Bridging the Causeway:  
A Center for Healthcare Policy and Research Symposium

In cooperation with:  
The Clinical and Translational Science Center  
The Center for Reducing Health Disparities

Obesity Breakout Group

University of California, Davis  
Memorial Union  
March 25, 2008
Our laboratory asks:

- How might fat stores in the obese differ, and what role would this play in disease risk? What makes fat tissue ‘tick?’
  - “adipose physiology & pathophysiology”

- How do environmental & metabolic cues regulate energy homeostasis & WAT phenotype?

- What biomarkers reflect metabolic health?
Experimental Approaches

- **Discovery biology**: transcript patterns & novel protein characterization
  - comparisons between extreme biological systems
    - mice--cold vs. warm ambient temperature exposure
    - newly-identified fat proteins
  - non-obese vs. obese animal, human subjects
- ID of adipose-”specific” genes-proteins
  - public expression databases
  - qPCR, tissue panels
- gene regulation & function in fat cell models
  - 3T3-L1 adipocytes; gene knockdown
  - PPARγ-driven regulation of specific target genes
Mice in the cold:
what links temperature to energy balance & WAT-BAT plasticity?

Metabolic rate

Food consumption

Brown Adipose Tissue

BMR

Temperature, °C

ml O2/(min•kg0.75)

Temperature, °C

g/mouse

courtesy of: Dr. Jan Nedergaard, The Wenner-Gren Institute, Stockholm
Identification of tumor suppressor candidate 5 (Tusc5), a novel cold-repressed “adipocyte-specific” gene

Adams, WO 02/097036 (2002)
Tusc5 is an Adipocyte-Peripheral Neuron Gene-Protein

Synuclein-γ: a Second “Adipocyte-Neuron” Protein

Twiss, J. Neuroscience 2005, 25(4)

γ-synuclein is significantly up-regulated in obesity & implicated in tissue plasticity

Oort et al. J.Nutr, in press
Peripheral Nerves:
Like WAT, these systems have the potential for plasticity
• i.e., following nerve injury
• inflammation?
• Recent Data: role in WAT & BAT growth

Afferent
pain, itch
hot-cold
proprioception, touch/pressure
adiposity and “tissue status” signals?

Efferent
inflammatory modulation
blood pressure regulators
adiposity phenotype regulators?

Peripheral Nerves
Like WAT, these systems have the potential for plasticity
• i.e., following nerve injury
• inflammation?
• Recent Data: role in WAT & BAT growth
Experimental Approaches

- **Organismal physiology**: nutritional studies in animal obesity models & in human subjects
  - endocrinology & inflammation biology
    - cytokines, adipokines—obese vs. lean
    - postprandial gut & pancreatic hormones, satiety—fluence of dairy calcium & fat loss
    - WAT inflammatory gene & protein signatures—lean vs. obese; influence of calcium nutrition & weight loss
  - biomarkers of metabolic phenotype variance
    - metabolomic patterns in diabetes
    - mitochondrial metabolite shifts during FFA β-oxidation
Acyl-Carnitines are Dysregulated in T2DM: TCA cycle impairment

**p ≤ 0.01**  Adams, Newman, Hoppel, Garvey (unpublished)
Acyl-Carnitines are Dysregulated in T2DM: TCA cycle impairment

**Plasma Concentration (µM)**

- **Non-Diabetic**
- **Diabetic**

***p ≤ 0.001
Emerging Concepts in Obesity

- **Adipose Plasticity** -- adipose tissue is dynamic, and its inflammatory & metabolic phenotype is influenced by:
  - extracellular matrix malleability
  - adipocyte hypertrophy, new adipocyte proliferation, transdifferentiation of the WAT (WAT to BAT to WAT, e.g.)

- "Afferent" Peripheral Neurons & Metabolism -- new roles for PNS neurons are evident for:
  - sensing adiposity
  - sensing tissue metabolic & inflammatory status
  - regulating WAT and BAT plasticity
  - regulating local inflammation
  - importance in neuropathy of insulin resistance/diabetes?
Health Services Research in Pediatric Obesity

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My Areas of Research

Healthcare Quality
  - Office practice
  - Provider behavior

Pediatric Nutrition
  - Obesity
  - Breastfeeding
Strategic Plan for National Institutes of Health Obesity Research

“Cross-cutting research topics, including health disparities, technology, translational research, and education/outreach efforts”
Prevalence of Overweight among Adolescents in Rural vs. Urban California

Ulfat Shaikh, Robert S. Byrd, Peter Franks
Adolescent overweight more prevalent in rural areas (16.4%) vs. urban areas (11.9%), p=0.009
Prevalence of Overweight among Adolescents in Rural California

- Race/ethnicity - White, Native American, African American
- Lower caregiver education
- Lower access to prevention and treatment services
- Lower access to safe play areas
Prevalence of Overweight among Adolescents in Rural California

- No difference in diet & access to PE in school
- Activity level better in rural areas
- Rural youth face unique circumstances that affect implementation / success of interventions
Outcomes of Telemedicine Consultations for Pediatric Obesity

Ulfat Shaikh, Stacey Cole, James P. Marcin, Thomas S. Nesbitt
UCDMC Pediatric Weight Management Clinic
UC Davis Outpatient Pediatric Telemedicine

- Dermatology: 37%
- Psychiatry: 24%
- Neurology: 7%
- Endocrinology: 6%
- Nutrition: 1%
- Otolaryngology: 3%
- Genetics: 2%
- Orthopaedics: 1%
- Other: 2%
- Pediatric Urology: 1%
- Pediatric Obesity: 14%

N = 2,446
Goals, Methods

- Outcomes on changes/additions to diagnoses, diagnostic evaluation or treatment
- If changes in recommendations associated with improvements in patient nutrition, activity and weight
- Retrospective chart review
Results

- 99 patients met inclusion criteria
- Changes/additions to diagnoses - 77.8%
- Changes/additions to diagnostic evaluation - 79.8%
- Of patients seen more than once, improvement in clinical outcomes - 80.7%
Results

• Improved diet - 80.6%
• Increased activity - 69.4%
• Slowing of weight gain / weight maintenance - 21.0%
• Weight reduction - 22.6%
Results

• Improvement in clinical outcomes
  – not associated with changes/additions to diagnoses (OR=0.98; 95% CI 0.25-3.98)
  – weakly associated with changes/additions to diagnostic evaluations (OR=2.23; 95% CI=0.58-8.73)

• Changes/additions to treatment associated with improvement in weight status (OR=9.0; 95% CI 1.34-76.21)
Telemedicine Pediatric Obesity Clinic Referring Provider Satisfaction

- Video Quality: 4.57
- Audio Quality: 4.61
- Ability to Perform Exam: 4.40
- Ability to Understand Consultant’s Recommendations: 4.78
- Overall Satisfaction with Telemedicine: 4.78
Pediatric Obesity Telemedicine Clinic Parent Satisfaction

- Perception of Physician's Skills: 4.26
- Ability to Speak Freely: 4.26
- Ability of Telemedicine to Meet Needs: 4.11
- Ability to Understand Consultant's Recommendations: 4.32
- Overall Satisfaction with Telemedicine: 4.26

N=19, Av=4.26
EMR to Improve Documentation of Obesity Screening and Counseling

Ulfat Shaikh, Rachel Nelson, Robert S. Byrd
Background, Objectives

- Clinicians under-document screening and counseling for pediatric obesity prevention
- EMR features have improved the quality of preventive services such as cancer screening and immunizations
- Goal: Does automatic calculation of BMI in EMR improve documentation of screening and counseling for pediatric obesity prevention and treatment
Methods

• Retrospective systematically sampled well child visit charts pre and post EMR
• 2-18 years old
• 551 charts reviewed
• Documentation of BMI, BMI percentile and weight category (underweight, normal weight, overweight or obese)
• Documentation of nutrition and exercise counseling
Results

• Prevalence of overweight and obesity similar (18% and 22%) both pre- and post-EMR
• Documentation of BMI and BMI percentile reduced from 17.1 to 3.3% (p<.001) and 37% to 11% (p<.001) post-EMR
• No significant difference in documentation of BMI category
• Documentation of nutrition assessment of intake of fruits/vegetables, sweetened drinks, fast food, breakfast, family meals, portion size, eating patterns, TV/video viewing, and video game/computer use similar
Results

- Documentation of assessment and counseling for high calorie food intake and other less specific references to nutrition counseling increased significantly post-EMR
- Documentation of assessment of physical activity decreased post-EMR
- Documentation of physical activity counseling increased significantly (8.9% vs. 32.5%, p<.001)
- Documentation of high risk family history increased significantly
- Documentation of BMI, weight status and counseling did not show trend or relationship with patient weight, or overweight/obese status
Conclusions

• Automatic BMI calculation did not improve clinicians’ documentation of BMI, BMI percentile and weight category, even in overweight and obese patients
• Variable increase in documentation of counseling on nutrition and physical activity
• Passive changes insufficient to result in systematic improvements in assessment and management of obesity
• Need for more coordinated and comprehensive approach (staff training, system-initiated alerts, counseling cues, enhanced patient encounter forms)
Health Services Research in Obesity

- **Organize care**
  - Define scope and nature of challenges; health disparities; utilization of services

- **Manage care**
  - Identify best practices and new solutions; treatment in children

- **Finance care**
  - Economics of obesity and co-morbidities; cost-effectiveness of interventions
Health Services Research in Obesity

- Deliver high quality care
  - Safe, effective, efficient, timely, patient-centered, equitable
- Improve patient safety
  - Reduce medical errors; safety of medications, procedures and bariatric surgery
Research Program

Initial research looked at what would be the benefits to California’s agricultural industries should Californian’s consume the recommended amounts of fruit and vegetables.

Examined the impact of the 5-a-day, 7-a-day, and 7-a-day cancer prevention recommendations using a market model.
Research Program

Benefits $350 million a year for the 5-a-day, $788 million for the 7-a-day and $814 million for the 7-a-day cancer prevention.

Research only examined what would be the benefits if Californian’s increased consumption, sources of supply for the increased consumption and available resources.

Did not examine how to get the increase in demand.
Research Program

Economic approach to changes in demand:

- 3 components
  
  **Preferences:** formed by cultural background, tastes, knowledge, etc.

  **Prices:** cost to purchase the commodity plus transaction costs such as search costs and travel costs.

  **Income:** Household earnings, food assistance programs.
Follow-up research: EBT fruit and vegetable bonus value. Used another market model to estimate the change in consumption of fruit and vegetables by food stamp recipients for a price discount of 25% on EBT fruit and vegetable purchases.

A 25% price discount is estimated to increase consumption by 5%, with greater increases in dark green vegetables and fruit in the citrus/berry/melon group.
Research Program

Follow up research: The Environment.
Market basket study on the cost of healthier alternatives: i.e. whole wheat bread instead of white bread.

Healthier basket is 17% more expensive. Lower income neighborhoods have a problem with access to healthier alternatives, especially whole grain products if they do not have a supermarket.
Research Program

Follow up research on the Environment.

Convenience store conversion whereby produce cases were installed in a convenience store to allow the owners the capability to sell fresh fruit and vegetables.

Consumer purchases steadily increased during 7 month follow-up, but unclear if financially viable for store owners.
Research Program

Projects in development:
- Education and environment
  Supermarket intervention
  Food Dudes child nutrition
- Impact on health indicators for food stamp recipients of a 25% reduction in the price of fruit and vegetables.
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