

Final Proposal

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1 Client

My client's name is Weichen Zhao, she is a friend of mine. Weichen is currently a master student with a major in Biology from Washington University in Saint Louis.

2 Background

(a) Terminology

1. Transcriptomic Signature : The transcriptome is the complete set of RNA transcripts that are produced by the genome, under specific circumstances or in a specific cell. For example, our data consists of RNA from naked mole rat's brain tissue. Comparison of transcriptomes allows the identification of genes that are differentially expressed in distinct cell populations, or in response to different treatments. These differences (or characteristics) in genes expression, can be referred as transcriptomic signature.
2. Eusocial Mammal: Eusociality, the highest level of organization of sociality, is defined by the following characteristics: cooperative brood care, overlapping generation within a colony of adults, and a division of labor into reproductive and non-reproductive group. Honeybees' sociality is a well-known example of eusociality. There were only two known mammal species which are eusocial. These are the naked mole rat and the Damaraland mole rat. Our project will focus on the analysis of transcriptomic signature of naked mole rat.

(b) Naked mole rat

The naked mole rat is a burrowing rodent native to parts of East Africa. It has a highly unusual set of physical traits that allows it to thrive in a harsh underground environment. The tunnel systems built by naked mole rat can stretch up to three to five kilometers in cumulative length.



1. Eusociality: Naked mole rat's eusocial structure is similar to that found in bees. Only one female (the queen) and one to three males reproduce, while the rest of the members in the colony (despite male or female) function as workers. Workers are sterile, the non-reproducing females appear to be reproductively suppressed, meaning their ovaries do not fully mature and do not have the same levels of certain hormones as the reproducing females. However, there is little difference of hormone concentration between reproducing and non-reproducing males.

2. Why Naked mole rat worth study?

- The naked mole rat holds the records for the longest living rodent, it can live up to 32 years. Also, the mortality rate of the species does not increase with age.
- The naked mole rat has a high resistance to cancer.
- The naked mole rat is pain insensitive, it feels no pain when it is exposed to acid or capsaicin.

3 Main Questions

1. Are there any significant transcriptomic signatures that exist for different types of naked mole rat.
2. Are there any transcriptomic differences that exist between guinea-pig and naked mole rat.

4 Dataset

1. Glimpse of the dataset

Our dataset consists of 16353 variables and 24 observations. Among the 24 observations, there are 6 breeder female, 6 non-breeder female, 6 breeder male and 6 non-breeder male. The 16353 variables are different RNA extracted from the brain tissue of these 24 observations.

2. How were these data collected

These data were collected with the help of RNA-Seq. RNA-Seq is a particular technology-based sequencing technique which uses next-generation sequencing to reveal the presence and quantity of RNA in a biological sample.