NASA TECH BRIEF

Ames Research Center

Ultrastructural Alteration of Mouse Lung by Prolonged Exposure to Mixtures of Helium and Oxygen

Helium is the frequent diluent for oxygen in closed-cycle breathing atmospheres (e.g., deep-sea diving, space cabins) because it is more readily released from the blood than nitrogen or other inert gases during rapid decompression and because it does not have the narcotizing effect of the higher-molecular-weight gases. Heretofore, the results of biochemical, metabolic, and physiological studies have indicated that helium diluent has little effect on small mammals; however, these studies usually have involved pathological techniques which could not be expected to reveal small changes such as might be made evident by use of ultrastructural techniques.

In a recent study, mice raised in a normal oxygen-nitrogen atmosphere have been used as controls for comparison with mice that were born and raised in a normal terrestrial atmosphere but exposed to a helium–oxygen atmosphere (4:1) and those born and raised in the helium–oxygen atmosphere but never exposed to a normal atmosphere. At appropriate intervals of time, animals from the various groups were sacrificed and the lungs removed, cut into tiny cubes, and embedded so that micro-sections could be viewed with an electron microscope.

It was concluded that the lungs of mice exposed to a helium–oxygen environment for long periods of time exhibit some ultrastructural changes. Observed changes consist mainly of blebbing of the capillary endothelium and the alveolar epithelium, which is quite possibly indicative of cellular edema; also, there can be observed a highly-convoluted basement membrane, alveolar debris, and increased numbers of platelets. The findings are considered significant in view of published reports which suggest that helium-oxygen mixtures do not affect lungs.

Note:

Requests for further information may be directed to:

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