

Antarctic fauna threatened by human-spread pathogens in polar latitudes

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These zoonotic agents, which cause common infections in humans, are caught by scavenger marine birds in contact with humans or livestock, and spread around the southern ocean. Credit: Jacob González-Solís (University of Barcelona-IRBio)

Antarctic fauna could be in danger due to pathogens humans spread in

the southern ocean, according to a study led by Jacob González-Solís from the Faculty of Biology and the Biodiversity Research Institute (IRBio) of the University of Barcelona, and Marta Cerdà-Cuéllas from the Institute of Agrifood Research and Technology (IRTA-CReSA).

The new study, which detected bacteria from humans in the genus *Salmonella* and *Campylobacter* in Antarctic and subantarctic marine birds, reveals the fragility of polar ecosystems and warns about the risk of massive deaths and extinctions of local fauna populations due to pathogens.

Reverse zoonosis: when humans infect other living beings

Explorers, whalers, scientists and tourists are examples of human collectives that have moved to the remotest regions of the planet. Some studies have claimed for years that there had been cases of reverse zoonosis: that is, infections humans transmit to other living beings. Despite some previous indications, scientific studies on zoonotic agents in the Antarctic and subantarctic areas have been fragmented. Therefore, evidence is thinly spread and not completely convincing in this field.

The new study, published in the journal *Science of the Total Environment*, reports on the potential transmission of bacteria from humans to marine bird populations in four areas of the Antarctic and subantarctic ecosystems. "Chronology and potential pathways for reverse zoonosis in these ecosystems are complex and difficult to study, but it seems they can be clearly related to the proximity of the fauna to inhabited areas and the presence of research stations," says González-Solís.

Antibiotic-resistant bacteria in polar ecosystems

The study confirms the first evidence of reverse zoonosis related to the presence of human-origin bacteria *Salmonella* and *Campylobacter* in polar fauna. One of the [warning signs](#) was the identification of *Campylobacter* strains, which are resistant to ciprofloxacin and enrofloxacin (common antibiotics in medicine and veterinary).

"Finding common *Campylobacter* genotypes in human species or livestock was the definite hint to prove that humans could be introducing pathogens in these regions," says Marta Cerdà-Cuéllar, researcher at the IRTA-CReSA. "These *Salmonella* and *Campylobacter* strains, which are a common cause for infections in humans and livestock, do not usually cause death outbreaks in wild animals. However, the emerging or invasive pathogens that arrive to highly sensitive populations such as the Antarctic and subantarctic fauna could have severe consequences and cause the local collapse and extinction of some populations."

Northern and Southern Hemisphere: migrating route for marine birds and pathogens

The study shows the risk of reverse zoonosis is higher in areas that are closer to inhabited areas, such as the Falkland Islands, and probably the Tristan da Cunha archipelago. In this situation, the biological connectivity between Antarctic and subantarctic communities through marine birds is a factor that would speed up the circulation of zoonotic agents among the ecosystems from different latitudes.

"This could be the case, for instance, of the subantarctic parasite *Stercorarius antarcticus*: a scavenger marine bird could get the pathogen and spread it from subantarctic latitudes to the Antarctica," says González-Solís.

Polar areas: not all biodiversity is protected

The Antarctic Treaty protocol on Environmental Protection sets a series of principles that can be applied to human activity in Antarctica to reduce the human footprint. However, some subantarctic areas, which are also the habitats of birds such as the brown skua or the giant petrel, are not protected by the regulation and could become the entrance for pathogen agents in polar ecosystems.

"Our results show it is easier for humans to introduce pathogenic agents in the pristine [areas](#) of Antarctica. As a result, [pathogens](#) entering the furthest ecosystems in the Southern Hemisphere could be a serious threat for the future of wildlife. Therefore, it is essential to adopt biosecurity measures to limit the human impacts in the Antarctica," notes Jacob González-Solís.

More information: Marta Cerdà-Cuéllar et al, Do humans spread zoonotic enteric bacteria in Antarctica?, *Science of The Total Environment* (2018). [DOI: 10.1016/j.scitotenv.2018.10.272](https://doi.org/10.1016/j.scitotenv.2018.10.272)

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