Possible explanation for high incidence of Chagas in some Peruvian communities

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Guinea pig pup at eight hours old. Credit: Wikipedia

(Phys.org)—A team of researchers with members from the U.S. and

Peru has found evidence that suggests the high infection rate of Chagas in some communities in Peru may be tied to the culling of guinea pigs. In their paper published in *Proceedings of the Royal Society B*, the team describes several experiments they carried out in looking for reasons for the abnormally high rates of the disease, their findings, which ruled out all but one, and changes that could be made to reduce the rates of infection.

Chagas disease is an ailment caused by the tropical parasite *Trypanosoma cruzi*. It is spread mostly by insects known as kissing bugs or beetles. There is no known cure for the disease, though fortunately, it is seldom fatal. The disease is most prevalent in South and Central America and Mexico. One country in South America, Peru, has been hit harder by the disease than others, with infection rates as high as 40 percent in some rural communities. In this new effort, the researchers sought to learn why—they focused their efforts on one small community called Arequipa.

The team started with the knowledge that infected insect rates were much higher than normal in the community (sometimes as high as 85 percent) and that those infection rates were centered around guinea pig enclosures. They came up with three possible explanations: that the insects were getting infected by ingesting the feces of other insects, that other animals besides guinea pigs were involved, and the most likely possibility, a bottleneck occurred that caused smaller more dense concentrations of infected insects leading to a higher likelihood of infections in people in the same areas.

After collecting many specimens for testing, the researchers were able to rule out the first two possibilities, which left the third as the most likely answer. The researchers point out that in that part of the country, people eat guinea pigs and raise them on alfalfa. They also note that during late summer as alfalfa prices rise and celebration roasts begin that feature

guinea pigs on the menu, the numbers of guinea pigs left in pens drops dramatically—but because of the high number of infected insects in the area, a higher percentage of those that are left become infected. And because those pens are in areas that are tended by people, higher infection rates occur.

The researchers suggest fixing the price of alfalfa might help to reverse the problem, as it would reduce culling when prices rise.

More information: Bottlenecks in domestic animal populations can facilitate the emergence of Trypanosoma cruzi, the aetiological agent of Chagas disease, *Proceedings of the Royal Society B*, DOI: 10.1098/rspb.2014.2807

Abstract
Faeces-mediated transmission of Trypanosoma cruzi (the aetiological agent of Chagas disease) by triatomine insects is extremely inefficient. Still, the parasite emerges frequently, and has infected millions of people and domestic animals. We synthesize here the results of field and laboratory studies of T. cruzi transmission conducted in and around Arequipa, Peru. We document the repeated occurrence of large colonies of triatomine bugs (more than 1000) with very high infection prevalence (more than 85%). By inoculating guinea pigs, an important reservoir of T. cruzi in Peru, and feeding triatomine bugs on them weekly, we demonstrate that, while most animals quickly control parasitaemia, a subset of animals remains highly infectious to vectors for many months. However, we argue that the presence of these persistently infectious hosts is insufficient to explain the observed prevalence of T. cruzi in vector colonies. We posit that seasonal rains, leading to a fluctuation in the price of guinea pig food (alfalfa), leading to annual guinea pig roasts, leading to a concentration of vectors on a small subpopulation of animals maintained for reproduction, can propel T. cruzi through vector colonies and create a considerable force of infection for a pathogen whose

transmission might otherwise fizzle out.

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