Ants are able to detect the odour of cancer cells

Baptiste PIQUERET[1], Fatima MECHTA-GRIGORIOU[2], Brigitte BOURACHOT[2], Jean-Christophe SANDOZ[3], Patrizia d'ETTORRE[1]

[1] Laboratory of Experimental and Comparative Ethology, University of Paris 13, Sorbonne Paris Cite, Villetaneuse, France
[2] Institut Curie, Stress and Cancer Laboratory, PSL Research University, Inserm, U830, Paris, France
[3] Evolution, Genomes, Behaviour, & Ecology, CNRS, Université Paris-Sud, Institut de Recherche pour le Développement, Université Paris-Saclay, Gif-sur-Yvette, France

Cancer causes millions of deaths every year. As for many others diseases, the sooner it is diagnosed, the higher are the recovery chances. Currently, different methods of cancer detection are available. However, they are often either costly (e.g. magnetic resonance imaging) or invasive (e.g. endoscopy). Furthermore, these methods require highly trained technical personnel. These limitations restrict the access to proper detection methods and associated treatments to rich populations/countries and to people who accept the use of invasive methods. An alternative approach is to identify biomarkers of cancer and to find a method to detect them precociously. Cancer cells have a different metabolism from healthy cells and thus consume and produce different volatile organic compounds (VOCs) that can be used as specific biomarkers. Detection of VOCs can be achieved by using animals with a highly sensitive sense of smell, such as dogs. However, a strong disadvantage is that training a dog requires highly specialized personnel, a long training period and is costly. Here, we evaluate the possibility of using ants to detect cancer VOCs. Ants are ecologically dominant in most terrestrial ecosystems where they form colonies that can contain up to millions of individuals. The remarkable organization of these colonies relies mostly on chemical communication; therefore ants have refined olfactory abilities. Here, we tested if a very common ant species, *Formica fusca*, is able to detect the presence of human cancer cells. Individual ants were trained to associate the odour of cancer cells with a reward of sugar solution and were then tested without reward to discriminate between cancer cells and a different odour. Results show that ants are able to learn the association and successfully discriminate the odour of cancer cells. Further experiments using different cell lines are required to confirm these results. Ant olfactory conditioning might represent a promising avenue for early detection of cancer in humans.