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Effects of a High-fat Meal on Circulating Microparticle Quantity and Function

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A high-fat meal (HFM) is a well-known stimulus for studying changes in vascular inflammation and function. However, its effects on molecular changes within the vasculature warrant further study. Annexin-V+ microparticles and their subpopulations are extracellular vesicles released by endothelial and other cells in response to stimuli including inflammation, apoptosis, cellular damage, and exercise. Microparticles are thought to be mechanisms of cell-to-cell communication and spread phenotypic changes dependent on their stimulus of release. While previous studies found changes in circulating microparticle counts following a HFM, none have assessed the function of these microparticles. **PURPOSE:** Determine the effects of a HFM on circulating microparticle counts and their ability to stimulate endothelial cell oxidative stress *in vitro*. **METHODS:** Fourteen healthy adults (18-35 yrs.) of high (VO_{2peak} 53.03 ± 2.67 mL/kg/min) or lower (VO_{2peak} 36.29 ± 1.66 mL/kg/min) fitness status consumed a HFM (85.5% fat, 11.3% carbohydrates, and 3.4% protein) normalized to body surface area (386g/2m^2). Participants underwent a blood draw at baseline, as well as post-prandially at 2 hours and 4 hours. Microparticles were isolated from plasma via sequential centrifugation, then labeled with fluorescent conjugated antibodies for quantification via flow cytometry. Human umbilical vein endothelial cells (HUVECs) were incubated with 5000 microparticles from each sample for one hour, then stained with CellROX Green to quantify reactive oxygen species (ROS) production. Paired samples were analyzed using the Wilcoxon signed-rank test. **RESULTS:** Compared to baseline and 4h, all microparticle populations were numerically higher at the 2h timepoint but did not reach significance (191 ± 35 vs. 342 ± 85 vs. 185 ± 53 MP/µL). HUVEC ROS production was numerically increased between baseline and the 2h and 4h timepoints, but also did not reach significance (0.81 ± 0.09 vs. 0.91 ± 0.13 vs. 1.10 ± 0.23 RFU). The ROS-producing capacity of total microparticles tended to increase from baseline to 2h in all subjects (0.031 ± 0.007 vs. 0.047 ± 0.009 RFU*MP, P = 0.057) but decreased from 2h to 4h in high-fit individuals (0.061 ± 0.013 to 0.028 ± 0.006 RFU*MP, P = 0.016) while remaining elevated in lower-fit individuals (0.031 ± 0.012 to 0.033 ± 0.027 RFU*MP, P = 0.9). **CONCLUSION:** Following a HFM, the ROS-producing capacity of total microparticles may increase 2 hours post-prandially. This returns to baseline in high-fit individuals but stays elevated at 4h in lower-fit individuals. **SIGNIFICANCE/NOVELTY:** To our knowledge, this is the first study to examine microparticle function in response to a HFM, suggesting that high-fit individuals recover from acute HFM-induced inflammation faster than their lower-fit counterparts.