

2021 Spring Undergraduate Research Symposium

Students created a poster to present their semester-long efforts during the 2021 Spring Undergraduate Research Symposium. Mitch Faloona, Harleen Kahlon, and Adeel Markatia recorded a poster pitch to introduce the class's work during the symposium, and students hosted a Zoom room to welcome all visitors and answer questions for the duration of the presentation.

Precision Ketogenic Therapy for Every Stage of the Life Cycle

BACKGROUND

Using the ketogenic diet to treat refractory epilepsy began around 100 years ago. Patients are frequently removed from the diet after 2-3 years. Precision Ketogenic Therapy (PKT) permits long-term use of ketogenic therapy because it creates a personalized treatment plan for every patient, factoring in their current eating habits, interests, and much more, with the goal of expanding the range of keto to benefit as many patients as possible.

ABSTRACT

The application of the PKT diet to patients is based on the concept that consuming less carbohydrate can mimic the effects of starvation, produce ketones, and reduce seizures in patients with epilepsy. The purpose of this research is to use this principle to improve patients' quality of life. Through this research, we gather information needed to tailor PKT to the needs of individual patients. The Foodomics Database is the foundation of the therapy because it provides the specific nutritional content of the foods being consumed by patients. We aim to extend the Foodomics database with the continued collection of food product information and the development of recipes for patients.

METHODS

Students were paired and assigned a patient age group. Students were then given lists of food products corresponding to their patient age group. Each food product was assigned an NDID number. Students completed nutrient runs by going online or to local grocery stores. Through nutrient runs, students collected information on product price, manufacturer, serving size, and nutritional content. Photos of food product information were uploaded and the information itself was entered into the Foodomics database. The date and location of information collection were noted. Information was audited twice by other students to ensure accuracy. Once this process was complete, food product data were applied to PKT treatment for patients according to their nutritional needs and dietary preferences.



Patient profiles created at the beginning of the semester provided much needed context for nutrient runs and recipes. Information was compiled in the Foodomics database for use in the administration of PKT to patients.

TEAM PRETERM NEONATES

- Two-week old female born at 28 weeks gestation named Ana
- H: 15", W: 3.5lbs
- Frequent and persistent neonatal seizures that occur in clusters
- Intubated due to breathing problems
- Seizure treatment via medication ineffective so far
- Stay at home mom prepares PKT recipes and patient feedings

TEAM ADOLESCENTS

- 15-year-old male named Edgar
- H: 5'1", W: 95lbs
- Seizures (1-2x a week), partial for ~30 sec followed by vomiting
- Rarely has a major tonic-clonic seizure (every few months)
- Low physical activity
- Poor nutritional status, favorite foods are from McDonald's
- Can chew most meals
- Limited improvement from medications
- No other major health conditions
- Misses out on teenage activities

TEAM ELDERS

- 72-year-old female named Carla
- H: 5'2", W: 105-110lbs
- Low activity level
- Average of one seizure per day, lasting 10-30 sec
- Partial-full loss of awareness during seizures
- Heavy medication regimen
- Can swallow food but some difficulty chewing
- Husband and daughter prepare meals

TEAM FULLTERM NEONATES

- 20-month-old male named Elias
- H: 29", W: 18lbs
- Seizures began before the age of one and now occur every 2-3 days, typically in the morning
- Medications losing efficacy
- Can chew and digest small bites of food, yet struggles with large bites of solid food
- Parents make most meals

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Mentors:

Dr. Peggy R. Borum and Dr. S. Parrish Winesett

TEAM STATUS EPILEPTICUS

- 35-year-old female named Giselle
- H: 5'8", W: 119lbs
- Diagnosed with Convulsive Status Epilepticus (CSE) as a result of acute brain trauma suffered in an automobile accident. CSE is a loss of consciousness and violent convulsions for 5+ minutes.
- History of eating disorders
- Increasing frequency in episodes of CSE

TEAM CHILDREN

- 7-year-old female named Sally
- H: 4'0", W: 60lbs
- Frequent seizures, every few days and occasionally twice a day
- Medications did not help long-term
- Mother cooks all meals, but they usually are not nutrient dense
- Sedentary
- Can swallow most foods

TEAM MATURE ADULTS

- 43-year-old male name Bob
- H: 5'10", W: 267lbs
- Suffers from mild photosensitive epilepsy after an early stroke
- Suffers from obesity and has a sedentary lifestyle
- Has tried a few medications which have not worked, and some have caused him to gain more weight

TEAM YOUNG ADULTS

- 23-year-old female named Lauren
- H: 5'2", W: 99lbs
- Suffers from frequent epileptic seizures, averaging one a day
- Anemic
- Has tried a variety of medications, and is currently using three, which make her lethargic and fatigued
- No swallowing issues
- Most often eats readymade foods
- Regularly forgets to eat

RESULTS

Through the completion of nutrient runs, food product data was added and updated. These entries will be used to make recipes for the patient profiles listed.

Sample Online Nutrient Run:



APPLICATIONS

The modification of diet in order to reduce frequency and severity of seizures allows patients to improve without many of the undesirable side effects of prescription medications. PKT often offers them relief from seizures that were otherwise not improved from traditional treatment options. Developing a comprehensive nutrient database helps make information about food products more accessible, in turn making PKT more feasible for patients throughout the life cycle. Developing recipes that are suitable to patients' individual needs also makes PKT more practical for their everyday routines and helps make the diet more enjoyable and sustainable.

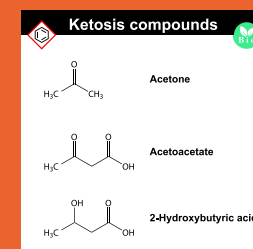


Fig. 1- Ketone Structure

