

# Purple urine in a patient with UTI and constipation

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## Abstract

Purple urine bag syndrome (PUBS) is a visually striking and a rare side effect in a patient with urinary tract infection where urine in the catheter bags and tubing turn purple. The urine in PUBS gets its color from the combination of two pigments, indirubin and indigo, which are breakdown products of tryptophan. The most important risk factors include long-term catheterization, female gender, chronic constipation, old age and being bed bound. Here, we present a case of PUBS in an elderly female with a history of bladder cancer that needed catheterization along with constipation.

## INTRODUCTION

Purple urine bag syndrome (PUBS) is a rare complication of urinary tract infection (UTI) with prevalence ranging between 8.3 and 42.1% among patients with long-term indwelling catheters [1]. The urine entering the catheter is normal in color, yet purple discoloration soon appears. This is due to the development of indigo (blue in color) and indirubin (red in color) by the presence of urinary bacteria. These pigments interact with the plastic material of the catheter bag and tubing to produce the purple discoloration by producing a coating layer [2]. Although it is benign in nature and only changes occur in the color of urine from yellow to purple, PUBS results in greater anxiety in patients.

## CASE DESCRIPTION

A 76-year-old female with medical history significant for congestive Stage III chronic kidney disease and bladder cancer presented to the hospital with shortness of breath from congestive heart failure exacerbation. Further investigation revealed an acute kidney injury secondary to cardiorenal syndrome and kidney ultrasound showed mild-to-moderate right-sided hydronephrosis from invasive bladder cancer. A Foley catheter was placed to relieve obstruction and she was placed on intravenous furosemide for congestive heart failure exacerbation. In addition, the patient has been constipated since admission and after 4 days, a change in the urine color was noted in the Foley bag (Fig. 1). Urine dipstick analysis showed alkaline urine (pH of 8.5) with a large amount of blood, nitrites, leukocyte esterase and proteins. Urine culture revealed >100 000 CFU/ml of *Proteus mirabilis*. Computed tomography of the abdomen/pelvis revealed constipation with stercoral colitis and moderate right-sided hydronephrosis with a thickened bladder wall but no stones. The patient was started on a course of ceftriaxone 1 g daily and miralax/senna twice daily with lactulose as needed for constipation. Based upon the patient's

history and the microbiology results, a diagnosis of PUBS was made. Her constipation resolved, and a 5-day course of antibiotics was completed. The patient was discharged to a nursing facility with recommendations to follow up with her nephrologist and urologist as an outpatient.

## DISCUSSION

PUBS was first reported in 1978 [3]. This is an uncommon phenomenon and most commonly seen in patients with permanent urinary catheterization in combination with a highly alkaline UTI (about 9.8%) [4–6]. Numerous organisms have been reported as being responsible for purple urine bag and include *Providencia stuartii*, *Providencia rettgeri*, *Klebsiella pneumoniae*, *Proteus species*, *Escherichia coli*, *Enterococcus species*, *Morganella morganii* and *Pseudomonas aeruginosa* [7]. The pathophysiology of this phenomenon can be traced back to the catabolism of tryptophan, an amino acid found only in our diet which aids in the production of proteins, enzymes and other components [8]. With the help of bacteria, tryptophan is broken down in the gut into indole where it is then taken to the liver and turned into indoxyl sulfate. Sulfatase-producing bacteria in the urinary tract convert indoxyl sulfate into indoxyl which, when metabolized in an alkaline environment, gives rise to indirubin (red pigment) and indigo (blue pigment). When these pigments are combined and oxidized, the urine becomes purple [9].

Gastrointestinal conditions such as obstruction, intussusception and ileal diversions can also increase PUBS, presumably because the bacteria are allowed more time to grow and deaminate tryptophan as in constipated patients. Elderly and bedridden patients with multiple comorbidities more often require long-term indwelling catheters which increase their risk of UTIs; such patients are more likely to be infected by the rarer bacteria which can go on to cause PUBS (10). Although PUBS is

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**Figure 1.** Dark purple urine in the Foley catheter bag. Patient's urine turned a dark shade of purple after she was constipated for 4 days.

generally considered benign on its own, it may progress to more severe disease (i.e. Fournier's gangrene) if immunocompromised [9]. Medical management of PUBS requires changing the catheter and administering appropriate antimicrobial therapy to treat the underlying bacterial infection.

### Teaching Points

- PUBS can be associated with many different types of bacteria in the urinary tract.
- The urine in PUBS gets its color from the combination of two pigments, indirubin and indigo, which are breakdown products of tryptophan.

- PUBS is most commonly associated with alkaline urine and is usually observed in elderly women who have catheter-related UTIs and are constipated.

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### CONFLICT OF INTEREST STATEMENT

None declared.

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## AUTHOR CONTRIBUTIONS

A.A.B. designed the study and contributed to case presentation and discussion. L.K. contributed to the review of manuscript.

## ETHICAL DISCLOSURE

The authors declare no potential conflicts of interest with respect to the authorship, and/or publication of this article. Our institution does not require ethical approval for reporting individual cases.

## INFORMED CONSENT

Informed consent was obtained from the patient for their anonymized information to be published in this article.

## DATA AVAILABILITY STATEMENT

All data generated for this case is included in the manuscript.

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