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ADAPTATION OF ANTS TO EXTREME ENVIRONMENTS. IS SURVIVAL AT 100 TIMES EARTH CO2 LEVELS POSSIBLE?

Abstract

Exploration, and possible terraformation, of planets within and outside of our solar system, requires a preliminary analysis of: "Is there life on this planet?" Even in instances of planets that appear life-less, identification of traces of lifeforms is of outmost importance. Chemical and physical analysis using remote instruments (either stationary or movable) can be sensitive, but is limited to the identification of known compounds. In order to detect traces of any life form, another approach is needed, one based on the idea: "life finds life". Ants are one of the most successful species that can adapt to changing environments, given their innate ability identifying and harnessing novel food sources. Hence finding traces of organic compounds, one could equate finding food with finding life.

In order for earth-species to survive on another planet, they first have to be adapted to those extrem environments. Here, we used a simple method of repetitive CO2 gas exposure to adapt common black garden ants (*Lasius niger*) to a more hostile environment. Careful monitoring of CO2 levels within the confined ant hive and video analysis of ant behaviour, indicated that over time an ant colony could be 'trained' to move and look for food in the presence of higher concentration of CO2. Furthermore, it was observed that the behaviour of queen-ant and worker-ants towards the presence of CO2 had changed. In the fist experiments the ants fell asleep at around 1% CO2, however towards the end of the experiment the ants managed to stay awake up to 5% CO2. These results illustrate, that ants are able to adapt over time to an environment with 100 fold higher levels of CO2.