Allergic Contact Dermatitis to Pure Indigo Powder Hair Dye

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Background

- While hair dyes are common causes of allergic contact dermatitis (ACD), **contact allergy to natural indigo powder has rarely been described**
- We present this case to raise awareness of indigo powder as a potential contact allergen and to reiterate the importance of patch testing to personal products

Case Presentation

Figure 1. Hyperpigmented macules/patches on the posterior neck

- **HPI:** A 50-year-old female presented with a 10-month history of intermittent dermatitis affecting the posterior neck and earlobes **(Fig. 1)**
  - Symptoms began after coloring her hair using natural indigo powder **(Fig. 2a, b)**[1]
  - She had previously been using natural henna hair dye for many years without complication

Figure 2. Our patient's MiNature indigo powder (a), consisting of *Indigofera tinctoria* (b), with instructions to mix with natural henna

Patch Testing

Patch Tested To:

- 2019 – 2020 North American Contact Dermatitis Group screening series
- Hairstyling series
- Textile dye series
- **Home products, including natural henna and natural indigo powders**

Relevant Final Reactions:

- +:
  - 2-nitro-PPD
- ++:
  - Para-toluenediamine sulfate
  - **Natural indigo powder (Fig. 4a)**
  - 3-aminophenol, 4-aminophenol
- +++:
  - **Para-phenylenediamine (PPD)**
  - Disperse orange 3
  - 4-aminoazobenzene
- Negative:
  - Natural henna powder (Fig. 4b)

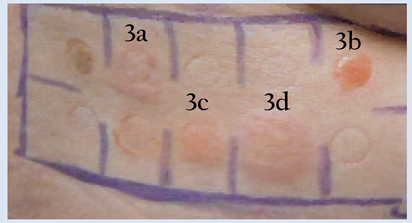

Figure 3a-d. Positive reactions to 3-aminophenol (a), 2-nitro-PPD (b), disperse orange 3 (c), and 4-aminoazobenzene (d)

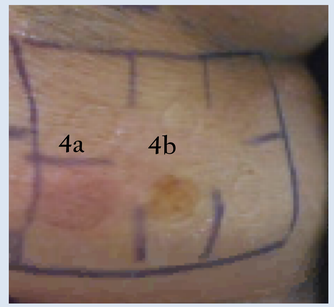

Figure 4a, b. ++ reaction to natural indigo powder (4a); negative reaction to henna (4b)

Indigo Powder Analyses

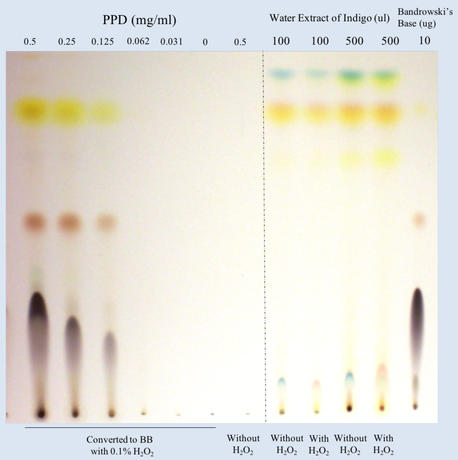

Figure 5. TLC analysis was negative for the presence of undisclosed PPD

- TLC analysis was negative for undisclosed PPD (Fig. 5)
- No PPD was detected by high-resolution liquid chromatography-mass spectrometry (LC-MS)
- 5 controls tested negative to indigo powder dilution series
  - 30%, 10%, 3%, 1%

Discussion

- Natural indigo dye is derived from *Indigofera tinctoria* and *Isatis tinctoria* **(Fig. 6)**; **its associated powder consists technically of 100% pure indigo**[2]

Figure 6. *Indigofera tinctoria* plant (source: Wikipedia)

- **Only one prior case of ACD to pure indigo powder hair dye has been reported**[3]
- PPD has been described as an additive and contaminant in henna preparations to intensify coloration[4]
  - **TLC and LC-MS analyses were negative for PPD; we concluded that indigo powder itself was the likely contact sensitizer (rather than PPD contaminant)**
- Our patient was advised to use only 100% pure henna and/or mineral-based hair dyes
  - **3 months later, she endorsed persistent pigmentation of the posterior neck but denied any recurrent dermatitis**

References

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