Sugar Assassin

How to Have Your Donut and Eat it Too

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Obesity Epidemic in the US

- 68.8% of adults are overweight or obese
- Food intake
- Lack of physical activity
- Average Calorie Content in Restaurant meals
- 66% of daily requirement
- High amounts of processed foods
- Difficult to equate calorie numbers with activity level

Obesity Costs

**Cost Burden of Obesity-Related Conditions to Society and Health Industry**

- **Heart Disease**
  - $8.8
- **Osteoarthritis**
  - $21.2
- **Gallbladder Disease**
  - $3.4
- **Type 2 Diabetes**
  - $98
- **Hypertension (high blood pressure)**
  - $4.1

1. 17 percent of the total direct cost of heart disease, independent of stroke
2. Direct cost: $5.3 billion; Indirect cost: $13.9 billion
3. Direct cost: $3.2 billion; Indirect cost: $187 million
4. Direct cost: $4.1 billion—17 percent of the total cost of hypertension
Sugar and Body Weight

• ~ 50% of our calories come from carbohydrates
  – Starches that are converted to sugar before absorption by the body

• Average annual sugar intake is 130 lbs. – 150 lbs.
  – 229,000 to 264,000 calories (56 to 65 lbs. body fat)

What is Sugar?

![Sucrose molecule diagram]
Opportunity

**Sugar Assassin** - Way to decrease the amount of dietary glucose absorbed by the GI Track.

- Encapsulated Dietary Enzyme  
  - Reduces glucose levels of a meal
- Orally active
- Taken with meals
- Dry powder capsules
How Does it Work?

Enzyme is encapsulated into cross-linked microgel, and protected from the degradation in GI track. Glucose can diffuse into microgel and be degraded reducing the level of glucose that can be absorbed by the body.
Does it Work?

Blood Glucose Levels After Meal

- 37.5 U/mg
- 4.8 U/mg
- No Enzyme

Blood Glucose (mg/dL) vs. Time After Meal (minutes)
Enzyme Encapsulation

Multi-arm PEG + PEG-DBCO crosslinker + enzyme → Encapsulated Enzyme

85% Encapsulation Efficiency

Platform for Encapsulation of other enzymes
- Fructose Dehydrogenase – oxidizes fructose to 5-keto-fructose
- Glactose Oxidase – metabolizes glactose from lactose
Market Size – Glucose Reduction

- Weight Loss Market Revenue (2010) - $60.9B
  - Typical dieter now makes 4 weight loss attempts per year
  - 80% prefer “self-directed” programs

- Fragmented
  - Supplements ($3B estimated for 2014)
  - Food Programs (Nutrisystem) - $1B in 2010
  - Group memberships (Weight Watchers)
Technology Status

• In vivo Proof-of-Principle experiments completed
  – Extended dietary weight gain/loss study planned for “normal” animals
  – Studies to determine if enzyme combinations are needed
  – Particle breakdown analysis
  – Scale-up cost analysis

• Provisional patent application filed – Emory Tech ID 13044
  – 04/03/2013
  – Encapsulation composition and method
  – Enzyme formulation