**MODULATION OF DECOMPRESSION SICKNESS RISK IN PIGS BY CAFFEINE ADMINISTRATION DURING H2 BIOCHEMICAL DECOMPRESSION**

**BACKGROUND**: Hydrogen biochemical decompression is a process in which intestinal microbes remove some of the $H_2$ dissolved in the tissues of animals breathing hyperbaric $H_2$, thereby lowering their risk of decompression sickness (DCS; Kayar et al, AJP 275:R677, 1998). We hypothesized that increasing intestinal perfusion would increase the supply rate of $H_2$ to *Methanobrevibacter smithii*, a microbe that metabolizes $H_2$ to $CH_4$, further lowering DCS incidence in pigs following a simulated dive with $H_2$.

**METHODS**: In 1 atm air, caffeine ingestion (5 $mg \cdot kg^{-1}$) increased oxygen consumption rate of pigs by 20% and heart rate by 8% for >3h. Animals were given caffeine alone (Ca+INJ-, n = 10, 20.0 $\pm$ 2.0 kg), or caffeine and intestinal injections of *M. smithii* (Ca+INJ-, n = 10, 18.9 $\pm$ 1.7 kg). They were placed in a hyperbaric chamber, compressed to 24 bar (20.5 – 23.1 bar $H_2$, 0.3 – 0.5 bar $O_2$) for 3 h, then decompressed to 11 bar and observed for 1 h for severe signs of DCS. Chamber concentrations of $O_2$, $H_2$ and $CH_4$ were measured by gas chromatography throughout the dive. The rate at which pigs released $CH_4$ (V $CH_4$) was used to monitor microbial activity.

**RESULTS**: Ca+INJ+ animals had a significantly (t-test, $P < 0.05$) higher V $CH_4$ than Ca+INJ- animals (104 $\pm$ 14 vs. 67 $\pm$ 9 □mol $CH_4 \cdot min^{-1}$). However, the DCS incidence in Ca+INJ+ was 90% (9/10) versus 40% (4/10) in the Ca+INJ- animals (□$^2$, $P < 0.05$).

**CONCLUSIONS**: The higher DCS incidence in *M. smithii*-injected pigs was unexpected. It may be attributable to increased tissue H2 loading due to the caffeine, combined with unknown effects on intestinal perfusion following microbial injections. There is much we must learn about biochemical decompression before it can be offered to human divers.