Case Report

A case of ‘green urine’

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Introduction

Normal urine is clear and of amber colour because of the presence of urochrome, an amorphous pigment. Variations in colour saturation are largely due to the differences in urine concentration, but may be caused by changes in pH, ingested substances, and metabolic abnormalities [1]. Here we report a case of a green urine hue.

Case

A 56-year-old woman was admitted to the hospital for an acute exacerbation of ulcerative colitis (blood-tined diarrhoea, nausea, and vomiting) associated with aspiration pneumonia, pancreatitis, pericarditis, pleuritis, hypereosinophilic reactive syndrome, and malnutrition. The patient developed respiratory failure, was intubated, and mechanical ventilation was instituted. Because of the complicated nature of her disease, the patient underwent numerous radiological and other studies. The nephrology service was called because of decreasing urine output and rising blood urea nitrogen from 9 mg/dl to 20 mg/dl and serum creatinine from 1.2 mg/dl to 2.8 mg/dl. A slight deterioration of renal function was caused by multiple studies with use of radiocontrasts. Renal function returned to normal within a few days.

The patient was treated with high-dose corticosteroids and antibiotics, and her gastrointestinal symptoms were also treated symptomatically. While still on mechanical ventilation the patient was started on tube feeding because of the prolonged nature of her illness and severe malnutrition (her serum albumin level at that time was 1.3 g/dl). Three days after initiation of enteral tube feeding her urine turned green in colour.

Urinalysis revealed pH of 5.0, trace blood and protein, and a specific gravity of 1.015. Urine culture was negative. The patient was on the following medications at that time: methylpredsolone, pipercillin, tobramycin, omeprazole, dopamine, dobutamine, morphine, and lorazepam.

There was a striking resemblance in colour of stool and urine, both of which were green (Figure 1). This led us to consider the blue dye used in the enteral feed as a possible source of green colour in the urine. Samples of the enteral feed and urine were collected for analysis on the same day.

Special studies

A sample of the dye used in the enteral feeds and patient’s urine were sent to a reference laboratory for analysis. On spectrophotometric analysis, diluted samples of the enteral dye produced absorption graphs similar to the reference data for FD&C blue no. 1 provided by the manufacturer. Spectrophotometry was also performed on the urine sample. Both the diluted enteral dye (1:10 000) and the urine showed an absorbance maximum at around $\lambda = 630$ nm. This is best seen with an overlay of the two graphs (Figure 2). This confirmed the presence of enteral dye in the urine. The urine colour changed back to normal within hours of removing the dye from subsequent enteral feeds.

Discussion

Though green or blue urine is rather uncommon, there are several possible causes for green or blue-green coloured urine, including drugs, dyes, and infection (Table 1) [1,2]. A thorough review of the patient’s history and medications, and relevant investigations enabled us to eliminate these causes. Special studies and disappearance of urine discoloration after removing the food colour from the tube feeding strongly indicates that the food colour was absorbed from the gastrointestinal tract and excreted in the urine.

A non-absorbable food colour is routinely added to tube feeding to facilitate early diagnosis of aspiration.

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Fig. 1. (a) Blue colour of enteral feed with FD&C blue no.1, (b) dark green stool colour, (c) green colour of healthy person’s urine with a drop of FD&C blue no.1, and (d) green colour of patient’s urine.

In our institution the most commonly used is the FD&C blue no.1 (McCormick & Co., Hunt Valley, Maryland). This food colour is an aqueous solution containing:

1. FD&C blue no.1 (disodium salt of ethyl [4-([p-ethyl(m-sulphobenzyl)amino]-(o-sulphophenyl)benzylidene]-2, 5-cyclohexadien-1-ylidene])
2. Propylene glycol
3. Propylparaben (0.1%) and sulphites as preservatives.

This food colour is blue in the tube feed (Figure 1a) but changes to dark green in stool due to the presence of dark yellow or brown intestinal contents (Figure 1b). The FD&C no.1 added to normal urine (Figure 1c) or present in the patient’s urine (Figure 1d) changes colour to green due to the presence of yellow pigments in urine (a mixture of blue and yellow giving a green colour). The prevalence of blue or green hue depends on the relative concentrations of the pigments.

The FD&C blue no.1 is reported to be totally excreted in the faeces. Hess and Fitzhugh [3] found that FD&C blue no.1 is almost completely excreted in the stool of rats within 40 h and the dye was absent.
Table 1. Causes of green and blue-green urine [1,2]

<table>
<thead>
<tr>
<th>Cause</th>
<th>Compound/Chemical</th>
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<tbody>
<tr>
<td>Pseudomonas infection</td>
<td>Azuresin</td>
</tr>
<tr>
<td>Biliverdin</td>
<td>Bromoforium</td>
</tr>
<tr>
<td>Chlorophyl-containing breath mints (Clorets)</td>
<td>Thymol (volatile oil of thyme and horsemint)</td>
</tr>
<tr>
<td>Excessive use of mouthwash or deodorant</td>
<td>Iodochlorohydroxyquinine</td>
</tr>
<tr>
<td>Methylene blue</td>
<td>Tolonium (medicinal grade of toluidine blue O)</td>
</tr>
<tr>
<td>Diagnex blue</td>
<td>Evans blue</td>
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<tr>
<td>Indigo blue</td>
<td>Guaiacol (in cough remedies)</td>
</tr>
<tr>
<td>Phenyl salicylate</td>
<td>Magnesium salicylate (Doan’s pills)</td>
</tr>
<tr>
<td>Amitriptyline</td>
<td>Methocarbamol</td>
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<tr>
<td>Resorcinol</td>
<td>Triamterene</td>
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from the urine following oral administration. Both stool and urine were positive for dye colour following intravenous administration. This observation was subsequently confirmed in dogs [4]. We have not found any report of intestinal absorption of this compound in humans.

The permeability of the intestinal mucosa is increased in inflammatory bowel disease because of increased absorptive uptake [3–5]. Increased gastrointestinal absorption of polymers of ethylene glycol (MW 600), correlating to the degree of inflammation, has also been reported [5]. Likewise, a much higher gastrointestinal absorption of $^{51}$Cr-EDTA in patients with acute ulcerative colitis has been reported to be present when compared to normal controls [6]. An inflammation-induced hyperaemic response and mucosal barrier damage may result in higher absorption.

We conclude that in a patient with ulcerative colitis, the normally non-absorbable food colour (FD &C blue no. 1), was absorbed from the gastrointestinal tract and excreted in urine. This was most probably related to the severe damage of intestinal mucosa leading to increased permeability.

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