CALCULATION OF THE INTERNAL MECHANICAL RESPONSE OF SHEEP TO BLAST LOADING

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Calculations are made of the rib motion and intrathoracic pressure ex-pected from blast loading of sheep. A mathematical model of the chest wall and lung parenchyma have been formulated as a system of differential equations which include the effects of chest wall mass and resistance, density of the parenchyma and an adiabatic equation of state for air within the parenchyma. Blast loading is an external force applied to the system. The system of differential equations is then discretized as a system of non-linear finite difference equations with the blast loading appearing as a boundary condition. The finite system is solved on a computer using an implicit solution algorithm. Pressure loadings used in the calculations were from field tests and correspond to injury levels ranging form no injury to severe injury. Calculated chest wall displacement, velocity and acceleration and intrathoracic pressure at 4 locations within the lung parenchyma and in the esophagus, all in the approximate plan of the seventh thoracic vertebra, are compared with field test measurements for 4 occupational levels and 2 injury levels or blast overpressures.