A Mother and Newborn with Brown Blood

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CASE DESCRIPTION

A 33-year-old woman of Indian origin presented for prenatal care at term. An ultrasound report from earlier in her pregnancy indicated complete placenta previa and placenta increta, which were confirmed by repeat ultrasound. She was admitted to the hospital for monitoring and delivery planning.

On admission, brown vaginal spotting was noted on the patient's pad. Her nail beds and fingers were cyanotic, and a finger prick blood sample was rusty brown in appearance. Oxygen saturation by pulse oximetry on room air was 45% despite her appearing clinically well. She was otherwise asymptomatic. The patient's husband remarked that her family has "brown blood, not red," noting that the patient's father, paternal grandfather, and sister also have brown blood but no clinical problems. Her 3-year-old daughter had a similar cyanotic appearance but was otherwise asymptomatic.

Repeat oxygen saturation measurements by pulse oximetry consistently gave results between 40%–60%, and arterial blood P_{O_2} was 95 mmHg. Methemoglobin measurement was attempted, but the cooximeter indicated "?Oximetry measuring error." This was also confirmed by repeated measurements.

Complete blood count results were as follows: hemoglobin, 12.5 g/dL (125 g/L; reference interval, 120–160 g/L); red blood cells (RBC), 4.19 × 10^{12}/L (reference interval, 3.80 – 5.20 × 10^{12}/L); hematocrit (HCT), 38% (0.38; reference interval, 0.36–0.46); mean corpuscular volume (MCV), 90 fL (reference interval, 80–100 fL); mean corpuscular hemoglobin (MCH), 30 pg (reference interval, 26–35 pg); mean corpuscular hemoglobin concentration (MCHC), 33.3 g/dL (333 g/L; reference interval, 310–360 g/L); red cell width distribution (RDW), 13.2% (reference interval, <15.6%); platelets (PLT), 224 × 10^9/L (reference interval, 140–450 × 10^9/L); white blood cells (WBC) 9.6 × 10^9/L (reference interval, 4.0 –11.0 × 10^9/L).

A peripheral blood film showed mild anemia with microcytes, no significant polychromasia or poikilocytosis, and neutrophils with prominent granulation. There was no increase in reticulocyte count, and glucose-6-phosphate dehydrogenase activity was normal.

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The newborn child was also found to be cyanotic at birth, with brown blood similar to the mother's. Attempts to measure methemoglobin were once again unsuccessful, and oxygen saturation results by pulse oximetry were consistently very low despite normal vital signs. Complete blood count results for the infant were as follows: hemoglobin, 17.2 g/dL (172 g/L; reference interval, 135–195 g/L); RBC, 4.66 $\times 10^{12}$/L (reference interval, 3.90 –5.50 $\times 10^{12}$/L); HCT, 51% (0.51; reference interval, 0.42– 0.60); MCV, 110 fL (reference interval, 98–118 fL); MCH, 37 pg (reference interval, 26–35 pg); MCHC, 33.5 g/dL (335 g/L; reference interval, 330–360 g/L); RDW, 16.0% (reference interval, <15.6%); PLT, 176 $\times 10^{12}$/L (reference interval, 140–450 $\times 10^{9}$/L); WBC, 12.5 $\times 10^{12}$/L (reference interval, 9.0 –30.0 $\times 10^{9}$/L).

Questions to Consider
• What are causes of cyanosis and brown blood?
• What additional laboratory tests could be useful in this case?
• What could cause both the pulse oximeter and cooximeter to give unusual results?

Final Publication and Comments

The final published version with discussion and comments from the experts will appear in the March 2015 issue of *Clinical Chemistry*. To view the case and comments online, go to http://www.clinchem.org/content/vol61/issue3 and follow the link to the Clinical Case Study and Commentaries.

Educational Centers

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