests and ROAT can confirm contact dermatitis. Less commonly, diagnostic approaches may include basophil activation tests and oral provocation tests.[6] PEGs can cause cross-sensitization due to their structural similarities with derivatives like PEG ethers, PEG fatty acid esters, PEG castor oils, and PEG sorbitans.[3,6]

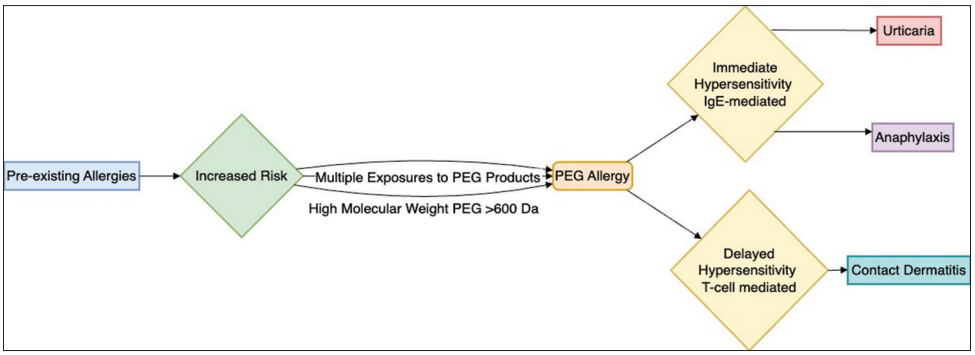

Figure 5: The flowchart delineates the potential risk factors associated with the development of PEG allergies. Individuals with pre-existing allergic conditions, frequent exposure to PEG-containing products, or utilization of high-molecular-weight PEG (>600 Daltons) exhibit an elevated likelihood of experiencing an allergic reaction. PEG-induced allergic responses are categorized into two types: immediate and delayed hypersensitivity reactions. Immediate hypersensitivity reactions, mediated by immunoglobulin E (IgE) antibodies, occur within minutes to hours post exposure and can manifest as urticaria (hives) or anaphylaxis. Delayed hypersensitivity reactions, which involve T-cell mediation, occur hours to days following exposure and typically manifest as contact dermatitis, characterized by irritation at the site of contact

Safety and carcinogenicity

PEG is widely regarded as safe. Studies indicate that low-molecular-weight PEGs are well absorbed and excreted primarily through the kidneys, whereas higher molecular weights are minimally absorbed, reducing systemic exposure.[7] Despite its general safety, PEG can cause hypersensitivity reactions in some individuals. However, these instances are rare, and the benefits of PEG, such as its ability to enhance the stability and efficacy of active ingredients, generally outweigh the risks.[6,44,47] Since no specific toxicity studies exist for PEG/PPG-17/6 copolymer, evaluations depend on data from chemical analogs like poloxamers. PEGs are synthesized via ethoxylation, a process that can introduce contaminants like 1,4-dioxane, suspected of being carcinogenic. While PEGs themselves are not considered carcinogenic, impurities such as 1,4-dioxane, ethylene oxide, and propylene oxide are a concern due to their known carcinogenic properties. The International Agency for Research on Cancer classifies ethylene oxide as a known carcinogen and 1,4-dioxane as a potential one. Proper purification is essential to reduce these impurities before use in cosmetics.[3,47]

PEG 3350, 8000, and 20,000 were tested for their effects on cell proliferation, invasion, and matrix metalloproteinase (MMP) activity. PEG 8000 notably increased proliferation and invasion while reducing cell cluster thickness and MMP-1 activity. The combination of PEG 8000 and commensal *E. coli* further enhanced proliferation, suggesting PEG 8000 may improve chemotherapy responsiveness in colon cancer.[48]

PEGs also function as penetration enhancers, increasing skin permeability and potentially allowing the absorption of harmful ingredients. Although generally approved in cosmetics, some PEG compounds are considered unsafe for damaged skin, raising concerns about irritation and toxicity, leading to their exclusion from certified organic cosmetics.[47]

Contraindications

The use of oral PEG is not recommended for individuals with a known or suspected bowel obstruction, appendicitis, inflammatory bowel disease, bowel perforation, or an allergy to PEG or any ingredient in the formulation.[49] There is no published experience with PEG during breastfeeding. However, since the drug is poorly absorbed from the gastrointestinal tract, it is unlikely to enter breastmilk in significant amounts.[50] PEG is poorly absorbed systemically. Its use has not been associated with adverse effects during pregnancy.[51] In patients with renal impairment, the excretion of PEG may be compromised, potentially leading to accumulation and adverse effects.[8] Hepatic disease can alter the metabolism of PEG, affecting its clearance and increasing the risk of systemic exposure.[7]

Precautions

Precautions include monitoring for hypersensitivity reactions, particularly in individuals with a history of allergies.[6] PEG can cause rare allergic reactions, including contact dermatitis and anaphylaxis, especially at higher concentrations or when applied to damaged skin.[44] Fatal anaphylaxis has been reported with PEG exposure. One case involved a fatal reaction after treatment with an endodontic temporary filling material containing PEG.[52] Another reported fatality occurred in a 24-year-old man who experienced PEG-induced anaphylaxis following a glucocorticoid injection.[53] Patients should avoid using PEG-containing products on broken skin to minimize absorption and potential irritation.[47] It is also important to be aware of cross-reactivity with similar compounds like polysorbates.[44] Healthcare providers should perform patch tests for individuals with known sensitivities before recommending PEG-based products and educate patients on reading labels to avoid inadvertent exposure.[6]

Conclusion

PEG is a versatile polymer offering benefits ranging from moisturizing to enhancing drug delivery in dermatology.

As an emollient and humectant, it retains moisture, alleviates dryness and improves barrier function. Its compatibility with active ingredients allows it to serve as a carrier in ointments, peels, and solutions.[4,21] Reports of hypersensitivity and allergic reactions emphasize the need for screening, particularly those with pre-existing sensitivities.[5] PEG-coated liposomal formulations need further evaluation to balance efficacy and potential toxicity.[47] Future research should address gaps in PEG's safety profile and expand its clinical applications. Studies on long-term use and interactions with various conditions can improve formulation guidelines. Exploring PEG's role in combination therapies, such as with hyaluronic acid fillers or salicylic acid peels, could unlock its full potential for safer and more effective dermatological treatments.

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Conflicts of interest

There are no conflicts of interest.

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