Red urinary discolouration following hydroxocobalamin treatment for vasoplegic syndrome

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Vasoplegic syndrome is a state of profoundly low systemic vascular resistance secondary to aberrant nitric oxide production, release, and signaling. Hydroxocobalamin (Cyanokit®, Meridian Medical Technologies, Columbia, MD, USA), a form of vitamin B12 conventionally used to treat cyanide poisoning, has recently been described as an off-label treatment for vasoplegic syndrome because it inhibits nitric oxide synthase and binds nitric oxide directly.¹

An 82-yr-old man underwent open explantation of an abdominal aortic stent graft with replacement. Intraoperatively, he developed refractory vasoplegia despite high-dose norepinephrine, epinephrine, vasopressin, and phenylephrine therapy. He received a single 5 g *iv* dose of hydroxocobalamin, resulting in substantial improvement in hemodynamics and decreased vasopressor requirement. Within several hours, his urine

turned bright red, discolouration that persisted for two weeks. Urinalysis revealed no red blood cells or other abnormalities.

Red or purple chromaturia is a side effect of hydroxocobalamin, typically resolving over several weeks.² Additional causes of red urine include blood (e.g., traumatic catheterization, malignancy, infection), dietary ingestion (e.g., beets), and medications (e.g., rifampin, phenothiazines).³ Although benign and not warranting further evaluation by itself, hydroxocobalamin-induced discolouration of body fluids may interfere with colorimetric sensors. For example, intermittent hemodialysis may be impeded for several weeks owing to pigment distribution across the dialysate membrane with subsequent triggering of a colorimetric alarm designed to detect blood leaks.⁴ Continuous renal replacement therapy, however, is unaffected. Although our experience suggests that hydroxocobalamin does not cause clinically significant interference with non-invasive pulse oximetry, there is evidence to suggest that co-oximetric blood gas analysis with several unique analyzers may be altered in the presence of hydroxocobalamin, specifically with false elevations of carboxyhemoglobin and methemoglobin concentrations and underestimation of true oxygen saturation values.⁵ There is no available evidence regarding the accuracy of other commonly utilized oximetric monitoring modalities (e.g., cerebral oximetry) following hydroxocobalamin administration.

This image displays the anticipated urinary colour change following administration of hydroxocobalamin, which is benign and self-limited but may make intermittent hemodialysis difficult. Further testing beyond simple urinalysis to exclude the presence of heme is typically unnecessary.

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Figure 1 Panel (A) Normal urine in the absence of hydroxocobalamin. Panel (B) Red urinary discoloration in the setting of recent hydroxocobalamin administration. These colour changes may appear within two hours of hydroxocobalamin administration and persist for several weeks. Although benign and

self-limited, hydroxocobalamin-induced discoloration of body fluids may interfere with colorimetric sensors. Intermittent hemodialysis may be hindered for several weeks because of the triggering of a colorimetric alarm designed to detect blood leaks

Conflicts of interest None declared.

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References

1. Roderique JD, VanDyck K, Holman B, Tang D, Chui B, Spiess BD. The use of high-dose hydroxocobalamin for vasoplegic syndrome. *Ann Thorac Surg* 2014; 97: 1785-6.
2. Geraci MJ, McCoy SL, Aquino ME. Woman with red urine: hydroxocobalamin-induced chromaturia. *J Emerg Med* 2012; 43: e207-9.
3. Raymond JR, Yarger WE. Abnormal urine color: differential diagnosis. *South Med J* 1988; 81: 837-41.
4. Stellpflug SJ, Gardner RL, Leroy JM, Ellsworth H, Zwank MD. Hydroxocobalamin hinders hemodialysis. *Am J Kidney Dis* 2013; 62: 395.
5. Pamidi PV, DeAbreu M, Kim D, Mansouri S. Hydroxocobalamin and cyanocobalamin interference on co-oximetry based hemoglobin measurements. *Clin Chim Acta* 2009; 401: 63-7.