"CHIX IN SPACE"

CASE STATEMENT: Little is known about the effects of Zero Gravity on the development of bone, muscle and organ tissue in animal embryos. This experiment should help to establish a base of information by analyzing 32 chicken embryos at various stages of development and growth after incubation on a six-day mission of the space shuttle Challenger. They will be compared to a control group of eggs on earth which will be incubated under identical conditions except for the gravity factor.

HYPOTHESIS: Without gravity to pull the yolk to the bottom of the egg, it will remain suspended in its central position, which should cause the embryo to develop more uniformly and efficiently.

EXPERIMENT DESCRIPTION:

The hen's constant movement on the nest causes the egg to rotate continually, which corrects the force of gravity drawing the yolk to the bottom of the egg. In space, there is no gravity to draw the yolk downward. Instead, it will be suspended in a more central position, which should create a more positive environment for embryo growth.

The incubator has been designed to control all the variables except weightlessness in order to study its effects on the developing embryo.

Four variables exist. They are: 1) launch vibration and shock; 2) G-forces; 3) oxygen exchange; and 4) ambient atmosphere. All four have been controlled.

The first variable, launch vibration, has been controlled by the incubator's spring system and air shock absorbers, which cradle the eggs from all the negative effects of vibration.

The second variable, G-forces, has been tested with a centrifuge. Simulating the launch profile of 3.3 G's, the fertilized eggs developed normally.

The third variable, oxygen exchange, has been controlled with the open-celled foam used to cradle the tops and bottoms of the eggs. This foam provides support to help hold the eggs in the correct location and also provides an extra damping device. Seven foams with varying porosity were tested with fertile eggs, and the respiration rate was analyzed. One of the seven allowed enough oxygen exchange, while maintaining its support function, for normal development. This is the foam used in the incubator.

The last variable, ambient environment, has been controlled by means of a mechanical on/off controller with a series of heaters, and a series of capillary pads. These satisfactorily maintain optimum heat and relative humidity, respectively.

Since the only remaining variable is weightlessness, the experiment data can be validated as being related to the impact of the weightless environment.

The chicken egg takes 21 days to incubate. The cell is most susceptible to damage during its developmental stages. These developmental stages of the chicken embryo occur within the first 11 days of the cycle and this is the time frame during which the experiment's embryos will be in the shuttle.

The experiment will provide information on how the embryo develops in a weightless environment compared to an environment of 1 G.

These results can serve as a base for further research into the effects of Zero Gravity on chickens and other organisms, improving our understanding of how animals can be used as food sources, and even whether humans can reproduce in a weightless environment.

This experiment could also provide important information as to whether earth is the optimal environment for all types of embryonic development.