

木綿の衣類への残留洗剤； アトピー性皮膚炎の乾燥肌の冬季悪化の要因

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概略

アトピー性皮膚炎患者の皮膚が冬季に一層乾燥する事はよく知られているが、乾燥肌悪化の仕組みはよく分かっていない。

我々の研究目的は、木綿の衣類に残る残留洗剤がアトピー性皮膚炎の乾燥肌の悪化と関係があるかを検証することである。冬季に当皮膚科を受診した148人のアトピー性皮膚炎患者を対象とした。彼らは洗濯機で冷水で洗った木綿の下着を着用していた。我々は彼らの体幹の乾燥肌の分布を調べた。そして、イオン系界面活性剤で添加剤の多い一般的な合成洗剤で衣類を洗うのを止めて、イオン系界面活性剤を含まない添加剤の少ない洗剤を2週間使用するように指示した。

この試みの前後に、体幹の目立った乾燥肌部分の実験前と実験後の臨床写真を撮った。実験前、実験後の写真を比較し、乾燥肌の重傷度を、著明改善から悪化までの5段階で評価した。148人の実験対象者のうち、115人（78%）が体幹の広範囲に、または局部的に乾燥肌が見られた。肌の乾燥度は肩部周辺がもっとも顕著であった。115人のうち87人（76%）が洗剤を変えた2週間後に、乾燥肌が著明または中等度に改善を示した。乾燥肌が悪化した患者はいなかった。

これらの結果から、一般的なイオン系合成洗剤は冬季に洗濯機の冷水で洗った場合、木綿の下着に残留し、それがアトピー性皮膚炎の乾燥肌の悪化に深刻な影響を与えていることを示唆している。

概論

アトピー性皮膚炎患者には、体幹の広範囲に、または局部的に乾燥肌が見られる。乾燥肌が冬季に悪化し、夏季には軽減するのはよく知られた臨床結果だが、冬季における乾燥肌の悪化の仕組みについてはよく分かっていない。

皮脂腺の分泌は冬季には減少する。冬季の室内や野外の湿度は低い。この二つの要因が冬季の乾燥肌をもたらしているかも知れない。しかし、冬季におけるアトピー性皮膚炎患

者の乾燥肌は、顔や首や手のように外気にさらされる箇所よりも衣類に覆われる体幹部において顕著である。この独特の分布は、衣類と皮膚が常に接触しているため、冬季の乾燥肌の悪化と関係があることを示唆している。

皮膚科の医師は、アトピー性皮膚炎患者に木綿の衣類を薦めてきた。そして今日では殆どすべてのアトピー性皮膚炎患者が木綿の下着を着用している。我々の研究は、木綿の衣類への残留洗剤がアトピー性皮膚炎患者における冬季の乾燥肌の悪化と関係があるかどうかを調べることである。

患者と実験方法

患者：当大学病院皮膚科に冬季中（１９９９年１２月～２０００年２月の間、２０００年１２月～２００１年２月の間）通院しているアトピー性皮膚炎患者１４８人を調査にした。患者たちは外来で最低２ヶ月間通常の治療（局所のステロイド剤の使用、経口による抗ヒスタミン剤の投与、そして悪化要因の回避）を受けていた。患者はハニフィンとラジカカの診断基準を満たしていた。男性６７人、女性８１人で、年齢は６歳から５８歳までであった。（平均年齢２３歳）

アトピー性皮膚炎の程度は、２９人が軽度の症状（体表面全体の１０％に症状）、７７人が中度の症状（体表面全体の１０～５０％に症状）、そして４２人が重度の症状（体表面全体の５０％以上に症状）であった。実験の間、患者には当皮膚科の治療を続けるように指示した。また患者には身体の乾燥肌部に皮膚軟膏を使用することを禁じた。

すべての患者は木綿の下着を着用していて、毎日か、一日おきに替えていた。彼らは、冷たい水道水で、蛍光増白剤や酵素配合の市販のイオン系界面活性剤の合成洗剤を使用して衣類を洗った。冬季の日本の水道水はかなり冷たいことを述べておかななくてはならない。（当大学病院においては５～１０℃である）そして一般の日本の家庭には、お湯が出てくる洗濯機がない。この実験ですべての患者は冷たい水道水で衣類を洗い、すすいだ。

実験の詳細は、患者または患者の親との間で話し合われ、十分な説明に基づく同意が得られた。

乾燥肌の分布：実験の最初に、我々はそれぞれの患者の体幹を観察し、乾燥肌の分布と乾燥肌の程度を調べた。皮膚が乾いていて医学的に荒れており、初殻のような部分がある箇所を乾燥肌と決めた。（２）

洗剤の指示：実験の準備段階として我々は、冷たい水道水（１０℃）で、イオン系合成洗剤Ａ（花王株式会社、東京）を使って木綿の下着を洗った。この洗剤は日本で最も広く使われているものである。そして、冷たい水道水ですすいだ。その後、もう一度同じ衣類を熱い風呂のお湯（４２℃）ですすいだ。そのお湯は白く濁った。このことは、衣類が冷たい水道水ですすがれた場合、かなりの量の洗剤が残ることを示している。

高性能の液体色層分析装置で、下着に残る残留洗剤の量を調べた。その結果、冷たい水道水で洗い、すすいだ木綿の下着の残留洗剤の量は、１００ｇの木綿生地に１２５ｍｇの花王のイオン系合成洗剤Ａが残っていた。

そして、実験対象の洗剤として、非イオン系合成洗剤（サンスター株式会社、大阪）を選んだ。なぜならば、非イオン系合成洗剤は一般的なイオン系合成洗剤よりも容易に木綿

の衣類からすすぎ出されるとの報告があったからだ。(非イオン系合成洗剤の木綿の衣類への残留洗剤の量は、イオン系合成洗剤Aの約3分の1である) また、この洗剤は蛍光増白剤や酵素を配合していないものである。

洗濯洗剤の比較公開実験：患者には今まで使っていた通常のイオン系合成洗剤の使用を止めさせ、非イオン系合成洗剤で蛍光増白剤や酵素を配合していない洗剤を使用するよう指示した。写真2および3は、実験前と実験後の体幹部の目立った乾燥肌の写真である。

非イオン系合成洗剤のアトピー性皮膚炎の臨床的な影響を検証するため、乾燥肌の程度は、実験前と実験後の写真を比較することによって判定した。

判定基準は、かなり改善された(50%以上の改善)、やや改善された(25～50%の改善)、わずかに改善された(25%の改善)、変化なし、または悪化した、という項目によって行った。実験後、患者には患部のかゆみは軽減されたか、変わりはないか、悪化したか、を尋ねた。

結果

体幹における乾燥肌の分布：実験対象となった148人のアトピー性皮膚炎患者のうち、115人(78%)が体幹の広範囲あるいは局所に乾燥肌があり、33人(22%)には医学的に判断される乾燥肌はなかった。

115人の患者のうち95人(83%)は、体幹に乾燥肌があり乾燥度は肩において特に顕著であった(写真2)。残りの20人の患者(17%)は、肩の周辺には目立った乾燥肌はなかった。

非イオン系合成洗剤で蛍光増白剤や酵素無配合の洗剤の乾燥肌における臨床的影響：体幹に乾燥肌のある115人のアトピー性皮膚炎患者のうち、87人(76%)が非イオン系合成洗剤で蛍光増白剤や酵素無配合の洗濯洗剤を2週間使用して、乾燥肌のかなりの改善、あるいはわずかな改善が見られた。そして、かゆみの軽減が見られた。症状が悪化した患者はいなかった。乾燥肌が見られなかった33人の患者には、肌の状態に医学的な影響はなかった。

論議

この実験では、80%のアトピー性皮膚炎患者が冬季において体幹に広範囲あるいは局所の乾燥肌があった。そのうち20%の患者は苔癬外傷を除いて臨床的には異常のない肌であった。結果は前出の実験とおおよそ一致する。

実験の対象としたアトピー性皮膚炎患者の多数は、肩の周りの乾燥肌が際立っていた。文献を再調査した限りでは、皮膚炎患者の体幹における乾燥肌部分の分布についての調査はないが、ある皮膚科医師は、乾燥肌は身体全体に無差別的に影響するという間接的な論究をしている。

肩の周りにアトピー性乾燥肌が頻発に起こる仕組みについては、はっきりしていない。しかし、下着と肌との摩擦は肩の周りが最もよく起こる。今回の実験では全ての患者が木綿の下着を着用していた。このことから木綿の下着の物理的な刺激は少なくとも部分的に

肩周辺において乾燥肌の悪化に影響があると言える。木綿の衣類はアトピー性皮膚炎患者に最も適していると信じられているが、この木綿における意見は経験に基づくようである。木綿の繊維がアトピー性の乾燥肌に刺激があるかどうか、実験したことはない。

今回の実験での重要な発見は、アトピー性皮膚炎患者の体幹における重度の乾燥肌が、市販されている一般のイオン系合成洗剤から非イオン系合成洗剤に変えることによってかなり軽減したということである。乾燥肌の軽減によって、かゆみもまた軽減した。

これらの発見は、添加物を含むイオン系合成洗剤の下着への残留が、冬季のアトピー性の乾燥肌と関係があることを示唆している。

西洋諸国と日本の洗濯洗剤のほとんどが、イオン系界面活性剤と蛍光増白剤や蛋白質分解酵素など様々な添加物を含んでいることが報じられている。この界面活性剤は、皮膚に何度も塗ると刺激性接触炎（ほとんどの場合、乾燥性皮膚炎）を起こす。蛍光増白剤は、アレルギー性接触皮膚炎を誘発する。蛋白質分解酵素は、炎症性の皮膚炎と、かゆみを引き起こすことがパッチテストにおいて分かった。

従って、一般の添加物を含むイオン系合成洗剤は、木綿の衣類に残留して、アトピー性皮膚炎の乾燥肌に累積的な炎症性、またはアレルギー性の接触性皮膚炎を引き起こす。また、皮膚の復活機能も減少する。炎症の過程は、下着と皮膚の摩擦が最も起こる肩の周りにおいて顕著に現れ、それは重度の乾燥肌につながる。

最近、アンデルセン氏やその他の人々によって、短期間の酵素入り洗濯洗剤の使用は、アトピー性皮膚炎の病原活動に目立った影響はないということが報告されたが、継続的な洗剤の使用における病的な乾燥肌への影響については調べられていない。ベルシト氏は、アトピー性皮膚炎の一部の患者たちは、洗濯洗剤で問題があるが、洗剤のパッチテストは陰性だったと述べた。

市販されている一般的な、添加物を含むイオン系合成洗剤の木綿の下着への残留は、冬季のアトピー性皮膚炎患者の乾燥肌の悪化に大きな影響を及ぼしていることを認めたい。

翻訳：馬場 浩

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Residual Washing Detergent in Cotton Clothes: A Factor of Winter Deterioration of Dry Skin in Atopic Dermatitis

Takashi Kiriya, Hisashi Sugiura and Masami Uehara

Abstract

Although it is well known that the skin in patients with atopic dermatitis becomes drier in winter, the mechanisms of winter deterioration of dry skin are not fully understood. Our purpose was to determine whether residual washing detergent in cotton clothes plays a role in the winter deterioration of atopic dry skin. We studied 148 Japanese patients with atopic dermatitis who visited our dermatology clinic during winter months. They wore cotton underwear, which they had washed in cold tap water. We examined the distribution of dry skin on their trunks. We then asked them to stop washing their clothes with common anionic, additive-enriched detergents, and to use a nonionic, additive-reduced detergent for a period of two weeks. Photographs of 2 or 3 representative dry skin sites on the trunk were taken before and after the trial. By comparing the before-after trial photographs, the severity of dry skin at the end of the trial was assessed on a 5-point scale ranging from markedly improved to worsened. Of the 148 patients examined, 115 (78%) had widespread or localized dry skin on the trunk. The dryness of the skin was prominent around the shoulders. Of these 115 patients, 87 (76%) showed marked or moderate improvement of dry skin after the two-weeks of use of the nonionic, additive-reduced washing detergent. No patient showed worsening of the dry skin. These results suggest that residues of common washing detergents in cotton underclothes play an important role in the winter deterioration of dry skin in patients with atopic dermatitis who use cold tap water for washing their clothes.

Key words: atopic dermatitis; dry skin; cotton clothes; residual washing detergent

Introduction

Patients with atopic dermatitis often have generalized or localized dry skin (1–3). Although it is a well-known clinical fact that the dry skin becomes worse in winter and attenuates in summer (4, 5), the mechanisms of this winter deterioration of dry skin are not fully understood. Sebaceous gland se-

cretion decreases in winter (6). Indoor and outdoor humidity is lower in that season. These two factors may contribute to the worsening of the dry skin in winter.

In our experience, however, the dryness of skin during wintertime in patients with atopic dermatitis tends to be more prominent on the trunk, which is covered with clothes, than on exposed skin sites such as the face and the backs of the hands. This unique distribution suggests that long-term contact of clothes with skin might be implicated in the winter worsening of the dry skin. Dermatologists have recommended cotton clothes for patients with atopic dermatitis (7–9), and almost all atopic patients in Japan nowadays wear cotton underwear.

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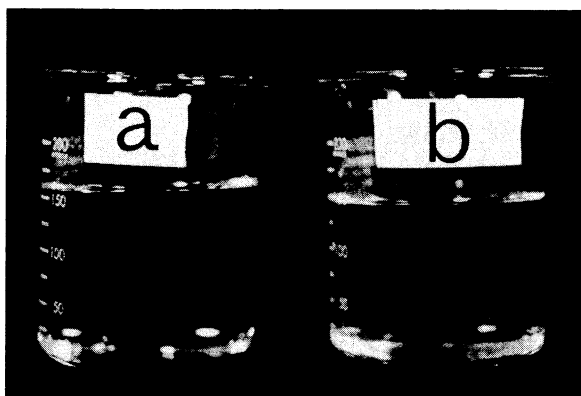


Fig. 1. Residual washing detergent in cotton underwear during winter. Cotton underclothes were washed and rinsed with cold tap water (10°C), and then rinsed once more with hot bath water (42°C). The hot bath water (a) became turbid after the rinsing (b).

In the present study, we then tried to see whether residual washing detergent in cotton clothes plays a role in the winter deterioration of dry skin in patients who are suffering from the disease.

Patients and Methods

Patients: A total of 148 Japanese patients with atopic dermatitis who visited our university hospital dermatology clinic in the winter months (December 1999 to February 2000 and December 2000 to February 2001) were included in the present study. They had been receiving standard treatment (topical corticosteroids, oral antihistamines, and avoidance of aggravating factors) for at least two months at our outpatient clinic. They all fulfilled the diagnostic criteria of Hanifin and Rajka (10). There were 67 males and 81 females. They ranged in age from 6 to 58 years (mean: 23 years). The degree of dermatitis was mild (involvement of less than 10% of body surface) in 29 patients, moderate (involvement of 10% to 50% of body surface) in 77 patients, and severe (involvement of more than 50% of body surface) in 42 patients. During the course of the study, patients were asked to maintain their dermatological treatments. They were prohibited from applying emollients to dry skin sites on the trunk.

All the patients were wearing cotton underwear, and were changing them every day or every other day. They were washing their clothes in cold tap water, using common washing detergents that contained anionic surfactants and additives such as fluorescent whiteners and enzymes. It is to be noted that the temperature of tap water during the wintertime in Japan is quite low (*e.g.*, 5°C to 10°C in mid Japan where our university hospital is located) and that ordinary Japanese homes do not have a hot water supply system for washing machines. All the patients in the present study were then washing and rinsing their clothes in cold tap water.

The details of the present study were discussed with each patient or the patient's parents, and informed consent was obtained.

Distribution of dry skin: At the beginning of the study, we observed the trunk of each patient, and examined the distribution and intensity of the dry skin on the trunk. A clinically dry and rough skin with varying amount of branny scales was regarded as dry skin (2).

Control washing detergent: In a preliminary study, we washed cotton underwear in cold tap water (10°C) and the anionic washing detergent A (Kao Corp., Tokyo, Japan) that is most widely used in Japan and then rinsed the clothes in cold tap water. We once more rinsed the same garments in hot bath water (42°C), which then became whitely turbid (Fig. 1), indicating that, when cotton clothes are rinsed in cold tap water, a considerable amount of common washing detergent remains in the clothes. Using high performance liquid chromatography, Torii et al (11) examined alcohol-extracted residual washing detergents in cotton underwear that had been washed and rinsed in cold tap water and showed that 125 mg of Kao's anionic washing detergent A remained in 100 g of the cotton fabric. We therefore selected a nonionic washing detergent (Sunstar Ltd., Osaka, Japan) as the control washing detergent, because it is reported that the nonionic washing detergent is more easily rinsed out from cotton clothes than the common anionic washing detergents (*i.e.*, the residue in cotton clothes of the nonionic detergent is approximately one-third of that of the anionic detergent A) and that this detergent does



Fig. 2. Deterioration of dry skin during winter around the shoulder in a 24-year-old male patient with atopic dermatitis.

not contain additives such as fluorescent whiteners or enzymes (11).

Open trial of control washing detergent: Patients were asked to stop the use of the common anionic washing detergents that they had been using for washing their clothes, and to use the nonionic, additive-reduced washing detergent for a period of two weeks. Photographs of 2 or 3 representative dry skin sites on the trunk were taken before and after the trial. To examine the clinical influence of the nonionic washing detergent on atopic dry skin, the degree of the dry skin was assessed by comparing the photographs taken before and after the trial. The assessment was graded as markedly improved (greater than 50% improvement), moderately improved (25% to 50% improvement), slightly improved (less than 25% improvement), unchanged, or worsened. At the end of the trial, patients were asked whether the severity of pruritus on the trunk was attenuated, unchanged, or worsened.

Results

Distribution of dry skin on the trunk: Of the 148 patients with atopic dermatitis exam-

Table 1. Dry skin in patients with atopic dermatitis after two-week use of nonionic, additive-reduced washing detergent

Number of patients	Skin condition after two-week use of anionic, additive-reduced washing detergent				
	Markedly improved	Moderately improved	Slightly improved	Unchanged	Worsened
148	46	41	21	12	0

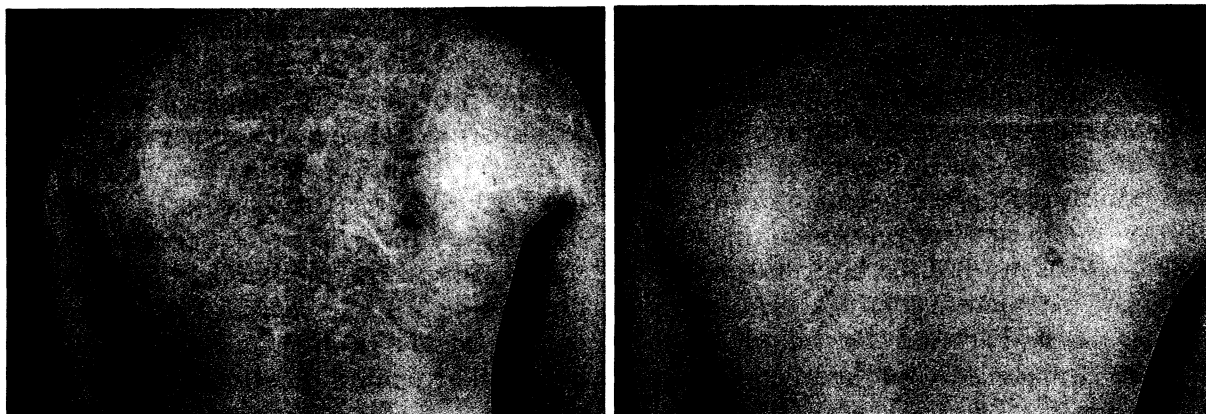


Fig. 3. Dry skin in a 10-year-old girl with atopic dermatitis during winter. Before (left) and after (right) the use of nonionic, additive-reduced washing detergent

ined, 115 (78%) had widespread or localized dry skin on the trunk, and 33 (22%) did not have clinically recognizable dry skin on the trunk.

In 95 (83%) of the 115 patients who had dry skin on the trunk, the dryness of skin was prominent around the shoulders (Fig. 2). The remaining 20 patients (17%) did not show perisoulder accentuation of dry skin.

Clinical influence of nonionic, additive-reduced washing detergent on dry skin: Of the 115 patients with atopic dermatitis who had dry skin on the trunk, 87 (76%) showed marked or moderate improvement of the dry skin after the two week use of the non-ionic, additive-reduced washing detergent (Table 1 and Fig. 3). With the improvement of dry skin, all these patients had a decrease in pruritis on the trunk. No patient showed worsening of the dry skin.

In the 33 patients who did not have clinically recognizable dry skin on the trunk, the two week use of the nonionic, additive-reduced washing detergent had no influence upon the clinical appearance of the skin.

Discussion

In the present study, we observed that approximately 80% of patients with atopic dermatitis had widespread or localized dry skin on the trunk during winter months, while about 20% of them had clinically normal skin except for their lichenified lesions. The results roughly coincide with those in previous studies (2, 3, 12, 13).

We also observed that, in the majority of the examined patients with atopic dermatitis, the dryness of the skin was prominent around the shoulders. As far as we reviewed the literature, there are no studies that investigated the distribution of dry skin on the trunk in patients suffering from the dermatosis, although some dermatologists (4, 14) have made passing reference that the dry skin affects most of the body indiscriminately. The mechanisms of the accentuation of atopic dry skin around the shoulders are not clear. However, friction between under-

wear and skin most actively occurs around the shoulders. All the patients in the present study were wearing cotton underwear. It was thus possible that the mechanical stimulus of cotton underwear was at least partly implicated in the deterioration of dry skin around the shoulders. Although it is widely believed that cotton clothes are the best for patients with atopic dermatitis (7-9), the belief in cotton seems to be empirical. As far as we know, no one has ever examined whether or not cotton fibers have irritant effects on atopic dry skin.

An important finding in the present study was that the severity of dry skin on the trunk in patients with atopic dermatitis greatly decreased when the washing detergent was changed from common anionic, additive-enriched detergents to a nonionic, additive-reduced detergent. With the improvement of dry skin, the intensity of pruritus on the trunk also diminished. These findings suggest that residues of common anionic, additive-enriched washing detergents are implicated in the winter deterioration of atopic dry skin. It is reported that most washing detergents in Western countries and Japan contain anionic surfactants and various additives such as fluorescent whiteners and proteolytic enzymes (15). Surfactants produce cumulative irritant contact dermatitis (mostly, xerotic dermatitis) when repetitively applied to the skin (16). Fluorescent whiteners may induce allergic contact dermatitis (17, 18). Proteolytic enzymes in washing detergents provoke irritant dermatitis and itching when patch tested on the skin (19, 20). It is therefore likely that residues of common anionic, additive-enriched washing detergents in cotton underclothes provoke a cumulative irritant or allergic contact dermatitis in the dry skin of patients with atopic dermatitis, which has a diminished barrier function (14). The inflammatory processes may occur predominantly around the shoulders where the friction between underwear and skin most vigorously occurs, leading to the maximal dryness of skin around the shoulders.

Recently, Andersen et al. (21) reported that a short-term use of enzyme-enriched detergents was without significant influence on disease activity in atopic dermatitis, but they did not examine the influence of continuous use of the detergents on the dry skin of the disease. Belsito et al. (22) stated that some patients with atopic dermatitis had a problem with laundry detergents, although patch tests with the detergents were negative.

We conclude that residues of common anionic, additive-enriched washing detergents in cotton underwear can play an important role in the winter deterioration of dry skin in some patients with atopic dermatitis who use cold tap water for washing and rinsing their clothes.

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