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LETTER TO THE EDITOR

Stress-hemoconcentration: plasma volume changes or splenic contraction? A Reply to Engan and Schagatay

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In their recent letter regarding our 2011 review article [1], Engan and Schagatay [2] suggest that spleen-induced increases in erythrocyte concentration may be partly responsible for stress-hemoconcentration. They rightly state that, due to a release of erythrocytes into the blood, hemoconcentration occurs as a result of spleen contraction during physiological stressors such as exercise [3] or apneic diving [3, 4]. Moreover, the spleen is sympathetically innervated [3] and catecholamine infusion results in spleen contraction and subsequent release of erythrocytes [5–8]. Although there is much research on this topic in animals, we did not mention animal research in our review because we limited our review to humans.

We [9, 10] and others [11] have shown that erythrocytes increase during acute mental stress. After correcting for plasma volume changes, erythrocytes were no longer different from baseline [10] or they even decreased [9]. This suggests that the increase in erythrocytes is a passive by-product of plasma volume shifts as opposed to a result of active release from the spleen. If the release of erythrocytes from the spleen and plasma volume reduction occur simultaneously, it seems unlikely that correcting for plasma volume changes would result in a decrease in erythrocytes. Instead, one would expect that the increase in erythrocytes and the decrease in plasma volume to offset. Moreover, HDL cholesterol, LDL cholesterol [10, 12–14], plasma proteins [13], and immune cells/messengers [15] are affected by hemoconcentration. However, erythrocyte concentration does not change during stress to the same extent that these substances change, suggesting that an increase in erythrocytes is not responsible for these increases.

Nevertheless, this does not completely preclude the possibility that the spleen releases erythrocytes during acute mental stress. The next step in this line of research would be to concurrently measure splenic contraction, erythrocyte concentration, and plasma volume before, during, and after stress in order to disentangle how these mechanisms may work together to produce a state of stress-hemoconcentration.

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