We received excellent questions from participants at NeuroFest. In addition to questions answered during the program, here are select Q&A that may be of interest to you.

**Answered by Dr. Megan Dennis**

**How long does it typically take to test a mutation of interest, introduce it into the zebra fish, and look for effect you can describe and how often to you need to reproduce the experiment to determine it is a true cause/effect?**

To really feel confident that our “quick” experiment is correct, we like to create “stable” zebra fish mutants, where they have the human variant in their genomes at birth. If we still see the brain and behavioral differences in these fish, we would be confident in our result. Creating stable mutants take a bit longer (more on the order of 3-6 months). We like to test many genes using the quick experiment and choose the ones that show the strongest difference to take the time to test the stable lines.

**If you introduce the genes early and once you find that it is a mutant, have you re-injected to fix the problem?**

This is something that can be done. What we have to do is create “stable” versions of fish that always carry the human variant. Then we can create babies that are born with the human variant then attempt to “rescue” the changes in brain and behavior by injecting a working version of the gene.

**How early can autism be diagnosed?**

Typically, autism can reliably be diagnosed by 2 years of age by an experienced clinician. It can sometimes be detected earlier. There is lots of research ongoing at the UC Davis MIND Institute in this area (early diagnosis and how early interventions improve outcomes of these children).

**Answered by Dr. Randy O’Reilly**

**To what extent do dopamine and serotonin pathways correspond to emotional granularity, and how does emotional suppression affect decision-making?**

Dopamine is relatively fast-acting – more like a quick “rush” of feeling, while serotonin is much slower and more likely to be associated with overall “mood” states. Emotions are also very important for decision making so suppression could impair the process. However, we also know that emotions can overwhelm more “rational” cognitive processes in decision making, so, there is no obvious “right answer” in this case. The most important thing overall is having an extended deliberative process, which is actually reflected in the legal definition of responsible decision making.

*The content in this document is not intended to be a substitute for professional medical advice, diagnosis, or treatment. Always seek the advice of your physician or other qualified health provider with any questions you may have regarding a medical condition.*
Answered by Dr. Randy O’Reilly (cont.)

How do researchers measure patient dopamine and serotonin? And is that measurement put into the computer models along with the medication and amount of? Is it that direct?

Dopamine can be measured directly using a PET scan using radioactive dopamine (same for serotonin). Newer, less invasive techniques can use fMRI to more indirectly measure it. The models are small-scale and simplified relative to the brain, so we typically can’t directly use quantitative measurements, but we do use qualitative, relative differences between patient and control levels.

Daniel Liberman’s book “The Molecule of More” emphasizes that dopamine is the one neurotransmitter which people’s brains are motivated to get more of. You showed how dopamine is important in learning. If this is the case, doesn’t it imply that people’s pre-existing prejudices and biases will continue to be reinforced as preferred learning? Does it also mean that critical thinking is and will continue to be an uphill battle?

Yes! This is reflected in the way that people seek “self-reinforcing” news sources -- these kinds of biases in decision making are an important application of our computational models and a major topic in the field more broadly.

Answered by Dr. David Olson

Are you familiar with Valerian and its possible heart effects or other side effects?

Valerian root is often used for insomnia, seems to work similar to benzodiazepines on the GABA-A receptor, but I think it binds the receptor at a different site. Unclear side effects and has the theoretical risk of causing withdrawal after chronic use. Not sure of heart effects. Like all supplements, individual formulations can vary greatly affecting overall safety and effectiveness.

Has there been any links between Alzheimer’s disease and electromagnetic fields?

The neuronal atrophy characteristic of Alzheimer’s disease can be indirectly measured using things like EEG.

Answered by Dr. John Gray

Do learning disabilities predispose you to mental health issues later on in life?

There is a higher risk of mental illness in persons with learning disabilities, though it appears to be a small increase in risk and is correlated with the severity of the learning disability. This is perhaps not surprising because many, if not most learning disabilities are likely due to subtle synaptic dysfunction.