Genetic basis of animal adaptation to indoor human habitats; Insights from cockroach genomes

Life on Earth evolves. Through means of the survival of the fittest, animals might evolve adaptations and survive environmental changes. How organisms adapt and the genetic basis of such adaptations are, thus, at the core of the field of evolutionary biology, which attempts to understand how life on Earth evolved generating the vast diversity of life forms we observe.

With increased pressure on wild habitats and changes to climate, many species are becoming extinct at unprecedented rates, others might be able to evolve and adapt. One strategy animals might take to protect themselves from drastic climate changes and catastrophes, is the adaptation to more stable environments, such as moving indoor human habitats. Cockroaches are one of the most successful animals at adapting to indoor human habitats. Some cockroach species, such as the German cockroach (*Blattella germanica*), are exclusively dependent on human habitats for survival and they are never found in wild environments. However, the genetic basis of adaptation to human habitats is not well understood.

In this project, our expert and multidisciplinary research team will study the genetic basis of cockroach adaptation to indoor human habitats using a multi-omics approach. This project will involve generating and comparing reference genomes for cockroach species that live in human habitats and cockroach species that live in the wild. It will also include sequencing and studying the genomes of current populations of German cockroaches from different cities around the world, as well as from specimens collected up to 100 years ago and preserved in museums, which altogether will help us understand their evolutionary history. Furthermore, the project includes testing the impact of candidate genes in the laboratory, and generating transcriptomic data to test how genomic differences are reflected in the gene expression.

The project has the potential to make significant contributions to our understanding of adaptation and evolution, which are fundamental pillars of our understanding of biology. By identifying the genetic changes that have enabled cockroaches to adapt to human habitats, the project will provide insights into the general process of adaptation, and help us to predict which other animal species are likely to adapt to human habitats in the future.

The project is ambitious and will require a significant investment of time and resources. However, the potential rewards are also significant. The project is interdisciplinary, bringing together expertise from genetics, genomics, and evolutionary biology. This is essential for addressing the complex questions regarding evolution and adaptation. These results might also have an impact on helping develop strategies for managing cockroach infestations.

All in all, through this international and interdisciplinary project, we aim to make a step forward in our understanding of how animals adapt, and specifically how they can adapt to live in our homes against our will.