The high cold biosphere-microscope studies on the microbiology of the stratosphere

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Claims that bacteria exist in the stratosphere were made during the early nineteen thirties and confirmed by Russian workers in the 1970s. More recently, workers in Cardiff, Sheffield and India have collaborated by sending balloons to the stratosphere to see if bacteria and fungi can be found at a maximum height of 41km. Using scanning, and environmental scanning, electron microscopes, clumps of bacteria-like forms have been shown to exist in the stratosphere; these are present alone, or are associated with cosmic dust particles. Very small particles, morphologically identical to nanobacteria have also been found in the stratosphere. Verification that such bacteria-like clumps are viable living cells has been achieved using vital fluorescent stains, visualised using fluorescent microscopes. The obvious assumption is that such bacteria originate from Earth and are carried up to the stratosphere. However, the tropopause is thought to act as a barrier to the upward movement of particles of the size of bacteria (1 micron and below). While bacteria are carried through the tropopause during a volcanic eruption our studies of bacteria, isolated at 41km were made 2 year after the last major volcanic eruption on Earth, a period longer than the calculated residence time of bacteria at this height. It is however, possible that bacteria-sized particles might carried into the stratosphere by mechanisms such a blue lightening or electro-photophoresis or by electrostatic transfer. However, using scanning electron microscopes and vital fluorescent staining, we also found clumps of viable bacteria, at 41km, which exceeded 10 microns in diameter. Since it is very unlikely that such particle masses could be carried through the tropopause to this height, we suggest that these bacterial clumps are incoming to Earth from space. We therefore envisage a mixed stratospheric bacterial population comprising a mixture of bacteria from earth and space. We also suggest that the incoming bacteria are viable but none culturable and that these organisms make up the large population of viable, but not culturable, bacteria found on Earth. We also suggest that the transfer of bacteria from earth into the stratosphere could have played a role in bacterial evolution by exposing bacteria to the high levels of mutagenic UV found in this region. Finally, we suggest that the incoming bacteria can exchange genes with bacteria already present on earth and, as a result, we envisage that Earth's microbial gene pool is enriched by a comic gene pool.