

Infectious pseudochromhidrosis in the setting of dupilumab use



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INTRODUCTION

Chromhidrosis (or true chromhidrosis) and pseudo-chromhidrosis are rare conditions of colored sweat.¹ In chromhidrosis, colored sweat is secreted from apocrine or eccrine sweat glands.¹ However, in pseudo-chromhidrosis, sweat becomes colored after secretion by exogenous factors such as dyes, paints, chemicals, or pigment-producing microorganisms, such as chromogenic bacteria.² When the color is due to chromogenic microorganisms, the condition is referred to as infectious pseudo-chromhidrosis (IPCH; Table D).² Different species can cause different colored sweat: *Bacillus* species and *Malassezia furfur* are associated with blue sweat, *Corynebacterium* species are associated with brown or black sweat, *Serratia marcescens* is associated with pink sweat, and *Pseudomonas aeruginosa* is associated with blue-green sweat.² IPCH is proposed to be triggered by medications that alter the pH and microflora of the skin.² Treatment with oral erythromycin and topical erythromycin or clindamycin has led to improvement in patients with IPCH.¹ Here we report a case of blue IPCH caused by *Bacillus cereus* in the setting of dupilumab use.

CASE REPORT

A 15-year-old boy presented to the Department of Dermatology at Michigan Medicine with concerns of blue sweat for the past 7 months. His dermatologic history was notable for atopic dermatitis, keratosis pilaris, pincer nail deformity, and chronic paronychia. He also had food and environmental allergies and asthma. For atopic dermatitis, he was prescribed dupilumab (“DUPIXENT,” Sanofi, and Regeneron Pharmaceuticals Inc; 300 mg injection every

Abbreviation used:

IPCH: infectious pseudo-chromhidrosis

14 days), a dual inhibitor of interleukin 4 and interleukin 13.³ After nearly 3 months of dupilumab use, the patient observed that while wiping his arms for the injections, the alcohol swabs turned blue (Fig 1). He had no special diet other than avoiding egg and milk products, denied eating many artificially colored foods, and denied frequent wearing of dark or blue clothing. His other medications included albuterol (90 mcg/actuation inhaler), fluticasone (110 mcg/actuation inhaler), mupirocin 2% ointment, and sertraline (25 mg). His primary care physician prescribed chlorhexidine gluconate 4% topical liquid after onset of the blue sweat. Approximately 1 month before presentation, he discontinued dupilumab because of pain associated with injections.

Physical examination revealed blue discoloration when cleaning his arm, hand, and axillae with alcohol swabs. No fluorescence was observed on Wood’s lamp examination. A bacterial swab of the skin of both arms palms was positive for *B cereus*, coagulase-negative *Staphylococcus*, and *Micrococcus luteus*. No biopsy was performed.

A diagnosis of IPCH was made based on clinical features and the presence of *B cereus* on the skin. The patient was prescribed oral erythromycin (250 mg 3 times a day) and topical clindamycin (2 times a day for 10-17 days), which has previously been reported to lead to improvement in patients with IPCH.¹ He reported that the blue sweat resolved

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Table I. Infectious pseudochromhidrosis: An overview

Natural history	Occurs in children and adults, male and female individuals
Pathophysiology	After secretion from the sweat gland, sweat is colored by chromogenic bacteria
Diagnosis	Comprehensive history to determine risk factors, including medications and lack of exposure to dyes and chemicals Physical examination reveals colored sweat Negative Wood's lamp examination Skin bacterial swab is positive for chromogenic bacteria
Management	Benign and does not require treatment Can be treated with oral erythromycin and topical erythromycin/clindamycin

with the antibiotic treatment, which he used intermittently for several months, further strengthening the IPCH diagnosis. Approximately 1 month after discontinuing the antibiotics, the blue sweat returned.

DISCUSSION

Because this patient presented with blue sweat, the differential diagnosis included chromhidrosis or pseudochromhidrosis, which are both rare conditions of colored sweat.¹ Many features of this case favored pseudochromhidrosis over chromhidrosis. The generalized distribution of the blue sweat made apocrine chromhidrosis less likely. Additionally, the negative Wood's lamp examination made a diagnosis of apocrine chromhidrosis less favorable. Apocrine chromhidrosis is often because of oxidation of lipofuscin, and an increased number of yellow-brown lipofuscin granules in the apocrine glands is observed on Wood's lamp examination.² An eccrine source was also considered, since ingestion of dyes or colored foods can cause eccrine chromhidrosis;⁴ however, the patient denied eating many artificially colored foods. Therefore, pseudochromhidrosis emerged as the likely diagnosis. Because of the absence of dye or chemical exposures, an infectious source was suspected. The IPCH diagnosis was confirmed with positive cultures for *B cereus*.

B cereus is a gram-positive, spore-forming bacterium that causes food poisoning, local infections, and systemic infections.⁵ *Bacillus* species have also

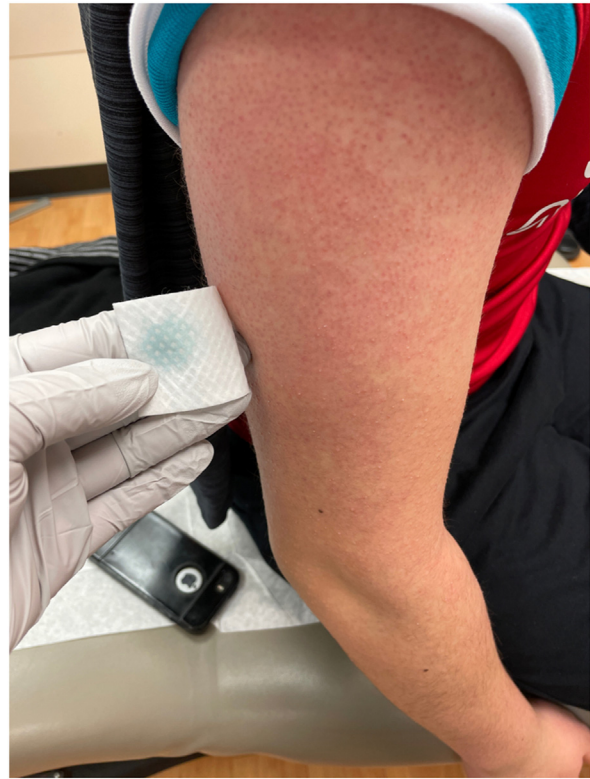


Fig 1. Infectious pseudochromhidrosis. An alcohol swab from the arm revealed blue discoloration of sweat.

previously been associated with blue IPCH.^{2,6,7} Reports of IPCH caused by *Bacillus* species have proposed that medications (such as ranitidine,⁶ promethazine,² and topiramate⁷) that alter the skin pH and microflora may trigger *Bacillus* colonization and IPCH. Dupilumab was started 3 months before the onset of blue sweat, suggesting a potential association with the IPCH. It is possible that dupilumab may have led to alterations in the patient's skin microflora. The blue sweat persisted after the patient stopped dupilumab injections due to injection-site pain; however, this may not necessarily rule out an association, if the effects on skin microflora were not quickly reversed. Indeed, it has been demonstrated that dupilumab can have effects on skin microflora for up to 18 weeks following the last injection.⁸

In summary, this patient's blue sweat was likely the result of *B cereus* colonization, potentially because of altered skin microflora following dupilumab use. This case highlights the importance of obtaining a comprehensive history when colored sweat is observed to differentiate between chromhidrosis and pseudochromhidrosis. If an infectious source is suspected, bacterial culture can be performed to elucidate specific microorganisms present, which can assist in the diagnosis of IPCH. Additionally, as in this patient, recent changes to

medications should be reviewed, and the medications should be investigated for potential effects on skin microflora.

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Conflicts of interest

None disclosed.

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