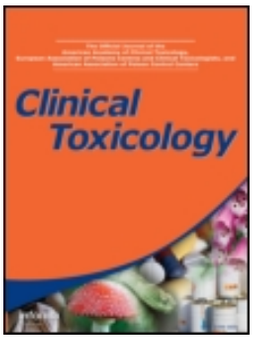

Clinical Toxicology

ISSN: 1556-3650 (Print) 1556-9519 (Online) Journal homepage: informahealthcare.com/journals/ictx20

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To cite this article: Yung-Chieh Huang, Te-Kau Chang, Yun-Ching Fu & Sheng-Ling Jan (2014) C for colored urine: Acute hemolysis induced by high-dose ascorbic acid, Clinical Toxicology, 52:9, 984-984, DOI: 10.3109/15563650.2014.954124

To link to this article: https://doi.org/10.3109/15563650.2014.954124

Published online: 27 Oct 2014.

Clinical Toxicology (2014), **52**, 984

ISSN: 1556-3650 print / 1556-9519 online
DOI: 10.3109/15563650.2014.954124

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LETTER TO THE EDITOR

C for colored urine: Acute hemolysis induced by high-dose ascorbic acid

To the Editor:

Ascorbic acid, vitamin C, has been widely used in the health care system. Recent studies suggest that ascorbic acid actually has beneficial effects on the process of systemic inflammation. A study of animals hyper-supplemented with ascorbic acid intravenously before induction of sepsis found 50% survival in ascorbic acid-treated animals while only 19% of control animals survived.[1] Severe enterovirus-71 infections are unusual but potentially result in high morbidity and mortality. Cardiovascular and neurologic damages in life-threatening enterovirus-71 infections might be caused by several factors, including brainstem encephalitis, as well as inflammatory process in the systemic and central nervous systems.[2] Although it is controversial as to whether high-dose ascorbic acid has anti-viral effects,[3] a few clinical practitioners in Taiwan are using it to treat children with enterovirus infection and the accompanying post-infectious systemic inflammation.

We report a 9-month-old male infant, weighing 12 kg, who was transferred to our hospital for suspicion of severe enterovirus infection. He had no significant medical history except for glucose-6-phosphate dehydrogenase (G6PD) deficiency. Three days before admission to our hospital, the patient presented with fever and multiple oral ulcers, and was admitted to a regional hospital. Tachycardia and decreased oxygen saturation detected by pulse oximeter were found in the morning before transferring to our hospital. Upon physical examinations, the patient voided some very deeply colored urine. Complete blood count revealed that his hemoglobin dropped to 5.4 g/dl, which was 11.1 g/dl two days prior. Both the direct and indirect Coombs tests were negative. When we reviewed his medical records, we found that he had been treated with a very high dose of ascorbic acid (2000 mg Q4H intravenously) for 2 days after being admitted to the previous hospital. After complete studies, we concluded that the patient's clinical presentations and the normocytic anemia were caused by G6PD deficiency-related acute hemolytic anemia (WHO class II for classification of G6PD variants) rather than severe enterovirus infection or alternative causes. He was discharged after supportive treatments.

G6PD deficiency is the most common human enzyme defect. Certain drugs, foods, and infections can cause acute hemolysis in patients with G6PD deficiency. This genetic disorder predisposes red blood cells to oxidative stress and hence, depending on the balance of oxidant species and antioxidants, may lead to red cell hemolysis. Vitamin C is a water-soluble antioxidant which has been found to suppress erythrocyte hemolysis induced by water-soluble radical initiator, and is thought to be one of the defense systems against reactive oxygen species. A few case studies on hemolytic anemia and complications occurring in patients with G6PD deficiency after using high-dose ascorbic acid have been reported in the literature despite the mechanism remained unknown.[4,5] The doses that caused hemolysis described in previous case reports ranged from 80 to 160 gm of intravenous ascorbic acid in adults and 3–4 gm in children with G6PD deficiency. Because tachycardia, poor activity and poor peripheral circulation are presentations common to both severe enterovirus infection and acute hemolytic anemia, the patient's urine color may be helpful in the diagnosis. Although ascorbic acid is a useful antioxidant, caution should be exercised when using ascorbic acid to treat young children with G6PD deficiency.

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Declaration of interest

The authors report no declarations of interest. The authors alone are responsible for the content and writing of the paper.

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Received 23 June 2014; accepted 6 August 2014.

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