Effect of Aspirin Supplementation on Hemodynamics in Older Firefighters

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ABSTRACT

LANE-CORDOVA, A. D., S. M. RANADIVE, H. YAN, R. M. KAPPUS, P. SUN, K. BUNSAWAT, D. L. SMITH, G. P. HORN, R. PLOUTZ-SNYDER, and B. FERNHALL. Effect of Aspirin Supplementation on Hemodynamics in Older Firefighters. Med. Sci. Sports Exerc., Vol. 47, No. 12, pp. 2653–2659, 2015. Purpose: Cardiovascular events are the leading cause of line-of-duty fatality for firefighters. Aspirin reduces the risk of cardiovascular events in men and may reduce fatalities in older (>40 yr) firefighters. We hypothesized that both chronic and acute aspirin supplementation would improve vascular function after live firefighting but that chronic supplementation would also improve resting hemodynamics. Methods: Twenty-four firefighters (40–60 yr) were randomly assigned to acute or chronic aspirin supplementation or placebo in a balanced, crossover design. Arterial stiffness, brachial and central blood pressures, as well as forearm vasodilatory capacity and blood flow were measured at rest and immediately after live firefighting. Results: Total hyperemic blood flow (area under the curve [AUC]) was increased (P < 0.001) after firefighting with no effects for aspirin supplementation or acute versus chronic administration (AUC, from 107 ± 5 to 223 ± 9 in aspirin condition and from 97 ± 5 to 216 ± 7 mL·min⁻¹·100 mL forearm tissue for placebo; P < 0.05 for main, and P > 0.05 for interaction). Arterial stiffness/central blood pressure increased (P < 0.04) with no effect of aspirin (from 0.0811 ± 0.001 to 0.0844 ± 0.003 ms⁻¹·mm Hg⁻¹ in aspirin condition versus 0.0802 ± 0.002 to 0.0858 ± 0.002 ms⁻¹·mm Hg⁻¹ in placebo condition), whereas peripheral and central systolic and pulse pressures decreased after firefighting across conditions (P < 0.05). Conclusions: Live firefighting resulted in increased AUC and pressure-controlled arterial stiffness and decreased blood pressure in older firefighters, but aspirin supplementation did not affect macro- or microvascular responsiveness at rest or after firefighting. Key Words: BLOOD FLOW, ANTICOAGULANT, FIREFIGHTING, ARTERIAL STIFFNESS

A cut, cardiovascular events accounted for approximately 42% of all line-of-duty firefighter deaths in the United States in 2012 (16). Firefighters are 10–100 times more likely to suffer a sudden cardiac event after fire suppression activities than during routine station work (29). This may be because firefighting acts as a trigger for a cardiovascular event in vulnerable individuals because of the combination of strenuous physical work, hyperthermia, smoke and particulate inhalation, and psychological/emotional stress (37). In addition, the risk of cardiac death during firefighting is increased in individuals with traditional cardiovascular risk factors (hypertension and obesity) and those >45 yr old (29,37). Indeed, firefighting has been shown to increase core temperature and HR and decrease plasma volume and stroke volume (17,25). Live firefighting also transiently augments arterial stiffness, a predictor of cardiovascular morbidity and precursor to hypertension and end-organ damage (39), which could further increase the risk of major cardiovascular events (15).

Low-dose (<325 mg) acetylsalicylic acid (aspirin) use reduces the risk of myocardial infarction in men (i.e., primary prevention (3,42). This is because aspirin inhibits cyclooxygenase-1-dependent platelet activation, thereby reducing risk of thrombosis (8). Furthermore, aspirin supplementation has been shown to reliably reduce the risk of serious vascular events (secondary prevention) (2) and effectively attenuate serum levels of inflammation, a modulator of vascular dysfunction (10). In animal and cellular models, aspirin preserves bioavailable nitric oxide (NO), a