

## Eccrine chromhidrosis: A case report and review of literature

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### ABSTRACT

Chromhidrosis is a rare disorder characterized by colored sweat and/or stained skin. Eccrine chromhidrosis is an orphan disease in which water-soluble pigments are excreted through the eccrine glands. This article provides a highly doubtful eccrine chromhidrosis case and the literature review for eccrine chromhidrosis. We recommend an investigative algorithm for dermatologists, hepatologist, and general practitioners to enhance diagnostic capability without mistake among similar and differential diseases. Most importantly, the exact etiology should be determined, which further decides the treatment plan. Systemic treatment of liver diseases or bacteremia was reported particularly effective. Results and prognosis were excellent and without recurrence.

**Key words:** *Chromhidrosis, Colored sweat, Eccrine chromhidrosis*

Chromhidrosis is a rare condition that produces colored sweat from apocrine or eccrine glands. Apocrine chromhidrosis is localized and predominantly affects the face, extremities, and the breast areolae, which is consistent with the distribution of apocrine sweat glands. It can be induced by exercise, stress, and hot baths. However, pseudochromhidrosis was identified as an extrinsic chromhidrosis because initially colorless sweat became colored on the skin surface once it was exposed to exogenous dyes, chemical agents, and/or chromogenic bacteria.

Eccrine chromhidrosis is an exceedingly rare condition where water-soluble pigments are secreted through eccrine sweat glands. Increased bilirubin in hyperbilirubinemia, secondary to liver diseases, was reported in the previous literature [1-4]. The most common extrinsic causes of this disorder are dyes and/or pigment(s) ingestion from medication (tartrazine-coated bisacodyl [5] and homeopathy drug [6]) or diet (tomato-flavored prepacked food [7]). In addition, water-soluble coloring food additives are widely used in the food industry, which can induce eccrine chromhidrosis as proven by spectrophotometry.

Herein, we report a case of chromhidrosis that might largely be caused by Chinese takeaway food, namely “noodles with Pork Intestine.” Furthermore, we will present the pathogenesis/etiology, clinical presentation, histopathology, and investigations related to this condition.

### CASE REPORT

A 16-year-old girl presented with an orange stained undershirt, a 1-month history of diffused darkish ebony skin discoloration and colored fingernails. The orange discoloration was notable after exercise. Moreover, there was no notable medical history, and the

patient denied occupational, environmental or habitual exposure to medication, cosmetics, or exogenous paint producing pigments.

Physical examination revealed an orange stained T-shirt (Fig. 1a), spots of the skin located on her abdomen and hind leg (Fig. 1b), and varying degrees of discoloration (orange) of her fingernails (Fig. 1c), which could not be removed by wet cotton swabs. The color of the urine, tears, saliva, and feces was all normal.

Laboratory examination was performed including blood, urine, liver, renal, thyroid, and tumor marker tests, all of which were normal except increased total bile acid 31  $\mu\text{mol/l}$  (normal: 3.4–17.1  $\mu\text{mol/l}$ ), blood's uric acid 370  $\mu\text{mol/l}$  (normal: 178.4–297.4  $\mu\text{mol/l}$ ), and urobilinogen +, 34  $\mu\text{mol/l}$  (normal: - or <16  $\mu\text{mol/l}$ ).

Abdominal ultrasonography of liver, gallbladder, spleen, and pancreas was normal. Dermoscopy showed darkish ebony pigment along the dermatoglyphic ridges of posterior shank skin (Fig. 2). Skin scraping/culture and biopsy were refused.

A follow-up in-depth history produced confirmation of a special fetish for takeaway food “bowel noodles.” Although lack of extraction of takeaway food and clothing by spectrophotometry to confirm causable pigment and additives, we proposed it to be eccrine chromhidrosis which turned normal completely in 4 months and no recurrence hitherto within 1.5 years.

### DISCUSSION

The exact pathogenesis of eccrine chromhidrosis is still unclear. From our review of the literature, the most important cause of the eccrine chromhidrosis found was hyperbilirubinemia, followed by ingestion of drugs and food; there also exist two other reasons which are unknown. Etiology of eccrine chromhidrosis is listed in Table 1.

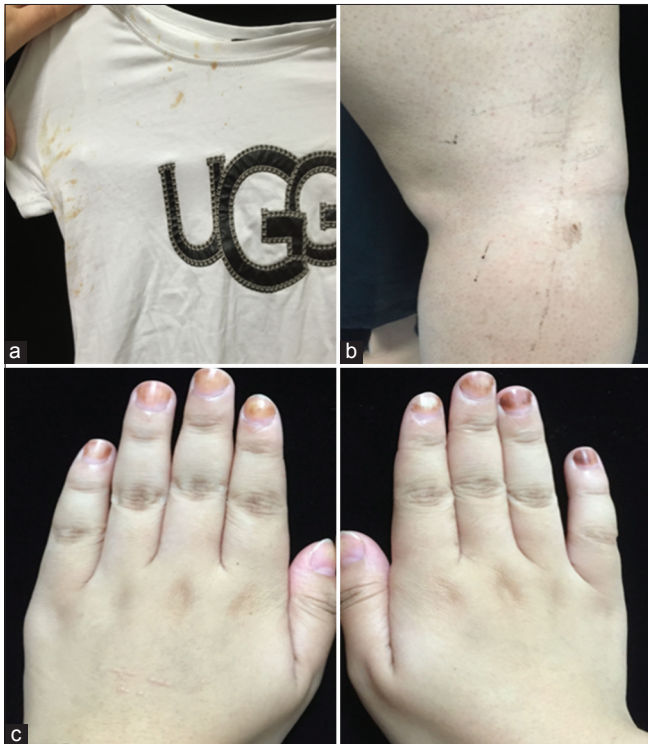


Figure 1: (a) Orange stained T-shirt, (b) darkish ebony skin, (c) orange stain on fingernails



Figure 2: Dermoscopy of darkish ebony pigment predominantly along the dermatoglyphic ridges

Disease-related eccrine chromhidrosis causes hyperbilirubinemia, which can be primary or secondary to cholangiocarcinoma [1], liver cirrhosis [2], drug-induced liver disease [3], and enterococcal bacteremia [4]. Progressive jaundice induced by advanced intrahepatic cholangiocarcinoma causes an elevated level of direct bilirubin which led to increased secretions of water-soluble bilirubin from the eccrine glands [1]. A 6-month-old patient presented with drug-abused cholestasis accompanied with jaundice, presenting with high levels of direct bilirubin that was secreted through the eccrine gland. Moreover, biopsy results showed dilated eccrine pores and a positive Prussian blue stain [3]. Previous reports consider this bilirubin excretion by the eccrine glands as exceptional variants of eccrine chromhidrosis.

Table 1: Etiology of pseudo-chromhidrosis

Cause	Agents
Disorders	Bilirubin increased in hyperbilirubinemia
	Acute hepatitis
	After cardiac bypass
	Cholelithiasis with choledocholithiasis
	Gallbladder adenocarcinoma
	Cholelithiasis
	Pancreatic adenocarcinoma
	Cholangiocarcinoma
	Drug-induced liver disease
	Duodenal adenocarcinoma
Drugs	Tartrazine coated bisacodyl
	Copper in homeopathic medicine
Food	Tomato-flavored prepacked food
	*Chinese takeout bowel noodles
Idiopathy	Unknown reasons

\*Our patient highly suspect Chinese takeout bowel noodles

Drugs related to eccrine chromhidrosis include bisacodyl (dulcolax) and homeopathy drugs. Krishnam *et al.* reported a case of yellow eccrine chromhidrosis induced by bisacodyl that was coated with highly water-soluble tartrazine [5]. Ghosh *et al.* reported a case of blue-green eccrine chromhidrosis with high blood copper and caused due to homeopathic medicine ingestion and later on returned normal after discontinuation of the drug [6].

A specific brand of tomato-flavored prepacked food was associated with red eccrine chromhidrosis [7]. Spectrophotometry identified that clothing and branded food extractions were revealed three water-soluble coloring food additives that were commonly included in prepacked fast foods: Tomato powder 04181 (H 3383), tomato powder 2148249 (H 3383), and paprika 03200 (H 3383) [7]. In the present case, our speculation was that bowel noodle takeout food-induced eccrine chromhidrosis might be possible; although pigments or additives were not detected.

An etiology of eccrine chromhidrosis has also been reported as idiopathic in several reported cases. Beer and Oakley reported a case of a 62-year-old woman who presented with 30 years complaint of a dark ebony discoloration that covered her axilla and stained her garments. She denied any history of dye/pigment exposure to drugs and foods and was without a significant medical history. She accepted Botox (50 units) for each axilla and significantly improved within 5 days. She was discharged on the 10<sup>th</sup> day [8]. Consequently, she returned for follow-up injections of Botox (100 units), twice in 1 year. The resolution of the symptoms by Botox supports the eccrine etiology; for this reason, the author suspected eccrine chromhidrosis as the underlying cause [8]. Botox was responsive to eccrine sweat glands and improved eccrine chromhidrosis after injection [9].

The clinical presentation could manifest as different colored sweat on various surfaces of the body. From our literature review, the color of eccrine chromhidrosis varied due to different primary causes and varied in the color discoloration from green, blue, yellow,

orange, and red to black. The clinical manifestations could be localized at the palmoplantar parts, fingertips, nails, thighs, face, or axilla. Moreover, it could also be generalized with solo discoloration of shirts and clothing. Besides the typical patches or staining of the skin, the symptom resembles eczema, pompholyx [2,10], and concomitant pityriasis rosea [10]; it can be easily misdiagnosed.

Histopathology examinations commonly revealed dilated intraepidermal eccrine ducts with associated amorphous pink material [10], which was located just in the stratum corneum where the bilirubin deposited [4]. Besides, the diseases in the setting of hyperbilirubinemia, other causality assessment also revealed amorphous agents within the eccrine glands, which were subsequently identified as copper [6]. Unlike apocrine glands involved in apocrine chromhidrosis, it is through that eccrine glands in eccrine chromhidrosis secrete pigments such as bilirubin, copper, and even unproven materials.

Investigation of complete blood count by blood routine and homogenisate should be examined to exclude bleeding diathesis and ochronosis, respectively. Abnormal serum iron, blood glucose, and liver function tests may suggest hemochromatosis.

Biochemical function tests were used to detect blood total and direct bilirubin, markers of hyperbilirubinemia related to severe jaundice, high fever, cholangiocarcinoma, liver cirrhosis, drug-induced liver disease, or bacteremia. Spectrophotometer revealed highly raised copper in sweat, which was normal in the blood and urine [6]. High-performance liquid chromatography (HPLC) was performed to demonstrate tartrazine, coating over bisacodyl, which thereby confirmed the diagnosis of chromhidrosis [5]. Dermoscopy was adopted to observe the discoloration of the skin, which revealed a green pigment predominantly on the ridges of the skin where eccrine glands opened [4].

Skin scraping/cultures should be identifiable using methods such as potassium hydroxide examination, Gram stain, and Wood's light examination to distinguish from pseudochromhidrosis. Herein, we propose an investigative algorithm to diagnose this rare disease, as shown in Fig. 3.

It is, in fact, indispensable to first determine the etiology of a condition before selecting a treatment strategy. If diet source dyes and pigments seem doubtful, immediate discontinuation and further close observation should be performed. If a drug is suspicious, we

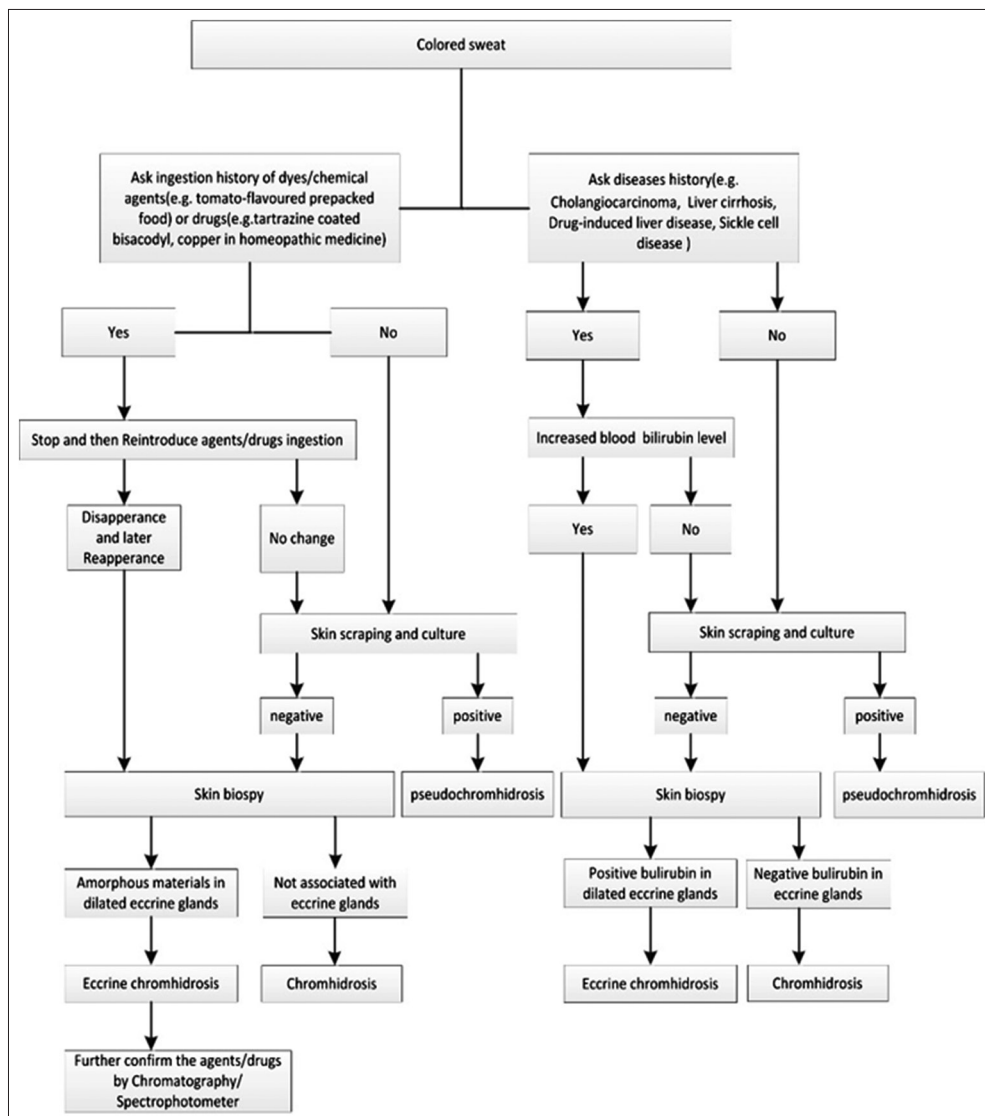


Figure 3: Algorithm investigation of eccrine chromhidrosis

might eliminate and/or reuse it again, and subsequently analyze the underlying agents by spectrophotometer or HPLC.

In terms of the reported cases related to diseases, the discolorations were all green and resulted from increased bilirubin that was excreted through the eccrine glands and mainly deposited on skin of the palms and soles. Cutaneous bilirubin excretion was considered as an exceptional variant of eccrine chromhidrosis related to hyperbilirubinemia secondary to cholangiocarcinoma, liver cirrhosis, drug-induced liver disease, and enterococcal bacteremia. When hyperbilirubinemia improved or was cured within 1 week–2 months, the fevers subsided, and the lesions faded or completely disappeared with or without sloughing of the skin.

In addition, not all cases related to hyperbilirubinemia involved reported positive bilirubin staining on Hall's or Fouchet stain. Therefore, it is speculated that the bilirubin stain had not been optimized in the skin [4].

## CONCLUSION

The exact etiology of chromhidrosis should be ascertained before treatment. As a special variant of eccrine chromhidrosis, cutaneous bilirubin excretion seems to be a sign of liver disease as, after control of these liver diseases, the lesions vanished. The use of food coloring and flavor-enhancing products added into takeaway foods (as seen in our case) should be used cautiously as it has a major health impact and a practical approach in the diagnosis of this condition would be necessary.

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