



**Case Report**

# Purple Urine Bag Syndrome

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Received 29 December 2018

Accepted 24 March 2019

**Keywords**

Purple urine bag syndrome,  
 urinary tract infection.

**ABSTRACT**

An 82-year-old lady with dementia, immobility, admitted with a sacral pressure injury and discharged with a urinary catheter developed purple urine in the catheter bag three weeks later. The mechanism of purple urine bag syndrome, pathogenesis and management is described.

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## 1. CASE REPORT

An 82-year old lady with moderate to severe dementia, T11 compression fracture from osteoporosis, immobility and chronic constipation was admitted with an infected stage 3 sacral pressure injury. Tissue culture obtained from surgical debridement grew *Escherichia coli* and *Proteus mirabilis*. She received 2 weeks of intravenous ceftazidime and was discharged with home based nursing follow-up. A urinary catheter was inserted during the admission to facilitate wound care.

Three weeks later, purple urine was observed in the catheter bag as shown in the Figure. Urinalysis showed alkaline urine (pH 7.5), positive nitrites, 3+ leukocytes, 2+ blood, trace protein, trace ketone and negative for glucose. Urine microscopy showed 10-20 WBCs in high-power field (hpF), 0-3 RBCs/hpF and packed bacteria. Urine culture yielded heavy mixed growth of bacteria (>100,000 cfu/mL bacteria, with at least 3 bacterial species). The catheter in situ was replaced and she was started on oral co-amoxiclav. The purple discolouration resolved 3 days later.

## 2. DISCUSSION

Purple urine bag syndrome (PUBS), was first reported

in 1978 by Barlow and Dickson<sup>1</sup> as an uncommon presentation associated with urinary tract infections (UTI). Arguably, PUBS was reported even earlier by Sir Henry Halford, who described blue-pigmented urine in King George III (1738-1820), characteristic of PUBS.<sup>2</sup>

The prevalence of PUBS was found to range between 8.3% to as high as 42.1% in long-term catheterised patients.<sup>3</sup> PUBS is more common in the geriatric population; due to the higher incidence of immobility or being bed bound, higher risk of hospitalisation and long-term catheter use. It is more prevalent among females, as the shorter urethral length and urethral proximity to the anus predisposes to UTI. Furthermore, the prostate secretes zinc, which exhibits antibacterial activity and serves as a protective factor for males.<sup>4,5</sup>

PUBS is likely caused by a triad of long-term catheterisation, UTI, and increased tryptophan levels in the gut secondary to bowel stasis or dietary intake.<sup>6</sup> Gut flora metabolises tryptophan to indole, pyruvic acid and ammonia. Indole is then absorbed from the gut and converted to indoxyl sulfate in the liver. Indoxyl sulfate is catalysed by enzymes sulfatase and phosphatase to indoxyl, which is excreted in the urine. An alkaline and anaerobic environment then oxidised indoxyl to indigo (blue pigment) and indirubin (red pigment) respectively, in which the pigments combine

and react with the plastic of catheter bags to form the purple colour.<sup>7,8</sup> The hue intensifies with warmer temperature and longer duration the urine is in contact with the synthetic material.<sup>3,4,8</sup>

Common pathogens of PUBS include indoxyl sulfatase- and phosphatase-producing bacteria such as *Escherichia coli*, *Proteus* spp., *Klebsiella pneumoniae*, *Providencia* spp., *Pseudomonas* spp., *Morganella* spp., *Enterococcus* spp., and *Citrobacter* spp.<sup>1,4,8</sup> Although bacteria is not a pre-requisite for PUBS,<sup>9,10</sup> higher bacterial counts are evident in PUBS.<sup>5,11,12</sup> In this case, the sacral pressure injury colonised by two causative bacteria (*Escherichia coli* and *Proteus mirabilis*) for PUBS may have adhered and formed a biofilm on the indwelling catheter, predisposing the patient to urine infections.<sup>13</sup>

Despite UTI being a risk factor and a common occurrence in patients, PUBS remains relatively rare. This is due to several reasons: The purple discoloration would only be visible when a target precipitation is reached.<sup>2,8</sup> Concentration is usually exaggerated in patients with dehydration or chronic kidney diseases.<sup>12</sup> The pH of the urine is also relevant, as alkalinity facilitates the process of discoloration.<sup>2,4</sup> However, PUBS has also been reported in patients without indicanuria<sup>9,10</sup> and acidic urine as well.<sup>10,14</sup>

In terms of management, the catheter should be changed before collecting urine to improve the accuracy of urine culture results and removing the biofilm containing bacteria. Laxatives for chronic constipation, and a short duration of indwelling catheters as possible with proper sanitation and care is recommended.<sup>1,11,12</sup>

Although PUBS is generally a benign phenomenon, there were reported cases of PUBS associated UTI, which progressed to Fourier's gangrene and eventually death in immunocompromised patients.<sup>15</sup> Antibiotics may be considered if there is a risk of

complications; for example, in this patient's case, re-infection of the sacral pressure injury. As there is no consensus or evidence base to recommend for or against antibiotics in PUBS, antibiotic prescribing should be individualized to each situation.

More commonly, the purple stain can cause alarm for families and healthcare workers who are unacquainted with such occurrence. It is crucial to recognise the syndrome, monitor for complications, and manage it accordingly.

## CONFLICTS OF INTEREST

All authors have no conflicts of interest to declare.

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Figure 1. Purple urine bag syndrome.

