

ABSTRACT

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Biology or Chemistry? The Viking Labeled Release Experiment on Mars.

A number of Labeled Release (LR) radiorespirometry experiments have been conducted on Mars soil at both Viking landing sites. The results are consistent with and, therefore, indicative of the presence of microbial life, but strong reservations against such a conclusion remain. Active tests produced responses far in excess of any obtained from sterilized terrestrial soils or lunar soil. However, the responses were not as great as those generally seen with terrestrial soils. Upon injection of a second aliquot of the radioactive medium, seven days or more after the first injection, reabsorption of some of the radioactive gas above the soil was detected. With terrestrial soils containing viable microorganisms, such a second injection produces a new evolution of radioactive gas. Control tests in which Martian soil was heated to 160°C for three hours prior to conducting the experiment produced essentially no radioactive gas. Heating, thus, destroys the active agent in the soil. The lack of detection of organic compounds, -exceeding two carbon atoms in chain length reported by the molecular analysis experiment raises the possibility that the LR results might be the result of exotic chemistry. Theories concerning production of oxidants in the soil by the strong ultraviolet flux incident to the surface of Mars have been advanced. However, an experiment in which the soil was heated to only 50°C prior to running the LR test showed that even this relatively moderate temperature destroyed most of the active agent. This result constrains chemical hypotheses to those which produce a reaction-at 20°C, the maximum temperature observed in the test cell during active runs, but which account for inactivation at 50°C.

Additional experiments on the spacecraft to distinguish between biological and chemical explanations and experiments in our laboratory attempting to duplicate the Mars responses by chemical means will be reported.