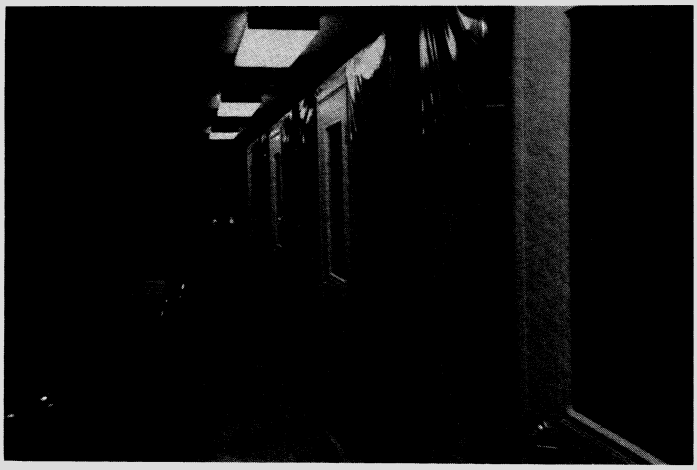
Carbon Dioxide and Animal Health



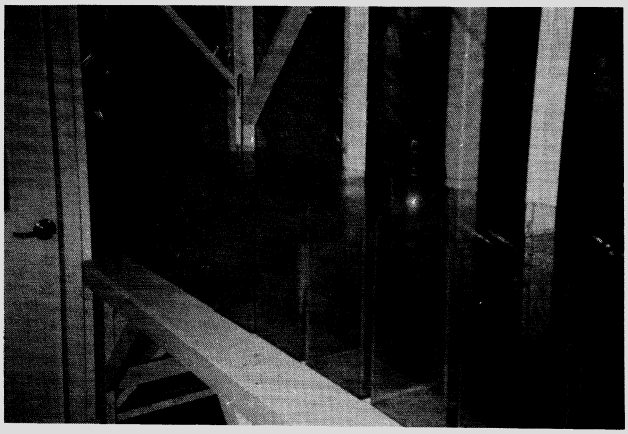
One unexpected environmental change during the 20th century has been the increase in amount of carbon dioxide in the earth's atmosphere. Since 1900, atmospheric carbon dioxide has increased about 70 parts per million or about 25%. This increase is believed to be the result of release of below-ground carbon from the burning of coal, oil, and natural gas.

This increase in carbon dioxide has caused a marked acceleration in the growth rate of vegetation. It is estimated that the world wide inventory of plants has increased by over 20% during this century. Trees are affected more than most other vegetation. The amount of standing timber in the United States has increased by about 25% since 1958. The nation currently has 120,000 pounds of standing timber for every man, woman, and child. This amount is increasing at the rate of 600 pounds per person per year.

Along with this remarkable increase in plants has come a corresponding increase in the amount of animal life. This lush increase in plant and animal life is expected to continue (as more coal, oil, and natural gas are burned), so that the quantity of plants and animals is likely to double during the 21st century.

It is not known, however, what effect this increase in carbon dioxide may have on the health of individual animals or upon individual human health.

The Institute's scientists are conducting, therefore, a series of experiments to determine the effect of increased atmospheric carbon dioxide on the health and longevity of animals. The pictures show the Institute's 1,000 square foot mouse facility in which mice are being raised in isolated chambers wherein carbon dioxide is regulated at different levels. These experiments have been in progress for about two years and are expected to yield their first completed results during 1995.



Molecular Clocks

Two of the 20 ordinarily occurring amino acid residues in peptides and proteins are inherently unstable in physiological solutions. These glutaminyl and asparaginyl residues undergo deamidation to become glutamic acid and aspartic acid residues under both laboratory conditions and also in the cells of plants and animals. It was originally proposed by Dr. Robinson that deamidations of these residues may serve as molecular clocks by which the processes of protein turnover, development, and aging are timed in living things.

It has since been shown that deamidation of glutaminyl and asparaginyl residues can control widely different timed intervals by means of different genetic variations in protein primary and three-dimensional structure. It has also been discovered that deamidation controls the turnover rate of some proteins in living things. Institute scientists have published a substantial amount of original research on this subject and are continuing to work toward a further understanding of deamidation and its potential role as a fundamentally important molecular clock for the regulation of biological processes.