Soy and Diabetes
What normally happens

- Carbohydrate eaten
- Blood glucose rises
- Blood insulin rises
- Glucose enters cell
What is Diabetes?

- Either no insulin produced, or (called type 1 diabetes)
What is Diabetes?

- Not enough insulin, or
- Receptors not working
  (called type 2 diabetes)
Fasting blood glucose

Oral glucose tolerance
Update on the “R. U. A. Healthy Kid?” project

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SOUTHERN ILLINOIS UNIVERSITY, CARBONDALE
Objectives of “R. U. A. Healthy Kid?”

1) To identify adolescents in Southern Illinois who are at-risk for Type 2 Diabetes.

2) To develop, implement and evaluate a relevant and effective community-based intervention for these at-risk adolescents.
Screening for T2DM risk factors:

246 **Harrisburg** students = 55% of total school.  
   48% had high BMI for age; 43% had positive family history  
   **54 students (21%)** had 3 or more risk factors

305 **Vienna** Grade School = 78% of total school.  
   40% had positive family history; 38% had high BMI for age  
   **39 (5th-8th graders)** had 2 or more risk factors.

148 **Highland** 6th graders = 91% of total 6th graders.  
   40% had positive family history; 35% had high BMI for age  
   **33 students (22%)** had 2 or more risk factors.
Results of T2DM screenings:

Based on these screenings at three Southern Illinois schools, approximately *2/3 of elementary students have one or more risk factors for Type 2 Diabetes.*

The most prevalent risk factors were *High BMI for age* and *Family History of T2DM.*

*At least 20% have multiple risk factors for T2DM,* however, *no program to refer these children...*
Update on “R. U. A. Healthy Kid?”

…until now!

Obj. 2) To develop, implement and evaluate a relevant & effective community-based intervention for adolescents at-risk for T2DM.

We’ve completed interventions at Harrisburg Middle School, Vienna Grade School, Highland Elementary.

We are now at Cobden Elementary, Carbondale Middle School, and Anna-Jonesboro High School.
Update on “R. U. A. Healthy Kid?”

Four main components of the program:
1. Family Meals.
2. Healthy Snacks.
3. Physical Activities.
4. “Unique U” (self-esteem, body image, goal setting, food journaling, and stress management).
Update on “R. U. A. Healthy Kid?”

#1. **Family Meals** = make-and-taste simple, tasty, healthy snacks/dishes (recipes).
Update on “R. U. A. Healthy Kid?”

#2. Healthy Snacks = Use interactive games to “sneak in” nutrition education topics such as *portion sizes* and *label reading.*
Update on “R. U. A. Healthy Kid?”

...plus taste-testing of Healthy Snacks.
Update on “R. U. A. Healthy Kid?“

#3. **Physical activities = Inflatable!**
Update on “R. U. A. Healthy Kid?”

# 4. **Unique U** = “everything from the neck up”

- Stress management (Dr. Les Lloyd, mind-body expert)
- Body image/Self-esteem (Social Work grad students)
- Food journaling
- Setting S.M.A.R.T. goals

► We also have a “Graffiti Wall” at each program and we do weekly phone calls/emails.
Changes in Anthropometrics:

Changes in anthropometric measurements of adolescents at-risk for Type 2 Diabetes before and after a 3-month, community-based intervention at Harrisburg Middle School (n=17).

<table>
<thead>
<tr>
<th>Variables</th>
<th>Baseline</th>
<th>3 Months</th>
<th>t</th>
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<th>sig.*</th>
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<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SEM a</td>
<td>Mean</td>
<td>SEM</td>
<td></td>
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<tr>
<td>Weight (lbs)</td>
<td>195.99</td>
<td>11.76</td>
<td>196.98</td>
<td>11.74</td>
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<td>BMI</td>
<td>33.60</td>
<td>1.64</td>
<td>33.03</td>
<td>1.65</td>
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<td><strong>Body Fat %</strong></td>
<td><strong>41.28</strong></td>
<td>2.69</td>
<td><strong>40.02</strong></td>
<td>2.56</td>
<td>2.54</td>
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<td>Fat Mass (lbs)</td>
<td>83.72</td>
<td>8.96</td>
<td>81.89</td>
<td>8.82</td>
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<td><strong>Muscle Mass (lbs)</strong></td>
<td><strong>112.26</strong></td>
<td>5.84</td>
<td><strong>115.05</strong></td>
<td>5.45</td>
<td>-2.47</td>
</tr>
</tbody>
</table>

*Significant (2-tailed) at p< 0.05 level calculated by paired t-test.
SEM a = Standard Error of Mean
Changes in Snacking Patterns:

In Vienna participants, we found significant changes from baseline to 3 months for:

- ↓ intake of hard/chewy candy ("sometimes" to "rarely")
- ↓ intake of ice cream ("sometimes" to "rarely")
- ↓ frequency of "buying a snack from a vending machine or convenience store."
- ↓ number of snacks per day.
- ↑ intake of protein bar (soy)----statistical trend.
Summary: “R. U. A. Healthy Kid?”

Based on these data, it appears that “R. U. A. Healthy Kid?” is making a positive impact on the body composition and snacking habits of Southern Illinois adolescents at-risk for Type 2 Diabetes.
In addition, we’ve learned how to reduce risk for T2DM and positively impact the overall health of today’s at-risk adolescents.

- Plan to test a 3-month, *after-school* format.
- Combine our “hands-on” activities with U of I’s web-based modules (HOT project)…
HOT Project: Healthy Outcomes for Teens

Karen Chapman-Novakofski, RD, PhD, Darla Castelli, PhD, Jane Scherer, MS
HOT Project
Healthy Outcomes for Teens

Why Do Some People Have High Blood Glucose Levels?

Glucose comes from the food we eat. Foods that have carbohydrates are broken down into glucose. This glucose is used for energy. Glucose in the blood is carried to all the cells of the body. However, in order for blood glucose to enter the cell, a special helper and cell receptor are needed. The helper that glucose needs to enter the cell is insulin. Insulin is a hormone made by the pancreas. Cell receptors are like doorways into a cell. A cell can have many receptors.

To imagine how glucose, insulin, and cell receptors work, think of your car. To park in your garage, you need a garage door and a garage door opener. Glucose is like your car, the cell receptor is like the garage door, and the insulin is like the opener.

If your body does not make enough insulin or if it does not work properly, glucose cannot get into your cells. Instead, glucose stays in your blood causing high blood glucose, or hyperglycemia. People with hyperglycemia have diabetes.

Control Group

Treatment Group
Module 1

- Why do some people have high blood glucose?
- What is diabetes?
- Types of physical activity
- Getting started
Module 2

- Staying in balance
- Working out
- Is sugar bad?
- Exercise videos
  - How likely are you to do this exercise?
    - Not Likely
    - Maybe
    - Likely
Module 3

- What counts as a portion or serving?
- What are macronutrients?
- Fun physical activity for daily life
  - What activity do you enjoy the most?
- Take a walk
Module 4

- Why are foods put together in groups?
- Fitness equipment
- Should people with diabetes avoid eating sugar and sweets?
Module 5

- Eating for target blood glucose levels
- 3 main types of diabetes
- HOT Review
**Stage 3: Implementation**

The HOT Project was implemented across three schools and in three different settings.

- 80 in control --- 101 in treatment

Both the control and treatment groups significantly increased their knowledge of content

- (Mcontrol = 5.96, SD = 2.23, \(p < 0.05\); Mtreatment = \textbf{8.54}; SD = 3.92; \(P \leq 0.001\)).
HOT Project results

- Only participants within the treatment group were allowed to retake knowledge tests
- 72 of the 101 participants elected to retake these tests!!
HOT Project results

- **Significant relationship**
  - adjusted $R^2 \geq 0.19$, $F(8, 169) \geq 6.31$, $P < 0.001$
  - **treatment** (HOT Project curriculum) ($t(3.8), \beta \geq 0.30, P \leq 0.001$) and **format of delivery** (after school, pull out from physical education, or health education curriculum) ($t(3.41), \beta \geq 0.24, P \leq 0.001$) influenced the acquisition of content knowledge.
“R.U.A. Healthy Kid 2?” Proposal

- January, 2010 – May, 2011
- Researchers:
  - S. Peterson, K. Chapman-Novakofski, L. Lloyd, D. Castelli
- Combine “R.U.A. Healthy Kid?” and HOT Project
- 3 school districts: Carbondale, Rantoul, Urbana
RUA Healthy Kid 2? Proposal

If each project was separately successful, why a combined trial?

- Flexibility
- Reinforcement
- Sustainability
- Align with Illinois Education Standards for Science and Health
- Demonstrate success as team for USDA/NIH/American Diabetes Association funding
Soymilk intake and human inhibition of obesity related risk factors

Soy Nutrition and Food Science MRA
September 20, 2009

Elvira de Mejia
Associate Professor
Department of Food Science and Human Nutrition
University of Illinois Urbana-Champaign
Soy milk with higher levels of β-conglycinin has improved potential to reduce fat accumulation and promote beneficial microbiota in humans compared with regular soy milk and cow milk.
Human study

- IRB N. 09454

- Recruitment of subjects
  - Advertisement
  - Heath questionnaire
  - Informed consent

- Development of the study
  - One week – washed out
  - Three months of milk consumption
  - Four meetings for samples:
    - Anthropometric measurement
    - Body fat composition
    - Microbiota analysis
    - Blood analysis

- Analysis of data and samples.

- Statistical analysis of results.

- Scientific presentation at Experimental Biology (2010).

- Scientific manuscript to be published in a peer-review journal.
Glycemic Index

Karen Chapman-Novakofski, RD, PhD
with Elvira de Mejia, PhD
For ISA, September, 2009
Soy, Diabetes, Native Americans

Access & affordability of healthy foods.
Soy & Diabetes

- RU A Healthy Kid and HOT Project
  - Impact on obesity, knowledge of children
- Soymilk, obesity & glycemic index
  - Impact on obesity, possibly glycemic index
- Native American proposal development
Thank you ISA!

Karen Chapman-Novakofski, RD, PhD &
Illinois Center for Soy Foods

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