

# Pseudo-ceramides as a Novel Therapy in Overcoming Xerosis Cutis in Geriatric Population with Chemotherapy and Radiotherapy: A Review Article

Claudia Felicia Limanda<sup>1</sup>, Susy Purnawati<sup>2</sup>

<sup>1</sup>Faculty of Medicine, Udayana University, Denpasar, Indonesia

<sup>2</sup>Department of Physiology, Faculty of Medicine, Udayana University, Denpasar, Indonesia

Corresponding Author: Claudia Felicia Limanda

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## ABSTRACT

**Background:** Xerosis Cutis is a common condition in geriatric population identified by the loss of water and oil to a certain level that resulted in the decrease of moisture and the increased possibility for more serious skin complications. This condition is considered harmless, however, when untreated leads to other skin problems such as skin cracking and bleeding, eczema reactivation, and skin infection. In addition, elderly is also prone in experiencing cancer that when treated with chemotherapy and radiotherapy can destroy healthy skin cells alongside cancer cells, making skin redder, darker, drier, and itchier. According to existing studies, the decrease of ceramides in stratum corneum is a contributing factor that cause dry skin in elderly. Pseudo-ceramides, being a synthetic type of ceramides that can replace skin natural ceramides, are believed to be effective in preventing and treating Xerosis Cutis. Therefore, authors want to further explain the effectiveness of pseudo-ceramides in the treatment of Xerosis Cutis, especially in elderly experiencing chemotherapy and radiotherapy.

**Method:** This review article is composed of articles from renowned sources such as PubMed, Karger Publishers, National Library of Medicine, ResearchGate, and others using keywords such as “Dry skin”, “Skin cancer”, “Elderly”, and “Pseudo-ceramides”. Information is then accessed for its validity, reliability, and compatibility with the study theme before compiled into this article.

**Result:** Based on studies using elderly population as test subjects, symptoms such as scaling, itchiness, erythema, dryness, and roughness improved in 3-4 weeks after topical application of pseudo-ceramides. Inflammatory cells also significantly decrease.

**Conclusion:** It is proved that pseudo-ceramides can act as an anti-inflammatory agent and reduce Xerosis Cutis and other complications related to this condition.

**Keywords:** [Dry Skin, Skin Cancer, Elderly, Pseudo-ceramide]

## INTRODUCTION

Xerosis Cutis or commonly known as dry skin is a normal condition of aging process and considered a minor and temporary problem.<sup>[1]</sup> However, this condition can become serious when water and oil level continue to decrease causing skin surface to become drier and rougher. Xerosis Cutis has main clinical presentations such as hay fever and/or itching when sweating. According to an epidemiology study in secondary care and nursing homes with subjects aged 65 years or older, prevalence of Xerosis Cutis is estimated to be 30-75% and may be higher if risk factors such as female sex, current or previous childhood skin problems, and concomitant treatment are present.<sup>[2]</sup> Another cross-sectional study by American Academy of Dermatology

showed that 60% of its middle aged and elderly participants are experiencing dry skin with 20% of them having Generalized Dry Skin (GDS). Based on this study, risk factors of GDS and Localized Dry skin (LDS) include old age, female sex, body mass index, outside temperature, and skin color, while risk factors such as smoking, poor health, use of medications, and other dermatologic conditions are related to GDS only. Looking at these statistics, it can be said that while Xerosis Cutis is harmless, it causes inconveniences and increases overall morbidity of geriatric population.<sup>[3]</sup> In addition, when not properly treated, Xerosis Cutis can lead to more serious problems such as eczema reactivation and skin infection due to skin cracking and bleeding that allows entrance of bacteria.<sup>[1]</sup> Eczema, as a complication of Xerosis Cutis, is presented by red and itchy skin as a result of skin barrier function loss. When this condition is untreated, it can lead to bacterial infection, viral infection, and psychological problems including bullying, sleeping problems, and self-confidence decrease.<sup>[4]</sup>

Geriatric population aged 65 years or older is also closely-linked to skin cancer in the form of Basal Cell Carcinoma (BCC), Cutaneous Melanoma (CM), and Cutaneous Squamous Cell Carcinoma (cSCC), thus making skin cancer a major issue for government across the globe. According to The National Institute of Aging, 50% cancers are diagnosed in people aged 65 years or older. In nursing homes, the prevalence of skin cancer is estimated to be between 2.1-8.3% and predicted to increase in 2030 due to multidimensional dynamic of interaction environmental and genetic factors.<sup>[5]</sup>

Application of topical Pseudo-ceramides as a major component of stratum corneum serves in maintaining skin barrier and retaining moisture<sup>[6]</sup> due to its lipid mixture that contains an anti-inflammatory function.<sup>[7]</sup> Pseudo-ceramides can improve conditions such as atopic dermatitis, dry skin, and ichthyosis, thus reducing

conditions such as skin dryness, redness, and scaling.<sup>[6]</sup> Pseudo-ceramide application is also suitable in elderly as an anti-aging component due to the natural decrease of skin ceramide. By applying pseudo-ceramides, skin health in general will improve, moisture loss will be prevented by barrier creation, skin will be further protected from environmental damage, infection, and allergy, and symptoms such as dryness and irritation will be minimized.<sup>[8]</sup>

Geriatric population is naturally prone in experiencing dry skin due to old age itself being one of the endogenous factors related to it. In addition, cancer is also more common in geriatric population compared to younger people. When cancer treatments such as chemotherapy and radiotherapy are given to this population, condition of Xerosis Cutis will worsen because more skin cells are destroyed. In addition, Xerosis Cutis is a precursor of many skin problems such as eczema, skin cracking and bleeding, and skin infection. Remembering its complications, it is necessary to discover treatment modalities that may decrease the risk of Xerosis Cutis, for instance Pseudo-ceramides.

## **MATERIALS & METHODS**

Review method used is literature review using preferred studies from 2007-2022 with criteria of inclusion such as “Dry skin”, “Skin cancer”, “Elderly”, and “Pseudo-ceramide”. Materials are taken from renowned sources such as PubMed, Karger Publishers, National Library of Medicine, ResearchGate, and other renowned websites. All information is then analysed for its validity, reliability, and compatibility before compiled into this literature review.

## **RESULT**

Effectiveness of pseudo-ceramides has been proven in many studies. According to a research done in Tokyo, Japan by observing patients with skin problems such as seborrheic dermatitis, atopic dermatitis, and pityriasis capitis, symptoms such as scaling,

itchiness, and erythema improved in all test subjects after four weeks of treatment and completely diminished by the end of study with the usage of both topical pseudo-ceramides and lotion-containing eucalyptus extract. This treatment is also considered safe because no adverse effects were found.<sup>[6]</sup>

According to a study using thirty elderly home residents in China that applied moisture cream containing pseudo-ceramides twice daily, symptoms such as skin dryness, itchiness, and roughness improved significantly after three weeks of treatment.<sup>[7]</sup> A research done in Korea showed the same results that by topical application, pseudo-ceramides enhance anti-inflammatory effect and accelerate skin barrier function. In addition, when inflammatory cells in dermis layer are counted and a *Staphylococcus aureus* binding assay is performed, there is a significant decrease of inflammatory cells.<sup>[9]</sup>

## DISCUSSION

### Pathophysiology of Xerosis Cutis

Xerosis Cutis is a result of compromised skin hydration due to lack of moisturizing factors, impaired keratinocytes differentiation and proliferation, and decreased levels of inter-corneocyte lipid<sup>[10]</sup> which are made up of cholesterol, fatty acid, and ceramides. In addition, inter-corneocyte lipid also contains keratin filaments and nuclear dissolution as materials in constructing insoluble structure to further maintain skin hydration. Aside from that, Xerosis Cutis happens when production of sweat and oil glands is dysregulated because sweat and oil glands serve as endogenous humectants in maintaining soft and pliable skin texture.<sup>[11]</sup> This result in a dull, scaly, and rough-looking skin.<sup>[10]</sup>

Xerosis Cutis is usually experienced by most people at some point of their lives in various body areas. Its etiology can be both exogenous and endogenous. Exogenous causes include excessive skin cleansing especially with hot water and alkaline soap, cold weather with low humidity, and

frequent contact with irritants. On the other hand, endogenous causes include skin and systemic diseases, psychiatric and dietary problems, and medication adverse effects. All of the factors, either exogenous or endogenous, can potentially damage inter-corneocyte lipids and reduce function of skin barrier by decreasing its water content below the minimum point of 10-15%.<sup>[12]</sup>

### Chemotherapy and Radiation as a Cause of Xerosis Cutis

Cancer treatments such as chemotherapy and radiotherapy can cause Xerosis Cutis.<sup>[13]</sup> In normal skin, cells rapidly divide and constantly renew themselves in order to replace old cells in skin surface. This characteristic of skin cells in growing rapidly is similar to those of cancer cells, thus making it difficult for chemotherapy and radiotherapy in differentiating the two types of cells. As a result of this, skin cells are attacked alongside cancer cells, causing skin to be dry and flaky.<sup>[14]</sup>

Chemotherapy causes photosensitivity and alteration of skin pigmentation that resulted in rash and easily-sunburned skin. In addition, an allergic response can also happen such as skin hives, rash, and burning sensation. If prior to chemotherapy radiation is done, an additional condition known as *radiation recall* will cause symptoms such as redness, blisters, and skin peeling.<sup>[15]</sup> Formation of open wound can also happen as a chemotherapy complication when veins leaks into the skin and left untreated.<sup>[16]</sup>

Radiotherapy as a modality in treating cancer leads to same effects as chemotherapy in the formation of red, dark, dry, and itchy skin. Radiation also activates *moist reaction* in the form of infected, painful, and wet sores.<sup>[15]</sup>

### Role of Pseudo-ceramide in Treating Xerosis Cutis in Elderly Population

Stabilization of ceramide levels in elderly skin is necessary due to the natural depletion of natural ceramides and intercellular lipid levels in stratum corneum as a result of old age. Since ceramides are

difficult and expensive to be produced naturally, synthetic ceramides known as pseudo-ceramides are used instead in order to maintain water loss and increase water binding capacity in the lipid layer of skin. In addition, symptoms such as itchiness, lichenification, and excoriation can also happen as a result of extensive scratching. Pseudo-ceramides are functional in decreasing itchiness, thus naturally potential in reducing excoriation and bacterial infection.<sup>[9]</sup>

## CONCLUSION

Geriatrics are vulnerable in experiencing Xerosis Cutis and cancer compared to other age groups. Cancer treatments such as chemotherapy and radiotherapy have a tendency in worsening condition of Xerosis Cutis due to the attack to rapidly-growing skin cells. Topical use of pseudo-ceramides, a synthetic type of ceramides, usually in the form of moisturizing cream, is relatively safe and effective in increasing skin hydration, decreasing itch, and maintaining possible complications making it a good alternative in treating Xerosis Cutis. However, studies explaining this subject is still little discussed and overall effects still need to be further researched.

## Declaration by Authors

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