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High-Resolution Dynamics of Hemodilution After Exercise-Related Hemoconcentration

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Zsolt Komka, Brigitta Szilágyi, Dóra Molnár, Bence Sipos, Miklós Tóth, János Elek, and Máté Szász

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Purpose: Hemoconcentration during acute intense exercise is intensively investigated, while the rearrangement of hematological parameters during the recovery period is less understood. The aim of our study was to understand the mechanisms of hemodilution after short-term dynamic exercise. **Methods:** Twelve euhydrated male kayak athletes and 6 untrained controls were examined on a spiroergometer. In addition to the continuous recording of circulatory parameters, blood samples were taken at rest, at maximum load, and during restitution with a dense sampling frequency. Hemoglobin, hematocrit, osmolality, blood components, and core temperature were measured. **Results:** The hemoconcentration, independently of training status, reached its maximum (athletes $\Delta 9.59\%$ [4.18%] vs controls $\Delta 11.85\%$ [2.71%]) in the first minute of the recovery period. There was a significant increase in core temperature, reducing the viscosity of blood and promoting tissue oxygenation. High cardiac output and the increased blood flow compensate for viscosity being elevated by hemoconcentration during exercise. Hemoconcentration was maintained for 7 to 10 minutes and then diluted back to baseline 30 minutes after exercise. Temporarily higher viscosity during reduced cardiac output may result in a critical hemoconcentration zone, elevating the risk of circulatory overload. Elite athletes have a faster cardiac output decrease compared with that of hemodilution, making the circulation more vulnerable. We supposed that hemodilution was guided independently by plasma- and erythrocyte-related effectors. **Conclusions:** After high-intensity dynamic acute exercise, hemodilution is driven by independent factors, and a critical hemoconcentration zone may be formed during the recovery period in trained elite athletes.

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