

COVID-19, Overzealous Sanitizer Use, and Hair Discoloration: Case Reports

Proper hand hygiene is one of the top preventive measures against the Coronavirus Disease 2019 (COVID-19). In this study, we report the cases of four patients who presented with blonde discoloration of hair of the dorsal hands and distal forearms during the COVID-19 pandemic.

The mean age of participants was 41.25 ± 4.35 years, and 75% percent of them were men. Three patients were medical staff who had to use antiseptics frequently, and one of them was a housewife. In all participants, the primary color of hand hair was black. The duration of sanitizer use was approximately four months (Table 1).

One of the patients, a 42-year-old male ophthalmologist, was examined due to the blonde discoloration of hairs of the dorsal hands and distal forearms (Figure 1). The color of the hand and forearms hair had changed to blonde. However, the underlying skin was unaffected. A dermoscopy examination showed lighter hair compared with the natural black hair of unaffected parts. In addition, the hair color of the scalp, upper arms, and other body parts was normal. The patient had frequently used a hand sanitizer that contained 70% ethanol and didecyl dimethyl ammonium chloride (DDAC) for the past five months.

The three other patients also had blonde discoloration observable on the hair of dorsal hands. They all reported excessive use of various alcoholic sanitizers. However, they were unaware of other ingredients. In addition, the examination of hair shafts and underlying skin was normal.

The COVID-19 pandemic caused an abrupt increase in the use of sanitizers. Hand disinfectants consist of two main categories: non-alcohol-based hand sanitizers and alcohol-based hand sanitizers. The alcohol-based type is an effective measure for the inactivation of enveloped viruses such as coronaviruses (1).

It has been shown that percutaneous absorption of alcohol is possible through intact skin. The use of ethanol as a penetration enhancer for pharmaceutical purposes also confirms that ethanol can be absorbed via the skin and be systematically distributed in the body (2). Reisfield et al. observed that intensive use of ethanol-based sanitizers led to an increase in urinary ethanol biomarkers concentrations (3). Alcohols used in various types of gels and solutions are easily released during hand rubbing (4). Ethanol absorption by inhalation should therefore also be taken into account (5).

Different pathways of ethanol metabolism can produce free radicals, which affect the antioxidant system (6). In addition, DDAC is also associated with cell growth inhibition and stress oxidative induction (7).

Hair discoloration may be a voluntary cosmetic change or a result of chemical or metal exposure. Most unwanted hair discolorations are blonde or white (8). Previous data suggested that an increase in pro-oxidants and a decrease in antioxidants play an important role in hair discoloration. A study performed by Akin Belli *et al.* demonstrated that hair

Table 1. Demographic and clinical patient data

Patient	Sex	Age	Occupation	Site of involvement	Primary hair color	Duration of sanitizer use
1	Male	35	Nurse	Hand	Black	4 months
2	Female	43	Housewife	Hand	Black	4 months
3	Male	42	Physician	Hand and distal forearm	Black	5 months
4	Male	45	Nurse	Hand	Black	4 months

discoloration is closely related to factors such as emotional stress and alcohol consumption, which cause oxidative stress (9). Hair discoloration might therefore result from oxidative stress induced by ethanol and DDAC used in sanitizers.

Golden hair discoloration has been associated with chloride in water. Hypochlorous acid in swimming pool water can penetrate the hair cortex through the cuticle, where it can oxidize and degenerate melanosomes (10). Another possible hypothesis is that the chloride compound in DDAC might be the culprit in sanitizer hair discoloration. Additionally, the bleaching compounds used in some hand disinfectants could be another possible cause of hair discoloration.

To the best of our knowledge, this observation of hair discoloration was not previously reported during the COVID-19 outbreak. It is also noteworthy that most hair discoloration normalizes over time (8).

The limitations of our study included the fact that the hand sanitizers used by the patients were unavailable and thus their ingredients could not be examined. Furthermore, as most of the sanitizers in this current pandemic are not standardized, they may have unknown ingredients with discoloration properties.

Due to the overzealous use of various antiseptics during the pandemic, it is expected that this side-effect will be observed more and more often. Therefore, physicians must be aware of this presentation and reassure the patient regarding this phenomenon. Additionally, products free of such agents should be prescribed to avoid hair discoloration.

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