

Dissertations

Cold Protecting Emollients and Frostbite

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Frostbite of the face and ears is a common problem in arctic and subarctic countries with cold winters. Application of non-medicated emollients on the face is a traditional way to prevent frostbite and drying of the facial skin in outdoor activities in Finland. The preliminary results of an epidemiological study on frostbite in Finnish conscripts showed unexpectedly that the use of cold protecting emollients increased the risk of facial frostbite. This finding and the lack of earlier scientific reports concerning the thermal effects of emollients motivated a series of studies on the effects and use of cold protecting emollients.

830 male conscripts from various parts of Finland answered a questionnaire concerning the previous and present use of cold protecting emollients by both the conscripts and their family members, and the subjective experience of using them in cold weather. The cumulative incidence of frostbite in the ears and face was studied by the same questionnaire. The association of the incidence of frostbite with the use of protective emollients, history of cold exposure and subjective cold sensitivity was evaluated statistically. A group of risk factors, including the use of emollients, was also investigated in a prospective epidemiological study including 913



Dr Eero Lehmuskallio (*left*) defended his thesis on June 15th, 2001 at National Defence College in Helsinki. The studies were performed at the Dept. of Dermatology and Venereology, University of Oulu, and at Oulu Regional Institute of Occupational Health. Faculty Opponent was Ass. Prof. Urpo Kiistala (*right*), University of Helsinki, and Chairman was Prof. Jaakko Karvonen (*centre*), Dept. of Dermatology, University of Oulu. Ass. Prof. Tuula Estlander (*second from left*), Institute of Occupational Health in Helsinki and Ass. Prof. Merja Kousa (*second from right*), Dept. of Dermatology in Middle-Finland Central Hospital had acted as faculty reviewers of the thesis.

Finnish conscripts needing medical attention for frostbite of the ears or face. This second study included 2 478 matched, uninjured controls.

Thermal insulation and occlusivity of four different emollients in the cold were studied *in vitro* with a skin model developed originally for measuring thermophysical properties of clothing. Thermal effects of the same four emollients were examined *in vivo* in experimental cold exposures of voluntary test persons. Test emollient was applied on one half of the face, as the other half was left untreated to act as control. The skin temperatures of the face-halves were measured and compared symmetrically by using thermistors and infrared thermography. Subjective sensation of thermal difference between face

halves was also registered during the cold exposures.

21% of the conscripts, and in 25% of their families some other member, had used emollients in the cold. A great majority of conscripts had experienced the emollients as protective. 47% of the conscripts participating in the questionnaire study had had frostbite in the head (42% in the ears and 23% on the face). There was a statistically significant correlation between the use of emollients and the incidence of facial frostbite in both epidemiological studies. Applying protective emollients formed an independent risk factor for frostbite of the nose (odds ratio 5.6), ear lobes (odds ratio 4.5) and cheeks (odds ratio 3.3) in the study with controls.

The thermal insulation of test emollients applied on the skin model was minimal. The grade of occlusion caused by different emollients led to varying thermal consequences depending e.g. on the amount of diffusing and evaporating water. On living skin, the emollients did not retard the cooling of the skin in the cold. On the contrary, the applied half was somewhat cooler in a majority of comparisons. However, white petrolatum gave often a subjective perception of a warming effect. False sensation of safety may form the principal cause for the increased risk of frostbite associated with the use of emollients.

When the warning symptoms of cold are weak or absent, the need for protection with efficient methods is neither recognized nor are the necessary protective measures carried out. Other mechanisms for the harmful effect may also be involved.

The moisturizing emollients, sports ointments or cosmetic moisturizers, often used for prevention and treatment of skin dryness during prolonged exposition to the cold, should be applied only when there is no actual risk of frostbite, preferably indoors.

List of original publications

- I Lehmuskallio E. Cold protecting ointments and frostbite. A questionnaire study of 830 conscripts in Finland. *Acta Derm Venereol* 1999; 79: 67-70.
- II Lehmuskallio E, Lindholm H, Koskenvuo K, Sarna S, Friberg O, Viljanen A. Frostbite on the face and ears: epidemiological study of risk factors in Finnish conscripts. *BMJ* 1995; 311: 1661-1663.
- III Lehmuskallio E, Anttonen H. Thermo-physical effects of ointments in cold: an experimental study with a skin model. *Acta Derm Venereol* 1999; 79: 33-36.
- IV Lehmuskallio E, Rintamäki H, Anttonen H. Thermal effects of emollients on facial skin in the cold. *Acta Derm Venereol* 2000; 80: 203-207.

Palmoplantar Pustulosis. Pathogenetic Studies with Special Reference to the Role of Nicotine

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Palmoplantar Pustulosis (PPP) is a chronic skin disease characterised by sterile intraepidermal pustules filled with neutrophils, and red and scaly skin on the palms and soles. It is considered to be a localised form of pustular psoriasis. Mainly women are affected and most patients are smokers. PPP is a rather common, chronic disease and difficult to treat. In spite of that, there are few studies on PPP

and the pathogenesis is not known. There is no curative treatment for PPP today. The main purpose of the first study was to characterise the cellular components of the inflammation and, even more, to try to identify a target for the inflammation.

Fifty-nine patients (52 women, 7 men) with typical PPP of the palms and/or soles answered a questionnaire. Their smoking habits over the years were also investigated. Thirty-nine of the 59 patients (35 women, 4 men) were examined clinically.

There was a worsening effect of warm weather and stress in a high proportion of patients that indicated that the sweat gland apparatus might be a possible target for the inflammation. The fact that 95% of the patients were smokers at the onset of the disease

(at a mean age of 42 years, range 15-66 years) pointed to nicotine as a possible precipitating factor for the disease. We observed a high prevalence of a number of autoimmune diseases (thyroid disease, coeliac disease, diabetes, vitiligo and alopecia areata) in the PPP patients. The association between autoimmune thyroid disease and PPP is well known, but the increased prevalence of coeliac disease in PPP patients has not been reported previously. The high prevalence of associated autoimmune disease in PPP gave us reason to consider the possibility that PPP itself might be an autoimmune disease affecting the skin and also the joints.

The association between PPP and autoimmune disease was further strengthened by the presence of antibodies to thyroglobulin/thyroperoxidase in 25% of the patients. IgA anti-