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50 Years Ago in *THE JOURNAL OF PEDIATRICS*

The Oxygen-Hemoglobin Equilibrium Curve and Tissue Oxygen Release

Oski FA, Delivoria-Papadopoulos M. The red cell, 2,3-diphosphoglycerate, and tissue oxygen release. *J Pediatr* 1970;77:941-56.

In 1967, Benesch and Benesch demonstrated that organic phosphates in red blood cells have a profound influence by lowering hemoglobin's affinity to oxygen.¹ This triggered an explosive interest in how such substances, and especially 2,3-diphosphoglycerate (2,3-DPG), influence the oxygen-hemoglobin equilibrium curve (OHEC). Fifty years ago, Oski and Delivoria-Papadopoulos reviewed in *The Journal* how such factors impact tissue oxygenation.

2,3-DPG binds to the deoxygenated form, but not the oxygenated form, of hemoglobin. Hypoxemic conditions, like cyanotic heart disease, chronic lung disease, chronic anemia, and exposure to high altitudes, lead to higher levels of both deoxygenated hemoglobin and 2,3-DPG and a right shift of the OHEC with increased release of oxygen to the tissues. In contrast, low 2,3-DPG levels, as occur in septic shock and transfusions of stored blood, lead to a left shift of the OHEC, thereby decreasing tissue oxygenation.² It is also well known that the fetal OHEC is left-shifted compared with the adult OHEC, owing to the reduced capacity of fetal hemoglobin to bind 2,3-DPG compared with adult hemoglobin. This is of benefit to the fetus in utero, as it facilitates the transfer of oxygen across the placenta, but it leads to inadequate oxygenation of the tissues in hypoxic episodes after birth. The right shift of the OHEC in the newborn occurs gradually, influenced by both the shift to adult hemoglobin and increased 2,3-DPG levels. Oski and Delivoria-Papadopoulos, who published a series of articles in this field, carefully explain how all these processes are carried out, as well as the factors influencing the OHEC. This is as important today as it was 50 years ago, and their review sheds light on a topic that remains highly relevant, especially for newborn care.

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