A 8

ORAL PRESENTATION TIME:
POSTER PRESENTATION TIME: 1130 - 1200
RESIDENT COMPETITION:

Do Lipids Or Proteins In Plasma Reduce Bubble Surface Tension? Interrelationships Between Plasma Chemicals, Surface Tension And Post-Dive Venous Gas Embolism

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Introduction/Background: Decompression sickness (DCS) of divers is mostly caused by inert venous gas bubbles; venous gas embolism (VGE). Bubbles with surfactant exist longer due to a reduced surface tension (γ). Also proteins may play a role. Interrelations between albumin, total protein, triglycerides, total cholesterol and free fatty acids, FFAs (i.e. not bound in other lipids), γ and VGE, measured before and after a dry air-dive simulation (21msw/40min) will be studied.

Materials and Methods: Participating divers (52) either had a fat-rich or a fat-poor breakfast to manipulate lipid levels. Eleven subjects obtained both. VGE was examined 40, 80, 120 and 160 min after surfacing (precordial Doppler method). Scores were transformed to Kisman Integrated Severity Scores and γ was determined with the dynamic bubble method.

Results: Theoretically, it was calculated that albumin was enough to cover all bubbles 10^7 times. Molecular dissolved FFA (long-chain; nM range) could just cover all bubbles (irrespective bubble grade), but this process is (too) slow and, moreover, the critical micelle concentration of long-chain-FFAs is 10^6x higher. With various statistical analyses, it could not be established whether γ (ca. 57 mN/m) as well as VGE scores are related to albumin, total protein, total cholesterol, triglycerides and FFAs, with the latter two varying substantially between subjects and between pre- and post-exposure. Correlation coefficients were small; < 0.27 and on average 0.11. Moreover, a relation between γ and VGE was lacking. Similar findings hold for the paired differences between the two exposures of the 11 subjects.

Summary/Conclusions: From these findings and theoretical considerations it seems likely that proteins do lower γ; lipids do not. However, proteins hardly stabilize bubbles. Since the findings are not in concordance with the classical surfactant hypothesis, this hypothesis possibly needs revision. Schellart, ASEM 2014;85:1086-91, Schellart et al., UHM, in press.