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Asocial Behavior in Zebrafish

A variance in social behavior has been seen in many animal species, and can have a profound effect on their ability to survive. For humans, quality of life can be heavily impacted by where individuals fall on the spectrum of social and asocial. But is asocial behavior genetic, or environmentally learned? And if it is genetic, what part of the brain dictates these traits? To research this, I will observe the consistency of zebrafish social behaviors, the heritability of these behaviors, and whether different wild type species of zebrafish exhibit higher or lower levels of sociability to provide us with new opportunities for future research.

Zebrafish are an excellent model organism to use for studying social behaviors. Zebrafish have established behavioral assays, which can be used to analyze social inclination using the natural practice of shoaling. Like humans, they have also been shown to have both social and asocial individuals. Using zebrafish as the model organism also ensures that any future research into the genetics of this behavior will be much easier, since zebrafish are translucent and their brains can be examined without killing them.

In the lab, there are two types of wildtype fish: TL and AB. I will be raising populations of TL, TLAB, and AB. All of these fish are raised in the same environment, with identical temperature, light, and feeding schedules. Once they are three weeks old, they will be old enough for me to perform behavioral assays. I will observe whether any exhibit asocial behavior, and separate each fish into its own tank, labeled with this information. Later in the same day, I will run the assay again, to determine if the asocial behavior is consistent throughout the day. I will then test if the behavior is consistent for consecutive days. The results between the wildtypes will

be compiled and analyzed for statistical significance, telling us whether one has a higher propensity for asocial behavior than the others.

Sociability will be tested using the behavioral assay detailed by Dreosti et al. in their paper, "Development of social behavior in young zebrafish." In this assay a fish is placed within a tank where in one side of the tank it can see another fish, and in the other side it can observe an otherwise identical, but empty, tank. If the fish spends a significantly larger amount of time in the part of the tank where it can observe conspecific, it is showing social behavior. However, if the fish shows an aversion to this side of the tank, it is showing asocial behavior.

If the species do show different sociability, it will provide later researchers the opportunity to examine the genetic differences between these wild types and possibly locate the genetic cause of a predisposition to asocial behavior. This could have important impacts on human life because it would enable us to help those who might feel that they suffer from their levels of asocial inclination. While most people range from extrovert to introvert, some are on the more extreme end of the spectrum. Strong asocial feelings are common in those with personality disorders such as Avoidant Personality Disorder, which in 2004 was found to affect 2.4% of Americans and often includes characteristics such as extreme social isolation and deep-set feelings of inadequacy. Asociality is also a major symptom of other personality disorders such as schizophrenia, mood disorders such as depression and social anxiety, and those with traumatic brain injury. In many of these cases, a person's quality of life is affected by these asocial feelings. If we knew the genetic cause for these types of disorders, we can help these people live a better life.