THE BENCH & BEYOND

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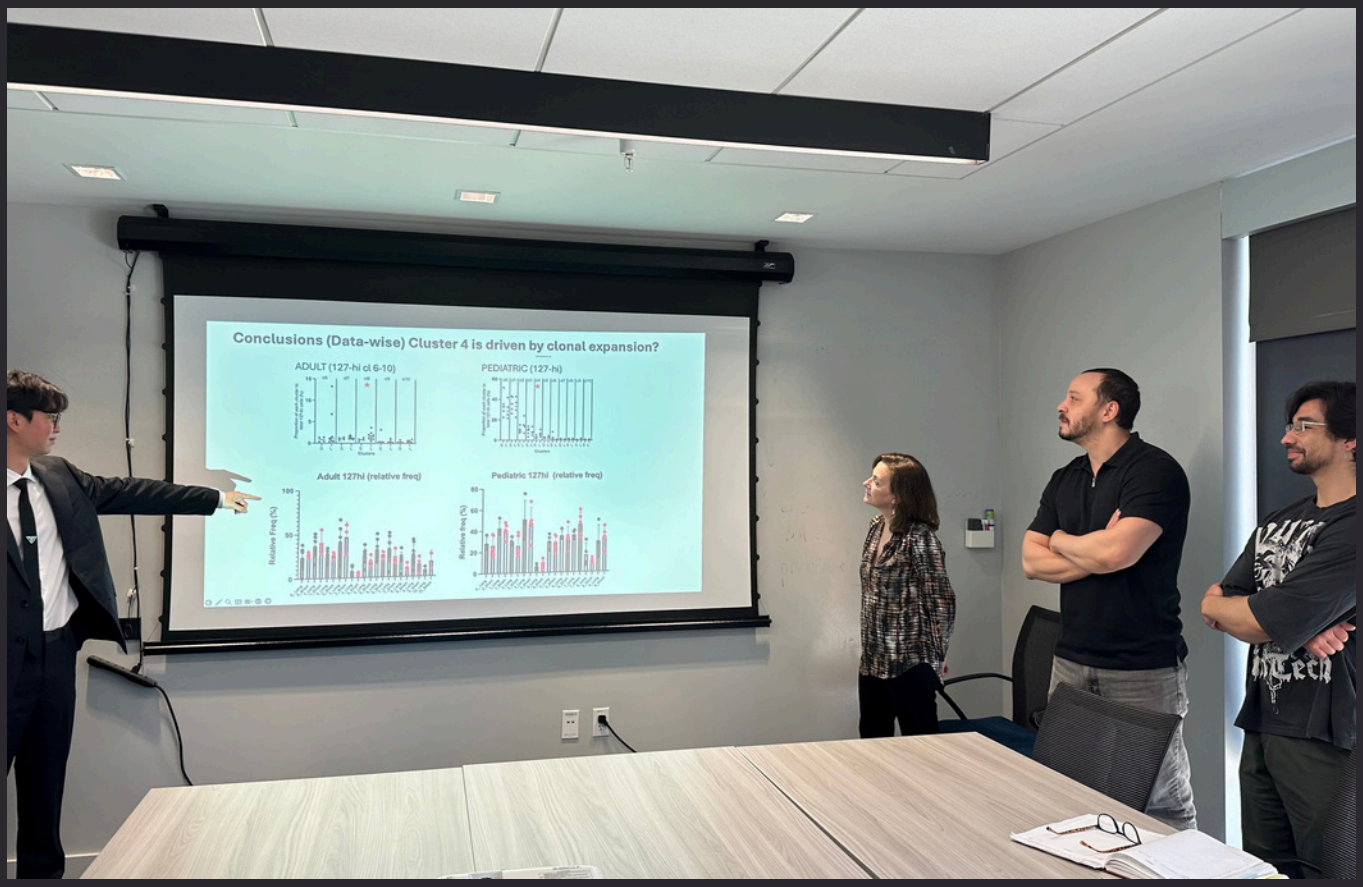
Shaping the Future of Science: Student Spotlight

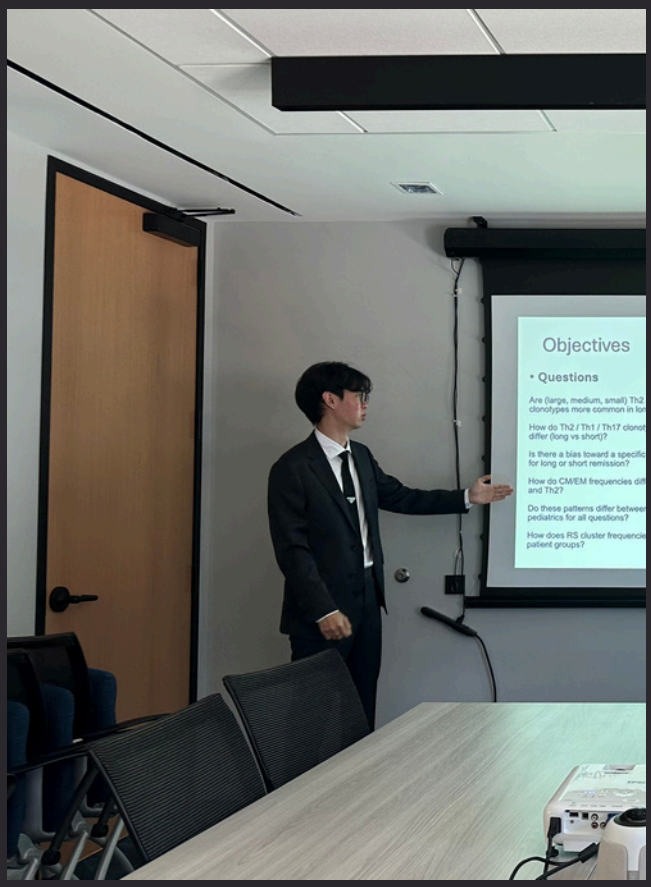
“I’m proud to spotlight the Off-Campus Work-Study partnership between UC San Diego and San Diego BioMed, an important collaboration that connects students to discovery driven science, professional growth, and career opportunities. {...}

We are especially grateful for the outstanding partnership with the San Diego BioMed leadership and faculty whose collaboration and commitment to student learning create an environment where students can grow with confidence and curiosity. Their support ensures that students are not only contributing to research, but also developing the skills and perspective needed for future careers in science and health.

Together, we are expanding access to transformative learning experiences while strengthening connections across San Diego’s dynamic research community.”

--TOD OLIVIERE, DIRECTOR OF STUDENT EMPLOYMENT & CAREER DEVELOPMENT @ UC SAN DIEGO

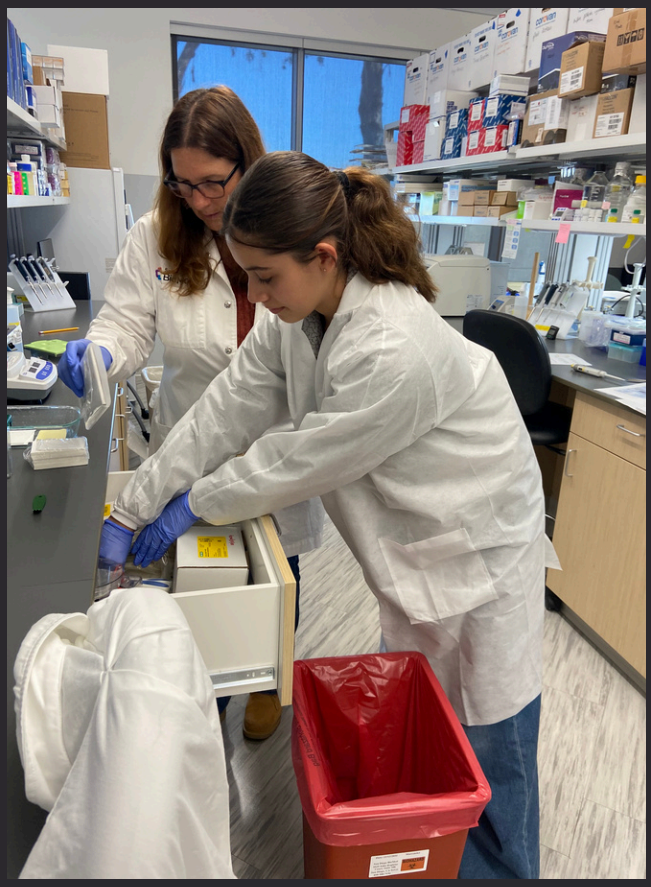


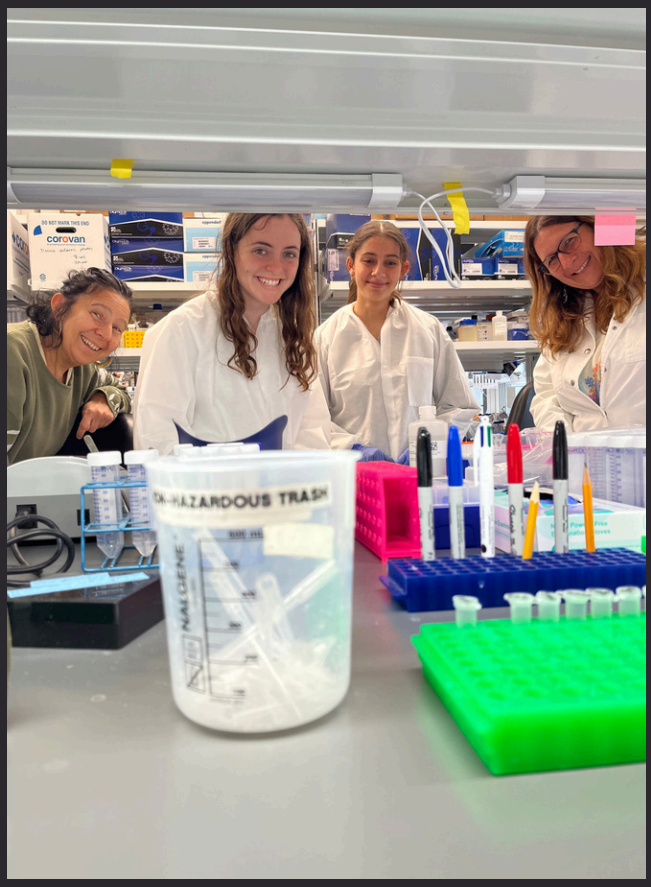


David Seo

UC San Diego Undergrad

David rounds out his farewell to San Diego BioMed after working in the Davies lab for two years as a work study student and two quarters as an academic intern. In the lab, David contributed to research on immune cell behavior in Type 1 Diabetes through both experimental and computational approaches. As a work study student his work involved learning and assisting in flow cytometry experiments and analyzing the data. As an intern, David developed a data analysis pipeline to quantify frequencies of immune cell subsets that cause and delay disease progression in Type 1 Diabetes. As with all lab efforts, the pipeline focuses on quality control, rigor, efficiency, and interpretability of the data. These efforts came full circle in David's final presentation to the lab, where he shared all he's learned in his time at San Diego BioMed. David's contribution has already earned him authorship on one publication, and his most recent work is expected to contribute to another.





Jenifer Castaneda & Nydia Grubbs

UC High - Biomedical Path

Thank you from the Marcondes Lab to their two interns, Jenifer Castaneda and Nydia Grubbs from the Biomedical Path at the University City High School (UCHS), for 12 weeks in the “Involvement of G-PCR -mediated signaling in the endothelial effects of cannabinoids".

Students at San Diego BioMed are actively contributing to research focused on complex health challenges. Along the way, they are strengthening skills in scientific reasoning, collaboration, data interpretation, and hands-on wet lab experiments, while also gaining insight on how research teams move ideas from concept to impact.

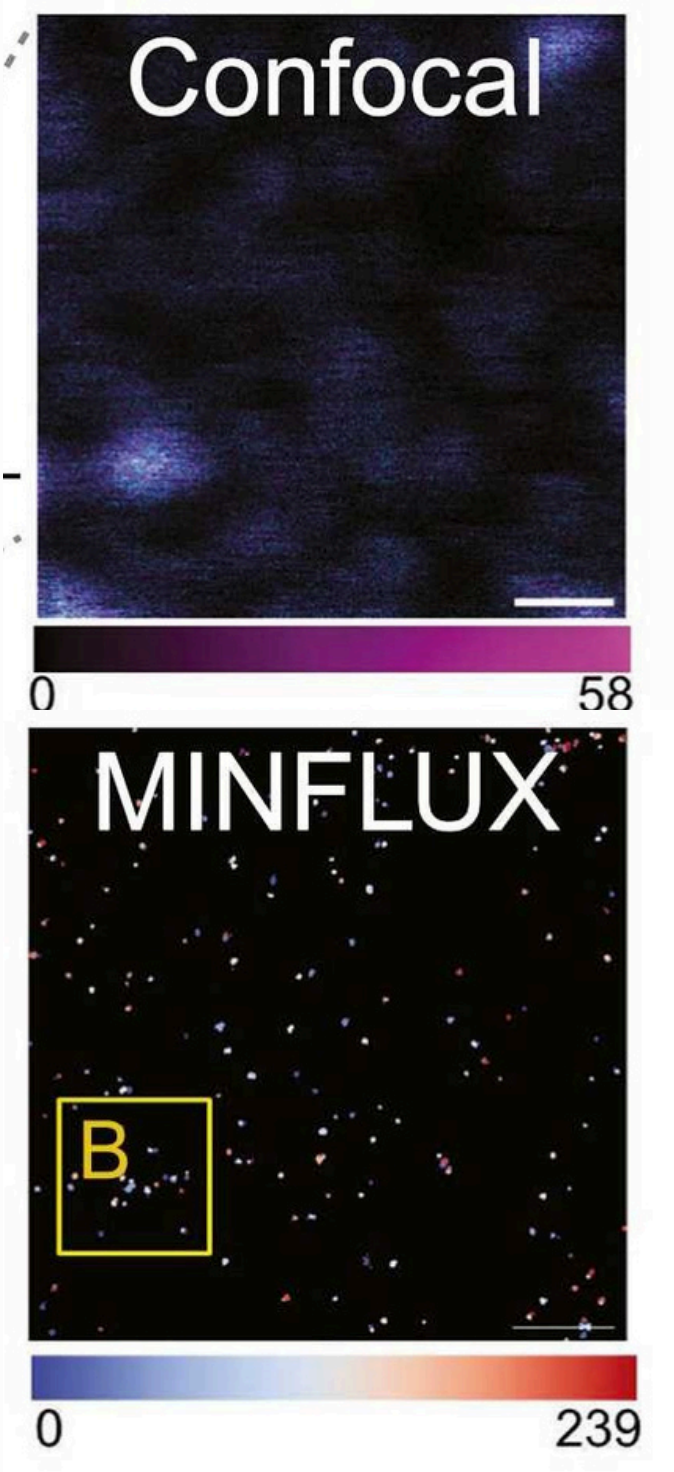
The Inside Scoop on the Science

FROM DISCOVERY TO DELIVERY

HERE ARE THE LATEST PUBLICATIONS FROM LABS AT SAN DIEGO BIOMED.

MINFLUX nanoscopy to study the NK cell immune synapse

Elsevier



Congratulations to Dr. Daniel Murin and the Murin Lab for their recent publication titled, “MINFLUX nanoscopy to study the NK cell immune synapse,” which is accessible as a book chapter in Methods of Cell Biology.

San Diego BioMed’s Murin lab spotlights novel techniques in the fast-moving environment of biomedical research as it intersects with technological innovation.

Dr. Murin comments: “This work is a culmination of several months of effort to setup new methodology for studying natural killer (NK) cell biology. We wanted to be able to see a protein named CD16a, which is responsible for triggering an antibody immune response, within synapses formed by NK cells. We turned to MINFLUX nanoscopy to perform these studies. *(See figure description below for more on the MINFLUX)*

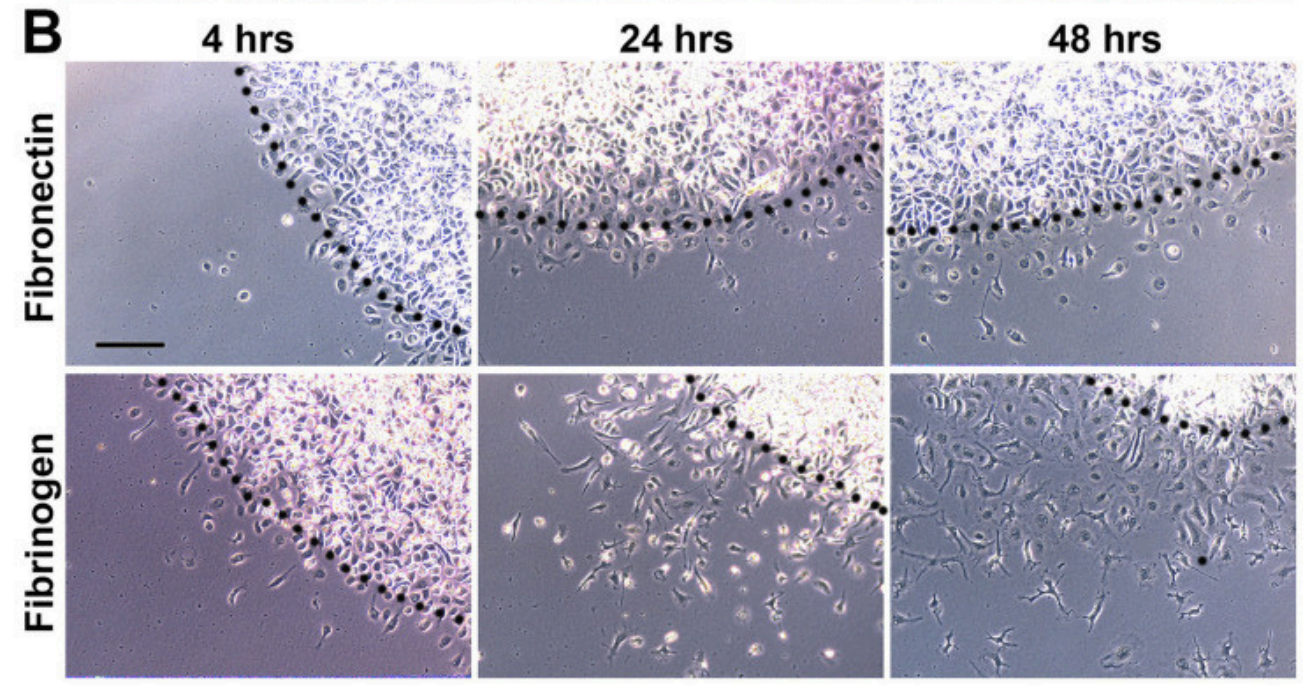
Before we began this project, there were no protocols for utilizing the MINFLUX in the way required to study NK cell synapse structure. Therefore, Dr. Ross, a postdoctoral fellow from the Murin Lab, was able to pioneer a new methodology that enabled us to collect high quality single molecule data. The paper we have published details this methodology and includes protocols for sample prep, data collection, and data analysis. This is the second paper published by the Murin Lab in less than a year and we are very proud of this accomplishment!”

Figure Legend: The cutting-edge technique of MINFLUX nanoscopy shows outputs to the left, comparing confocal microscopy to MINFLUX nanoscopy. The Murin lab used MINFLUX to see a protein named CD16a with a need for sub-10 nanometer localization precision to detect individual proteins on the NK cell surface. The difference in clarity shown above is outstanding. MINFLUX is the result of Nobel Prize winning work in super-resolution microscopy that enables scientists to label proteins with fluorophores that blink and then identify those proteins with up to single nanometer localization precision.

A central role for fibrinogen in promoting microglial repair of the hypoxia-disrupted blood-brain barrier

Journal of Neuroinflammation

This new study by the Milner Lab highlights an unexpected “repair crew” in the brain after injury: a blood protein called fibrinogen. Researchers found that when the brain is deprived of oxygen—such as during stroke or other injuries—the protective barrier that normally shields it (the blood-brain barrier) becomes damaged. In response, fibrinogen leaks into the brain and signals immune cells known as microglia to step in and help fix the damage. Rather than being purely harmful, as previously thought, fibrinogen appears to play a crucial role in activating these cells to rebuild the barrier and restore normal function. The findings suggest that this protein may be part of the brain’s natural healing process, opening the door to future therapies that could boost recovery after stroke or other neurological injuries.



The figure above shows how fibrinogen promotes microglial transition. The images from left to right are of microglial (white dots) migration characteristics on fibronectin and fibrinogen after 4, 24, and 48 hours. Note that as early as 4 h, fibrinogen promoted microglial migration away from the edge of the high-density population (black dotted lines) and over the next 1–2 days, the extent of microglial migration on fibrinogen was much greater than on fibronectin. This is important as the migration clusters around leaky blood vessels to help seal and protect the compromised vascular wall.

EMBO Reports

Transcription elongation can be sufficient, but is not necessary, to advance replication timing

Even though we can now manipulate DNA, there are still mysteries among the two major DNA activities called transcription and replication. Transcription reads and writes parts of your DNA into a workable instruction set, while DNA replication copies the entire DNA set during cell division. Replication doesn't happen all at once—it unfolds in temporally ordered segments and this is referred to as replication timing (RT). A masterful timetable still being decoded.

In this study, published in EMBO Reports, San Diego BioMed's Gilbert Lab and their collaborators look at how these two processes are connected and venture to make sense of contradictory literature surrounding the link between transcription and RT. Historically, researchers have known that transcription and replication must be coordinated to avoid collisions and to not occur at exactly the same time. We also know that the first DNA sequences to replicate during the cell cycle are most likely to be transcribed. That led to speculation as to whether replicating early was a pre-requisite for being transcribed, or whether transcription causes DNA to replicate early.

In this paper, researchers asked: If we turn transcription on, does DNA get copied earlier? If we turn transcription off, does DNA get copied later?

The answer was discovered to be more nuanced. This study used modern methods to show that when genes are experimentally manipulated to be turned on, especially strongly and continuously, it can shift that DNA region to replicate earlier. So, transcription can directly influence timing, but further testing proved that transcription does not always do so, and it is not strictly required to change RT. Moreover, as researchers collected more data on these activities in many cell types, they could see that there were many examples of late replicating expressed genes, early replicating silent genes, and genes that changed their timing and transcription during differentiation of one cell type to another. Even when they completely shut off transcription throughout a region, that region of DNA still switched to early copying during development.

Overall, they discovered that transcription alone can be sufficient to advance replication timing rapidly and reversibly, but it is not the only thing controlling the schedule.

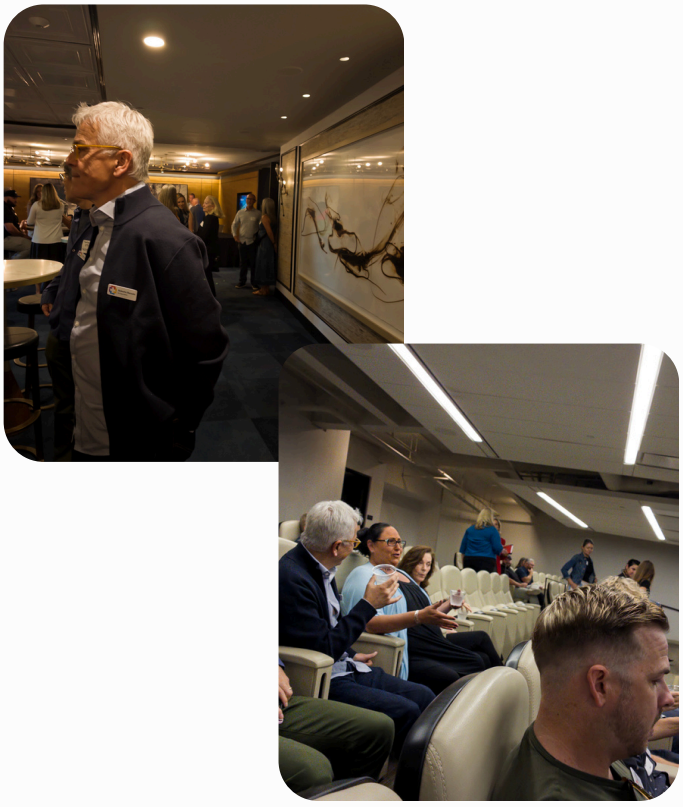
Partnering with Curebound

San Diego BioMed is excited to share its new partnership with Curebound, a San Diego philanthropic organization that is dedicated to raising and strategically investing funds in translational cancer research.

Recently, San Diego BioMed principal investigators joined Curebound and other partners for the event, Curebound Connects, where CEO Robin Toft, Chief Science Advisor, Ezra Cohen, MD and Scientific Advisory leaders introduced their strategic plan and vision for the future of cancer research.

They also attended Curebound's Concert for Cures, featuring P!NK! Our team was honored to help create meaningful differences by advocating for the fight against cancer and share the science behind our own efforts to find a cure. We are deeply grateful to all those who participated this night as we witnessed one of the most outstanding turnouts in support of advancing cancer research that helped Curebound raise over $8 million in funds!

We are excited for the journey ahead!



Pets of San Diego BioMed

Welcome to the first feature in the Pets of San Diego BioMed Series:

We are excited to spotlight the family we come home to! Each newsletter we will highlight 2 pets!

Mojoncio Siberian Husky

Greg Seumois (Dad): “Mojoncio is a lively seven-year-old Siberian Husky rescued from the heat of Mexicali at just eight months old. His name, an affectionate Spanish nickname meaning “little rascal”, perfectly reflects his mischievous yet lovable personality. A devoted fitness partner, Mojoncio wakes up his human at 5:12 a.m. daily for long walks through the Eastlake trails, teaching discipline, focus, and resilience along the way. He’s also an avid collector of lost tennis balls, with a stash of over 200, doing his part for a cleaner California. Generous with his ever-shedding fur and always ready with a playful spirit (especially as the household “ghost” around Halloween), Mojoncio brings energy, humor, and inspiration to every day.”

Mizu Half tortoiseshell, half tabby

Giselle Mejia (Mom): “Mizu means water. As a kitten she was so quick and nimble, worse than trying to catch a running chicken. So I imagined her as fast as Bruce Lee, which led me to think about his famous line “Be water my friend.” And indeed, she was water. This reminded me of the beautiful Japanese word for water - *mizu*. She continues to be water to this day.”

Mizu’s favorite pastimes are doing exactly what her mom tells her not to do, licking anything sticky like the tape from packages laying around, and stealing and chewing up her mom’s Q-TIps. Mizu’s mom hopes this rebellious teenager phase will soon pass.

Stay Tuned!

Thank you for reading San Diego BioMed's triannual newsletter - The Bench & Beyond. We look forward to your continued support!

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