

ALTITUDE DECOMPRESSION SICKNESS RISK FACTORS REVISITED

FACTEURS DE RISQUE DE MALADIE DE DÉCOMPRESSION D'ALTITUDE RÉVISÉS

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Introduction: Altitude Decompression sickness (DCS) risk prediction is crucial to designing protective equipment and procedures for individuals exposed to high terrestrial altitude or low pressure extra-terrestrial environments. The four critical factors for developing an accurate DCS risk model are prebreathe time (denitrogenation by breathing 100% oxygen), altitude, level of activity while decompressed, and duration of exposure. The level of activity while decompressed has been inadequately quantified in earlier models. Another factor, altitude, has been based on linear measures of altitude, despite the non-linear relationship between altitude and pressure. The current effort demonstrates that revised DCS risk factors provide more accurate inputs to be used in a DCS risk model in development.

Methods: Effect of prebreathe time was based on USAF and NASA research with all other conditions, altitude and level of activity being fixed. Altitude of exposure in feet was converted to exposure pressure in mmHg, and further converted to Tissue Ratio (TR). Effect of level of activity, defined as the highest 1-min of oxygen consumption (ml) per kg per min, was used as reported in previous research publications from Brooks City-Base, TX. The trendline equations for each parameter were used to compare the basis for model in input with results of the previous research.

Results: Equations and graphs of each of the parameters have been shown to better reflect their actual effect on DCS risk. The remaining factor, time at altitude, has a sigmoidal relationship between duration of exposure and risk of DCS and can be adjusted by the other three parameters.

Conclusions: The parameters of prebreathe time, TR, and level of activity should provide more accurate and relevant results than previous models. However, their integration with exposure time has been problematic and, at this writing, is still in development.