

## Doctor: Why Has Her Urine Turned Purple?

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### ABSTRACT

We present the case of an elderly woman with long-term indwelling urinary catheter use whose urine turned purple due to a urinary tract infection.

### LEARNING POINTS

- Purple urine bag syndrome is secondary to urinary tract infections with indigo- and indirubin-producing bacteria and affects typically institutionalized and chronically catheterized patients.
- *Escherichia coli*, *Citrobacter* and *Proteus spp* are the main culprit.
- It may reflect only asymptomatic bacteriuria and therefore the need for antibiotic treatment must be carefully addressed and individualized.
- Catheter sanitation, constipation avoidance and prompt removal of unnecessary catheters are key to prevention.

### KEYWORDS

Purple urine bag syndrome; urinary catheterization; urinary tract infections; indigo; indirubin

### CASE DESCRIPTION

A 90-year-old woman with advanced dementia and prolonged urinary catheterization presented to the emergency department with general discomfort. Her relatives described her urine's color turning purple ten days prior. Her medical history was remarkable for type 2 DM, chronic kidney disease (CKD), cardiovascular disease and recurrent urinary tract infections (UTIs). On physical examination, the urine in her Foley tubing and bag was bright purple (Fig. 1). C-reactive protein in blood was 12.7mg/dL (normal <1). Her urine was alkaline (pH 8). Empiric ceftriaxone and intravenous fluids were started. Within 24 hours, her condition improved and urine color returned to normal (Fig. 2). The urine culture grew >100,000 UFC/mL *Citrobacter freundii* and *Enterococcus spp*.

### DISCUSSION

Purple urine bag syndrome (PUBS) is a condition in which the urine bag and tubing of chronically catheterized patients turn purple. It is secondary to UTIs with indigo- and indirubin-producing bacteria<sup>[1]</sup>, most commonly *Escherichia coli*, *Citrobacter spp* or *Proteus spp*<sup>[2,3]</sup>. Dietary tryptophan is metabolized to indole by gastro-intestinal bacteria and then converted to indole-sulfate in the liver. Certain bacteria possess enzymes which catalyze indole-sulfate, finally producing indirubin (red) and indigo (blue) that then concentrate in the urine, producing an

intense purple color<sup>[1]</sup>. A similar phenomenon has been described in infants born with a genetic metabolic disorder called Drummond's Syndrome or blue diaper syndrome, a rare inborn error metabolism. Drummond's Syndrome is characterized by the incomplete intestinal breakdown and absorption of tryptophan that is then metabolized to indoles, absorbed and then excreted in the urine, which becomes stained in blue on infant's diapers (indoluria)<sup>[4]</sup>.

Female gender, dementia, chronic debilitated states, alkaline urine, constipation, high bacterial loads and CKD are risk factors for PUBS<sup>[2,3]</sup>, and this syndrome is more frequently reported in Asian patients. PUBS is generally benign but distressing for caregivers and unfamiliar health providers; aggressive management with antibiotics is generally not advised<sup>[3]</sup>. Conversely, catheter sanitation and hygienic and nutritional measures to avoid constipation must be carefully addressed. Institutional policies of prompt recognition of unnecessary indwelling catheters and their removal are needed; multimodal interventions that include staff education and training, daily patient tracking or electronic alerts may help<sup>[5]</sup>. Novel silver-impregnated Foley catheter systems or hydrogel catheters pretreated with a phage cocktail may play a future role in PUBS prevention<sup>[6]</sup>.



Figure 1: Patient's urine at admission



Figure 2: Patient's urine 24 hours after treatment initiation

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