H_2 BIOCHEMICAL DECOMPRESSION IN PIGS: EFFECTS OF 24 H IN HYPERBARIA.

S.R. Kayar, A. Fahlman, W.C. Lin and W.B. Whitman. Naval Med. Res. Cen., Bethesda, MD 20889-5607, Carleton Univ., Ottawa, ON K1S 5B6, and Dept. Microbiology, Univ. Georgia, Athens, GA 30602.

Injections of the microbe *Methanobrevibacter smithii* into the intestines of pigs reduced their risk of decompression sickness (DCS) after 3 h in hyperbaric H_2 (Fahlman et al., FASEB J. 13:A408, 1999). The reduction was due to H_2 removal from the pigs' tissues by the metabolism of *M. smithii* ($4H_2 + CO_2 \rightarrow 2H_20 + CH_4$). We studied the effects of exposing pigs with *M. smithii* to hyperbaric H_2 for 24 h, to better simulate H_2 dive conditions for humans. Pigs (20.6 ± 0.5 kg, n = 3) received intestinal injections of *M. smithii* with activity of 260 - 1170 μmol CH_4/min. To simulate a H_2 dive, each pig was placed in a dry hyperbaric chamber and compressed to 24 atm with O_2 (0.2 - 0.5 atm) and H_2 (> 95% final value) for 24 h. Chamber concentrations of O_2, H_2, He, N_2 and CH_4 were monitored by gas chromatography throughout the dive. After correcting for chamber gas wash-in kinetics, CH_4 release rate from the pig increased throughout the 24 h, with 4x the release rate at 24 h as at 8 h. This suggests that the activity of *M. smithii* was increasing throughout the dive. Final CH_4 release rate was 25-80% of *in vitro* injected activity. Pigs appeared normal at all times at pressure and 1/3 had DCS symptoms on decompression (*vs*. 18/22 controls and 7/16 treated pigs after 3 h). Thus H_2 biochemical decompression appears to be sustainable for at least 24 h, with microbial activity increasing over time. *(Support: ONR 603706N 00096 133 1703).*