

Professor Rick Lieber 11/3/2021

Dr Lieber is the Chief Scientific Officer at the Shirley Ryan Ability Lab (SRAL). He is an expert in translational science especially in the areas of muscle physiology. He first reviewed translational science levels and how SRAL has adopted them. As we have discussed, translational science involves getting the results of basic science experiments to “translate” out of the lab into benefits to patients. Specific levels:

T1- Translation to humans

T2 Translation to patients

T3 Translation to practice

T4 Translation to community

Translational science occurs at many prestigious institutions worldwide. However, it often occurs in different buildings, creating silos and impediments to the end goal of patient benefit. Addressing this “lag” was something that was important when the SRAL was planned. At the planning stage, the team including Shirley Ryan and Joanne Smith, MD (CEO of the Rehabilitation Institute of Chicago) asked the question “how can the #1 rehabilitation institute in the world re-imagine this antiquated model? They came up with several innovations. For example, the prior model worldwide featured therapy gyms where patients received therapy separate from research and innovation. At the SRAL, everyone works in the same space. So the therapy areas have clinicians and researchers on the same floor, in the same room literally surrounding patients. The SRAL also has a focus area for each floor for example brain or spinal cord injuries. Finally this model added the best technology and equipment to focus on regaining ability. Overall the new model combines research, innovation and clinical care to help each patient face their unique circumstances and challenges. This idea came to life in 2017 when the hospital opened with a focus on ability. As Dr Lieber stated, when you think about it this is exactly what patients want: ability.

Dr. Lieber then presented an overview of research at SRAL. Rehabilitation science requires a team based approach. All the researchers from different disciplines such as stem cell biology and musculoskeletal bioengineering are co-located at the SRAL. Today, SRAL researchers have more than \$100M in external research funding. Co-location of researchers helps with crowdsourcing solutions. There is a well-known book called “the Wisdom of Crowds” by James Surowiecki that illustrates how this works. This concept is very intentional at SRAL. Dr. Jim Sliwa, the Chief Medical Officer, and Dr. Lieber, the Chief Scientific Officer, partner together closely. They use RoundTables, Buzz Labs and Idea Labs to bring people together and crowdsource ideas intentionally and frequently. This is remarkable as in most institutions scientists and clinicians are in separate buildings and do not communicate frequently.

Dr. Lieber gave some exciting examples of research at SRAL. In the brain injury lab, scientists use special glasses to monitor and study graphs of eye fixations (number, duration, etc.) in different patient populations to develop treatments for severe brain injury. In the arm and hands lab, patients with spinal cord injuries are exposed to hypoxia. Patients breathe 10% oxygen (this simulates high altitude) and muscle function is studied. Although we don’t know exactly why or how this occurs, exposure to hypoxia leads to remarkably improved muscle function that persists even 24 hours later.

Dr. Lieber shared an exciting inter-institutional collaboration between SRAL and Professor John Rogers (device development), the Chair of Pediatrics at Lurie Children's Hospital, Dr. Matt Davis, and the Vice President of Pathways, Sarah Babula. This is a remarkable partnership between a researcher, an engineer, an educator and a pediatrician. This group is called the Corbett Ryan Northwestern Shirley Ryan AbilityLab Lurie Children's Early Detection, Intervention and Prevention Project. It is also known as the Corbett Project for short. This is an example of educational translational science because it is taking education and training for physical therapists and translating it into better outcomes for patients through early detection of atypical movements in infants. The collaboration with Professor Rogers, who makes tissue sensors, takes it even a step further. Because the sensors can detect these movements and work with iPhones, the technology for abnormal motion tracking can be disseminated to areas that do not have trained physical therapists across the world.

Dr. Lieber presented another research project from the Arms and Hands lab. Dr Monica Perez was recently recruited to the SRAL to study patients with spinal cord injuries. Her work shows that precisely timed magnetic spikes impact muscles that were injured decades ago. This is an example of "neuro plasticity." What the researchers showed is that if you can get various neurons to "fire together," you can get them to "wire together" to improve motor function. At the SRAL, therapists and scientists worked together to help a woman with a spinal cord injury jump in the air and another to walk briskly across a treadmill. This innovative work is remarkable because it is in patients who had previously plateaued.

The biologics lab at SRAL studies the biology of humans. One example is contractures in children with cerebral palsy (CP). Scientists study muscles at the molecule level (sarcomere or muscle unit) while physicians and therapists work with muscles at the clinical level. When doing operative procedures on muscle, a partnership between surgeons and researchers can help make surgical procedures on patients with contractures more accurate leading to better outcomes. Research from the operating room showed that the muscle fibers in these actual patients were not the same as in the mice model. This would not have been clear without the partnership between Dr. Lieber and the orthopedic surgeon he worked with in the operating room. Discovering this has allowed for potential therapies to try to develop stronger muscles and potentially cure contractures in patients with CP. One potential treatment is currently under review at the FDA.

Today we learned a great deal about the intentional partnership between scientists and clinicians at the SRAL with distinct applications for patients with CP, strokes, spinal cord injuries and other conditions. The unifying goal of the SRAL is improving patient health, well-being and outcomes through unique partnerships and collaborations.

Please feel free to contact Dr. Rick Lieber with any follow up questions. His email address is rlieber@sral.com