MAY 2023 | THE PREMED SCENE'S MONTHLY MEDICAL NEWSLETTER

# CROSSROADS

## THE OFFICIAL NEWSLETTER OF THE PREMED SCENE

# RISING STARS IN MEDICINE: DR. SERENA NIK-ZAINAL

### DEAR MEDICAL NEWSLETTER READERS,

Happy May! Today, we bring to you the most recent news in medical research! I am your next Rising Stars in Medicine writer, talking about Dr. Serena Nik-Zainal and her work in medical genetics. Then, Mahima Bhat focuses on the many health benefits associated with staying hydrated. Next, Rameesha Mustafa spreads greater awareness regarding microbots in medicine. Siri Nikku talks about associations between play deserts and pediatric health. Finally, Ilana Saidov ends by sharing more about the evolution of neurotechnology.

Please enjoy reading The Premed Scene's May 2023 Medical Newsletter! Till next month.

*Aprile Bertomo*

### INSIDE:



# Rising Stars in Medicine: Dr. Serena Nik-Zainal

**BY APRILE BERTOMO**

Innovations in the field of medical genetics have rapidly brought about tremendous positive impact in several ways. Though great strides have been made by many, one of the most notable individuals in the field is Dr. Serena Nik-Zainal. Dr. Nik-Zainal explored medical genetics from an oncological perspective, expanding the world's knowledge of how bioinformatics can contribute to the development of novel forms of therapy.

Following advancing herself in her education at both the University of Cambridge and the Wellcome Sanger Institute, Dr. Nik-Zainal performed further research investigating how breast cancer development through whole genome sequencing can be better understood. She explained the significance of noticing mutation signatures. These types of "signatures" were noted as the result of mutation-based occurrences resulting from the evolution of cancer. She particularly researched a phenomenon known as "kataegis." She defined this as an occurrence involving many basepair mutations within a limited DNA stretch.

As a result of her notable contributions in medical genetics, Dr. Nik-Zainal later received the honorable opportunity of the Wellcome Trust Intermediate Clinical Fellowship. Her later work involves a fusion of both computational analyses and model systems that are more cell-based, with a strong focus on the previously-mentioned mutation signatures. She then brought to life the clinical project denoted "Insignia." Through Insignia, Dr. Nik-Zainal recruited participants to obtain a better understanding of mutational issues. Her present work continues to focus on applications of her research to more clinical settings.

Source:
https://medgen.medschl.cam.ac.uk/serena-nik-zainal/

# Water Works: The Essential Key to a Healthy Body and Mind

**BY MAHIMA BHAT**

Your body weighs roughly two thirds water. To function, all of your cells require water. All of your body fluids, including saliva, blood, urine, perspiration, and joint fluid, are made primarily of water. How can you tell if you're getting enough to drink?

You may experience extreme thirst and headaches as a sign that you are becoming dehydrated. Your skin or mouth may feel extremely dry. Additionally, your body may try to preserve water by making your urine darker. Mild dehydration should be treated with fluid consumption.

Severe dehydration can result in confusion, fainting, the inability to urinate, as well as fast respiration and heartbeat. You need to get medical care right now because it could be life-threatening at this stage. To replace the fluids in your body, drinking liquids might not be sufficient. Fluids may need to be administered to you intravenously, or by a tube or needle placed in a vein.

Recent NIH-funded research indicates that staying hydrated may not be your main motivation for doing so. Dr. Natalia Dmitrieva, a heart researcher at the NIH, has researched the long-term consequences of dehydration. Her team discovered that middle-aged adults who were dehydrated were more prone to develop chronic illnesses. Heart failure, diabetes, chronic lung disease, and dementia were among the illnesses.

The best way to avoid dehydration is to make sure you drink enough fluids every day. Your ideal source of fluids should be water or other low-calorie drinks like simple coffee or tea, sparkling water, or flavored waters. 100% vegetable juice and other nutritional liquids like milk or milk substitutes are also healthy choices. Dependence on soda, sports drinks, or other sweetened drinks for the majority of your fluids can result in a calorie-dense diet with little nutritious benefit.

Dmitrieva has changed her own drinking habits based on the results of her research. "When I started to see the results of these studies and then started seeing how much I drink, I realized that I drank less than needed," Dmitrieva says. "Then I just started to take one liter of water with me when I go to work. And I make sure that during the day I drink this one liter."

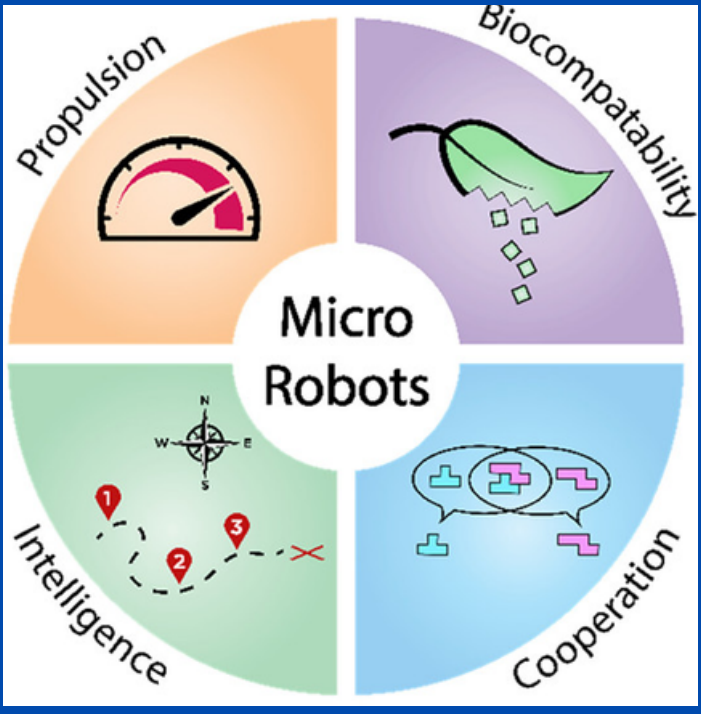
Source: https://newsinhealth.nih.gov/2023/05/hydrating-health

# Advancements in Medical “Microrobots”

BY RAMEESHA MUSTAFA

Engineered nanoparticles can be used to deliver drugs throughout the body. They are effectively able to protect the therapeutic drug due to their high durability. However, they maintain a linear pattern of motion and depend solely on the body's circulation system to move around. Thus, treatments cannot reach the diseased tissue properly as their poor adhesion to the target tissue hinders sustained drug release.

A team of engineers and scientists at the University of Colorado Boulder have designed bubble-based microrobots. "Imagine if microrobots could perform certain tasks in the body, such as non-invasive surgeries," said Jin Lee, which led his team to explore the possibility of different designs. They were able to curate microrobots with complex geometries that have been experimentally proven to follow non-linear trajectories in the mouse bladder. They showed that the microrobots were able to pin to the epithelium and slowly release therapeutic drugs. Moreover, they were able to reach an independent speed of about 150 body lengths per second.




This advancement, if it can be replicated in humans, can help cure urinary diseases, as done for the mouse. In addition, this can also be applied to other parts of the body such as the brain and other organs, which can lead to tremendous solutions in healthcare. As the root of many neurological diseases cannot be targeted due to the lack of therapeutic drug delivery control, effective microrobots can help overcome this. Increased functionalities, such as their motility and cooperation, can help penetrate tissues and effectively target cancers.

The advancements in microrobots and their effectiveness has created many new prospects for targeted therapeutic drug delivery systems.

Sources:
https://onlinelibrary.wiley.com/doi/10.1002/smll.202300409
https://www.sciencedaily.com/releases/2023/05/230524181939.htm
https://pubs.acs.org/doi/10.1021/acs.chemrev.0c00999

# Effects of Play Deserts on Children in Communities

**BY SIRI NIKKU**

There has been a rise of food deserts, which are defined as communities where people are struggling to go to a grocery store or accessing fresh, nutritious food. About 10% of the United States goes into this category. There is a similar percentage for play deserts, which are communities where there is a lack of good quality play areas for children. Many of these play deserts are located in the Southeast and one issue that stuck out as well as the lack of play areas for children was the affordability. Some parks and play areas required a membership fee or some other fee to enter. There has to be more than just parks or play areas existing but also parking, walkability, bathrooms, and shade in such areas as well as the safety and quality of playground equipment. One might ask why it's such a big deal that play deserts are a growing issue and the answer lies with recent national data relating to pediatric obesity and health behavior. There have been patterns of the proportion of children spending time outdoors decreasing, especially in low-income neighborhoods.

Another shocking statistic is that about 2/3 of American kids lived in a safe environment, especially lower for children of color. Parents who lived in more low-income neighborhoods and/or had teenage girls discouraged their kids from playing outside. The article mentioned that communities can respond by investing in safe parks and recreational buildings to allow free physical activity. One method for urban areas to have more parks was to have protected bike lanes and sidwealks free of vehicles. Communities can also have schools and other buildings turn into public reactional areas in off-hours. There are many pros of children having play areas like physical activity and socializing with other children their age that should be prioritized.

Sources
https://www.usnews.com/news/health-news/articles/2023-05-24/nowhere-safe-to-play-play-deserts-keep-kids-from-fun-physical-activity
https://www.gametime.com/news/how-do-i-build-a-playground

# The Future of Neurotechnology

**BY ILANA SAIDOV**

Neuralink, Elon Musk's brain implant company, announced that it had received FDA approval to begin clinical trials on humans. This is a significant milestone for the company, which aims to develop neurotechnology to help treat various neurological disorders and enhance human cognitive abilities. The company was founded in 2016 to develop a brain-machine interface (BMI) that can directly link human brains to computers. This technology has the potential to revolutionize the way we interact with machines and to help people with neurological disorders regain lost abilities.

The N1 sensor is a tiny implantable device that can record and stimulate brain activity. The device is designed to be minimally invasive and can be implanted using a simple surgical procedure that does not require general anesthesia. This sensor can potentially help individuals with neurological disorders, including paralysis, epilepsy, and Parkinson's disease. The technology could also enhance human cognitive abilities by allowing people to directly interface with digital devices, such as smartphones and computers, using their thoughts alone.

The approval from the FDA allows Neuralink to begin clinical trials of the N1 sensor in humans, which is a crucial step in developing the technology. The trials will initially involve a small number of patients with neurological disorders and will focus on evaluating the safety and efficacy of the technology. If the trials are successful, the N1 sensor could eventually become a widely used medical device that can help millions. It could also pave the way for the development of more advanced brain-machine interfaces that can unlock the full potential of the human brain.

However, there are also concerns about the ethical implications of brain-machine interfaces, mainly if they are used to enhance human abilities beyond what is considered "normal." Some experts have raised concerns about the potential for such technology to blur the line between humans and machines. Despite these concerns, the approval of Neuralink's clinical trials represents a significant step forward in neurotechnology development.

Sources:
https://www.findlight.net/blog/neuralink-technology/#:~:text=Neuralink%20is%20a%20neurotechnology%20company,the%20brain%20and%20a%20computer.

https://www.usnews.com/news/business/articles/2023-05-26/elon-musks-brain-implant-company-neuralink-says-it-has-us-approval-to-begin-trials-in-people