

## Review on Physical Characteristics of Urine

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### ABSTRACT

*We reported a case of 24 yrs old male clerk referred to our medicine department with complaint of high grade fever for 10 days associated with episodic red urine of 4 days. On the basis of clinical examination and laboratory parameters he was finally diagnosed a case of enteric fever and improved on antibiotic therapy. The cause of episodic red urine was consumption of much beet roots as advised by local practitioner. Patient was counselled for red urine due to beet consumption and not due to disease. He was explained nutrient value of beet root so he can take it without worry. He was discharged on 10<sup>th</sup> day of admission.*

**Keywords:** Abnormal Urine, Colour, Odor, Turbidity, Specific Gravity

### INTRODUCTION

Urine discoloration is frequent complaint in either gender of all age groups. Abnormal urine colour is important clue for differential diagnosis. Urine is important part of investigation. Normal colour of

urine varies from pale yellow to deep amber which is largely dependent on concentration of urine. In a healthy normal person urine has little or no odor. Though many times colour and odor of urine changes which is not always a sign of

disease, but it must not be ignored because it may be a part of underlying disease particularly if patient is symptomatic. Therefore treating Physician should investigate appropriately. We review physical characteristics of urine and hope it would be helpful for making spot differential diagnosis of a patient.

### ABNORMAL COLOR OF URINE

1. **Red Urine-** Red urine is a frequent complaint and it may be due to medical or nonmedical conditions. If urine analysis shows red blood cells or haemoglobin, it is called hematuria. Various causes of red urine are summarised as – (I). Organic causes-Haematuria (due to vascular, glomerular, interstitial and uroepithelial causes), Hemoglobinuria (due to intravascular hemolysis such as sickle cell anaemia, thalassemia, transfusion reactions and Glucose 6 phosphate dehydrogenase deficiency,<sup>[1,2]</sup> Myoglobinuria (due to ischemic damage of muscles, crush injuries, and vigorous exercise),<sup>[3]</sup> nut cracker syndrome,<sup>[4]</sup> porphyria,<sup>[5]</sup> urate crystals in urine (pink diaper syndrome),<sup>[6]</sup> use of hydroxocobalamin for cyanide poisoning.<sup>[7]</sup> (II). Drug causes- warfarin,<sup>[8]</sup> rifampin,<sup>[9]</sup> phenazopyridine,<sup>[10]</sup> Ibuprofen and deferoxamine<sup>[11]</sup> salicylate and chloroquine,<sup>[6]</sup> phenytoin<sup>[12]</sup>. (III). Food- carrots,<sup>[13]</sup> black berries and beet roots,<sup>[14,15]</sup> senna and rhubarb<sup>[12]</sup>. (IV). Contamination- factitious disorders and menstrual blood.

2. **Orange Urine-** A number of conditions are associated with orange urine and it may be helpful to reach a diagnosis. Following conditions may be associated with orange urine. (I). Organic causes- Bile pigments,<sup>[3]</sup> urinary tract infection caused by Gram negative bacilli<sup>[16]</sup>. (II). Drug causes- high dose of riboflavin,<sup>[17]</sup> rifampin,<sup>[12]</sup> isoniazid,<sup>[18]</sup> phenazopyridine,<sup>[19]</sup> phenacetin, sulfasalazine and vitamin C.<sup>[20,21]</sup> (III). Food- carrots.<sup>[20,21]</sup>

3. **Purple Urine-** The only known cause of purple urine is purple bag syndrome.<sup>[22,23]</sup> Sometimes Gram negative bacteremia is also associated with purple urine.<sup>[24,25]</sup>

4. **Blue / Green Urine-** Blue- green urine is not very uncommon entity. It may be useful for clinician to suspect the following disorders. (I). Organic causes- bacteraemia or Urinary tract infection caused by *pseudomonas aeruginosa*,<sup>[26,27]</sup> hartnup disease,<sup>[28]</sup> blue diaper syndrome (familial hypercalcemia),<sup>[29,30]</sup> Indicanuria.<sup>[30]</sup> (II). Drugs- methylene blue,<sup>[31,32]</sup> triamterene,<sup>[12]</sup> promethazin,<sup>[33]</sup> thymol,<sup>[34]</sup> cimetidine,<sup>[35]</sup> metaclopramide,<sup>[36]</sup> popofol,<sup>[37,38,39]</sup> amytriptiline,<sup>[40]</sup> tetrahydronaphthalene (cuprex) and ingestion of herbicides mefenaceta and imazosulfuro).<sup>[41]</sup> (III). Food- Dyes or coloring agents of enteral feeds.

5. **Yellow urine-** Yellow urine is commonly associated with following conditions. (I). Organic causes- liver disorders. (II).

Drugs- vitamin B-complex, rifampin<sup>[12]</sup>  
(III). Food – carotene, senna and  
rhubarb.<sup>[12]</sup>

6. **Brown urine-** Following conditions should be suspected if urine is brown in color. (I). Organic causes– hemolysis, porphyria,<sup>[42]</sup> metastatic melanoma,<sup>[43]</sup> Copper poisoning and phenol poisoning,<sup>[44]</sup> (II). Drug causes- metronidazole,<sup>[44]</sup> acetaminophen, nitrofurantoin and chloroquine,<sup>[12]</sup> (III). Food-carotene and Rhubarb,<sup>[12]</sup> fava beans.<sup>[44]</sup>
7. **Black Urine-** Black urine may be a diagnostic clue for the given conditions. (I). Organic causes- intramuscular iron injection,<sup>[45]</sup> Alcaptonuria,<sup>[46]</sup> porphyrinuria,<sup>[12]</sup> metastatic melanoma.<sup>[43]</sup> (II). Drug causes-nitrofurantoin, senna laxative, methocarbamol, sorbitol and phenol derivative cresol,<sup>[47]</sup> metronidazole.<sup>[44]</sup>
8. **White urine-** white urine or Albinuria is associated with a variety of conditions which may help a clinician to make diagnosis of following disorders- chyluria due to filariasis,<sup>[48]</sup> lymphatic fistula,<sup>[49]</sup> pyuria in sever UTI,<sup>[48]</sup> mineral sediments such as hypercalciuria, hyperoxalouria and phosphaturia.<sup>[50]</sup> Other causes are Schistosomiasis, lipiduria, proteinuria and propofol infusion.<sup>[51]</sup>

#### ABNORMAL TURBIDITY OF URINE

Urine is normally transparent but can be turbid in

various conditions. Such as UTI, heavy hematuria and genital secretion contamination.<sup>[12]</sup>

#### ABNORMAL ODOR OF URINE

Urinary odor is also a helpful parameter in urine analysis which is characteristics in following conditions. odors may be may be different as-

1. **Pungent odor-** It is due to production of ammonia present in bacterial UTI.<sup>[12]</sup>
2. **Sweet or fruity odor-** It is associated with ketones in urine.<sup>[12]</sup>
3. **Maple syrup odor-** It indicates maple syrup disease.<sup>[12]</sup>
4. **Musty or mousy odor-** It is characteristic of phenylketonuria.<sup>[12]</sup>
5. **Fishy or rancid butter odor-** It is caused by hypermethioninemia.<sup>[12]</sup>
6. **Sweaty feet odor-** It is present in isovaleric acidemia and Glutaric acidemia type II.<sup>[46]</sup>
7. **Cat's urine odor-** It is found in 3-Methylcrotonyl glycinuria.<sup>[46]</sup>
8. **Boiled cabbage odor-** It is found in Tyrosinemia type I.<sup>[46]</sup>
9. **Swimming pool odor-** It is present in hawkinsinuria.<sup>[52]</sup>
10. **Hops like odor-** It is associated with oasthouse urine disease.<sup>[52]</sup>
11. **Fecal odor-** It is characteristic of bladder-intestinal fistula.

#### ABNORMAL SPECIFIC GRAVITY OF URINE

Specific gravity (SG) is a function of number and weight of dissolved particles. It can be measured

with refractrometer or hygrometer or dipstick test. Normal range of SG is 1.003 to 1.030. It may be affected by urine temperature, glucose, proteins, mannitol, dextran, diuretics, radiocontrast media and some antibiotics<sup>[3]</sup>. It is marked with a scale from 1.000 to 1.060 on urinometer. On the basis of specific gravity urine may be (I) Isosthenuric-when SG is 1.010. It means urine SG is similar (and osmolality) as plasma eg. Acute tubular necrosis and chronic kidney disease. (II) SG from 1.000 to 1.003 – it is associated with marked urinary dilution such as diabetes incipidus or water intoxication. (III) SG above 1.040 – it is almost always associates with osmotic agents eg. Contrast material.<sup>[12]</sup>

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