RESULTS

A symmetrical 240 min half-time compartment was sufficient (see Table 1) to describe the DCS survival times in 179 exposures that included air break during the PB.

The hypothesis is that N2 washin during an air break is faster than N2 washout during 100% O2 PB due to the release of the vasoconstrictive action of high O2 partial pressure.

METHODS

We used an accelerated log logistic survival model for asymptmetrical N2 kinetics: 

\[ \log \left( \frac{t}{t_1/2} \right) = \alpha + \beta \chi \]

where \( t \) is time at 3.0 psia (hrs), \( t_1/2 \) is 120 min for \( P_1N2 = 7.61 \) psia, with \( t_1/2base = 216 \) min.

CONCLUSIONS/DISCUSSION

A simple symmetrical half-time compartment is all that was statistically justified to describe survival time to DCS in these few data. The survival model with \( \beta \) as decomposition dose is very simple, but utilitarian.

Computing PB payback time after an air break is a practical application of the survival model. \( \beta \) is complex, it can be short or long, and the location of an air break can be early or late into the PB, and the duration of the air break can be short or long. So a quantitative approach to compute PB payback is useful.

For example, an operational task requires that the incidence of DCS not exceed 5% at the end of a two hr exposure to 3.5 psia in someone that performs ambulatory activity. A 200 min PB with a five min aseptic is sufficient to restrict the PB(DCS) ≤ 0.05.

A 30 min PB break 60 min into this PB requires five min of additional PB before ascent.

A 30 min PB break 180 min into this PB requires 19 min of additional PB before ascent.

The approach to compute \( \beta \) payback time is not appropriate outside the range of tested conditions.

The results are data-specific, and additional data may change the conclusions.

The regression model has not been prospectively validated, so the conclusions about payback time are hypotheses rather than recommendations.

REFERENCES

6. Cooke JS. Decompression Physiology: Theory and Practice. The Clarke (8) data. The hazard function defines the instantaneous failure rate at a specific time, given that the subject survived to at least that specified time without DCS. It is expressed as a rate (hr⁻¹).

The hazard function for curve A is \( h(t) = \frac{1}{(0.3)^2} \text{exp}(-0.3t) + \frac{0.022}{(0.3)^2} \text{exp}(-0.022t) \) for \( t > 0.01 \).