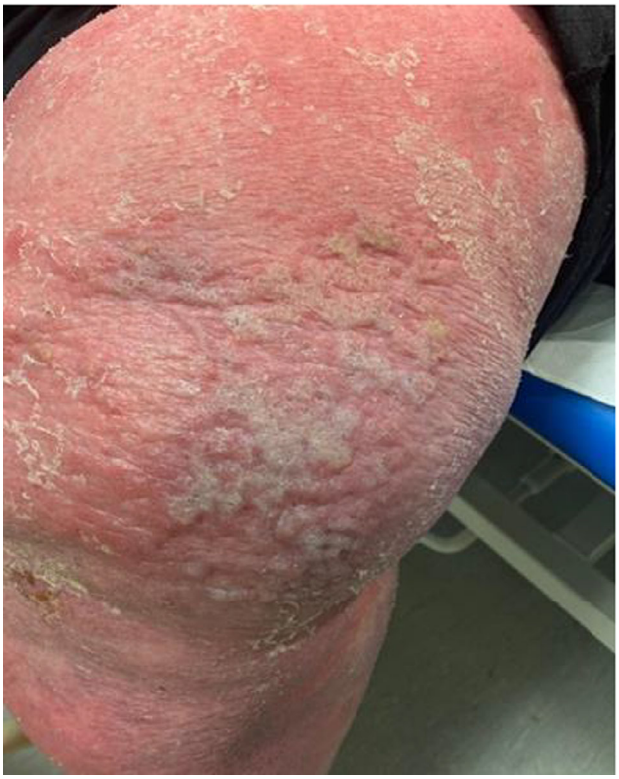

Figure 2 Flaccid blistering on the left knee with background erythema and desquamation.

in the rash leaving postinflammatory hyperpigmentation. COVID-19 PCR test was negative throughout the admission.

Fernandez-Nieto *et al.*[4] reported 864 cases of cutaneous reactions following the Pfizer- BioNTech COVID-19 vaccination in 4775 subjects. The most common reaction being itch, followed by delayed injection site reaction, disseminated lesions and rarely urticaria. No severe cutaneous reactions were reported.[4]

It is unclear which component of the vaccine maybe causing the cutaneous reactions seen. The mRNA encoding its spike protein is loaded into a lipid nanoparticle before administration to prevent tissue degradation. These nanoparticles include an attachment of polyethylene glycol (PEG). Cabanillas *et al.*[5] report PEG being used as a common excipient in medicines, cosmetics and foods; cutaneous reactions to PEG in individuals have previously been described. Further allergy diagnostic studies using ingredients of the Pfizer-BioNTech vaccine may help delineate the underlying causative agent.

This temporal association between the eruption and vaccination suggests a link with the COVID-19 mRNA vaccine Pfizer-BioNTech. In contrast to previous reports, this presentation was severe and necessitated inpatient admission and systemic steroids. Careful pharmacovigilance is required to establish and report unknown side effects of this new vaccine and to increase awareness.

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Conflict of interest

No conflict of interest to declare.

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SARS-CoV-2 in the sweat of COVID-19-positive patients: a possible route of transmission?

Dear Editor,

SARS-CoV-2 has caused a global pandemic, in part due to the highly infectious nature of the disease. Transmission between individuals occurs mainly through respiratory droplets and physical contacts, but other modes of transmission could be underestimated.[1] Some observations point to a role of human sweat as a possible vehicle of transmission of SARS-CoV-2.[2] SARS-CoV was already demonstrated in sweat glands in 2004.[3] Recently, immunohistochemical investigations and RNA-FISH technique documented SARS-CoV-2 presence in the eccrine glands of COVID-19-positive patients.[4–6] Moreover, human angiotensin-converting enzyme 2 (ACE2), the receptor by which

SARS-CoV-2 enters into the human cells, was found in the sweat glands and co-localizes with viral antigens in the secretory cells.[4] Interestingly, in a study of 212 SARS-CoV-2 diagnosed individuals, 114 (53%) reported 'profuse sweating'.[7] These findings suggest ample material for infection, if sweat would contain SARS-CoV-2. However, studies conducted so far failed to demonstrate the sweat as a possible route of transmission.[8,9]

We investigated the presence of SARS-CoV-2 in sweat, as a possible under-considered potential mechanism of virus transmission. Twenty-two patients (9 males, 13 females, mean age 73.5 years), hospitalized for acute COVID-19, were tested for the presence of SARS-CoV-2 in sweat. The median time of samples collection from confirmation of SARS-CoV-2 infection was 6.7 days. Sweat samples were taken by swabs from both hands and axillae. Thorough disinfection of patient's skin with 70% ethanol was performed before collecting samples. In order to promote sweating, a heater was used. Sweat samples were placed into 1 ml sterile Universal Transport Medium and processed the same day for the best results. Samples were analysed by rRT-PCR for SARS-CoV-2 ORF8 and RdRp genes. RNaseP human gene was used as endogenous internal control (SARS-CoV-2 ELITe MGB kit, Torino Italy). RT-PCR test was positive for SARS-CoV-2 in 5/22 patients (22.7%).

Key reasons for the wide and rapid spread of SARS-CoV-2 are its high infectiousness and the possibility of transmission by asymptomatic people. Our results are consistent with previous demonstrations of SARS-CoV-2 in eccrine glands and suggest that one possible route of transmission may be sweat mediated, through contact between individuals. We chose to test the hands because in this site there is the highest concentration of eccrine glands. In addition, in previous studies, biopsies, identifying the virus on skin specimens, were collected on hands or feet.[4,10] A limitation of this study is the low number of tested patients. Moreover, the possibility of contamination of the hands with mucosal secretions has to be considered. Following previous studies, we minimized this possibility with careful cleansing of the skin with an alcohol-based solution prior to sample collection. In addition, 4 out of 5 patients with positive result on sweat samples were bedridden, wearing continuous positive airway pressure helmets, which prevents the contamination of the skin by respiratory secretions. Certainly, a conclusive proof of the presence of SARS-CoV-2 in sweat samples would require direct demonstration of the virus (e.g. through electron microscopy). Other questions remain about sweat as a potential route of transmission, e.g. whether infected individuals shed virus in sweat in sufficient quantities to be infectious, and the exact timing of the shedding. The latter factor may explain the variance of our results with the findings of Arslan *et al*,[8] who did not detect SARS-CoV-2 in the sweat of 50 newly diagnosed (i.e. within 24 h) COVID-19 patients. The discrepancy could suggest that the presence of SARS-CoV-2 in sweat glands and its shedding might be late events. While sanitary recommendations already include prevention of direct contact with patients and potentially contaminated objects, our findings could be used to implement mitigation strategies and empirically based public health messaging.

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