Abstract:
BACKGROUND: Biochemical decompression, a novel approach for decreasing decompression sickness (DCS) risk by increasing the tissue washout rate of the diluent gas, was tested in an animal model during simulated H_2 dives. Logistic regression was used to show that the DCS risk was negatively correlated with the biochemical activity used to decrease the tissue gas burden.
METHODS: To increase the washout rate of H_2, we used a H_2-metabolizing microbe (*Methanobrevibacter smithii*) that converts H_2 to CH_4. Pigs (*Sus scrofa*, 19.4±1.3 kg) were either untreated controls (n=10), saline-injected controls (n=10), or injected with *M. smithii* into the large intestine (n=14; varying total activity 200-2200 mmol CH_4/min). The pigs were placed in a dry hyperbaric chamber and compressed to 24 bar (20.6-22.9 bar H_2, 0.3-0.5 bar O_2). Chamber gases (O_2, N_2, He, H_2, and CH_4) were monitored using gas chromatography throughout the dive. After 3 h, the pigs were decompressed to 11 bar at 0.9 bar/min, and observed for severe symptoms of DCS for 1 h.
RESULTS: Pigs with *M. smithii* had a 46% lower incidence of DCS compared to controls (6/14 vs. 16/20). Using logistic regression techniques, we showed that the DCS risk rate decreased with increasing total activity of microbes injected (P = 0.015, Log-Likelihood ratio = 5.965, 1 df).
CONCLUSION: Reducing the tissue concentration of the inert gas significantly reduced the risk of DCS in a pig model. (NMRDC #61153N MR04101.00D-1103).