

Epinephrine, Trunk Fat and Fasting Glucose

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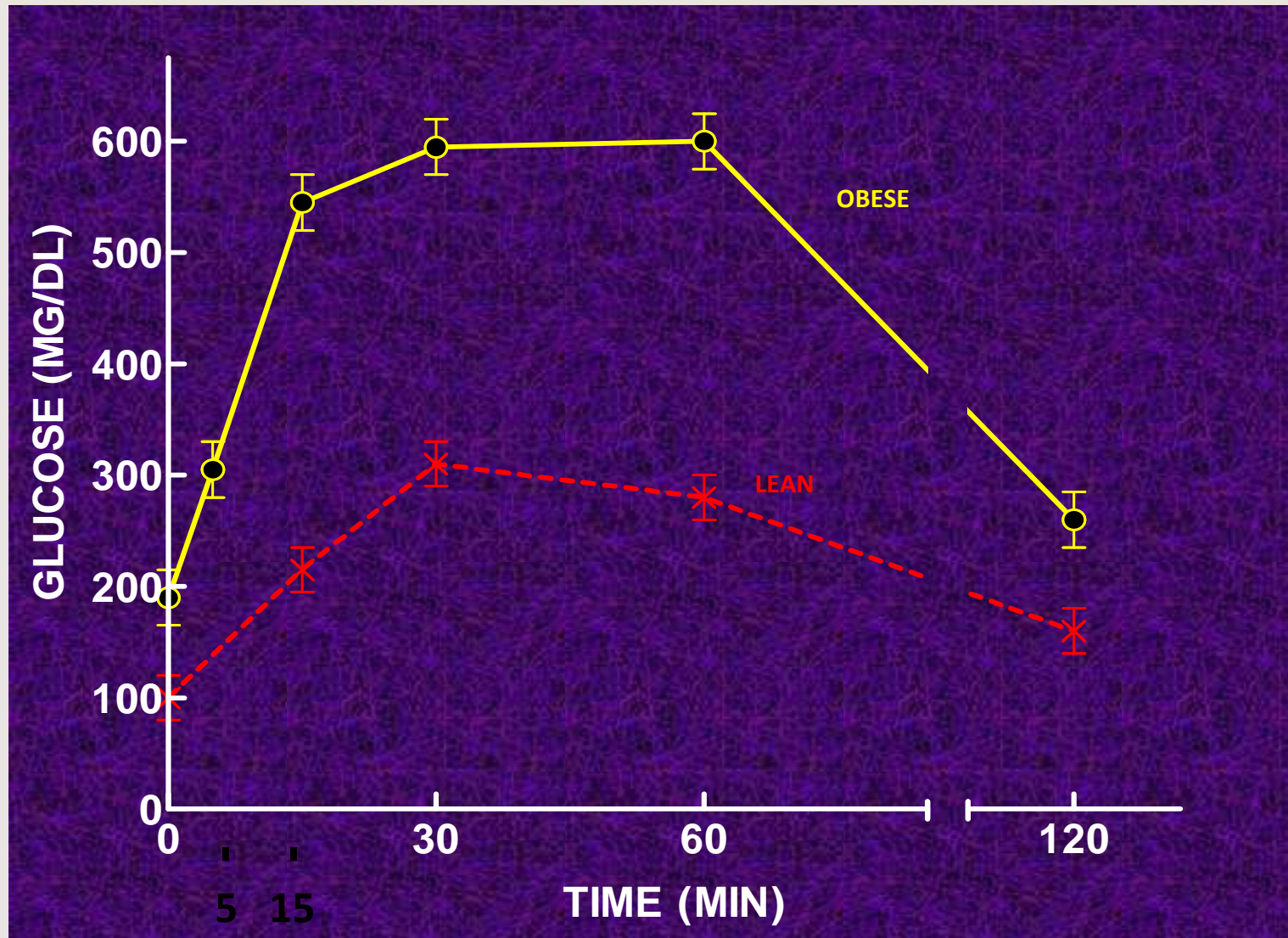


Background

- The adrenal medulla has been thought to mainly function as a safety system to prevent hypoglycemia. It has not been thought to have a role in the relationship of obesity to the development of diabetes.
- However, increased glycemic responses to epinephrine (EPI) have been found in obese animals predisposed to diabetes.

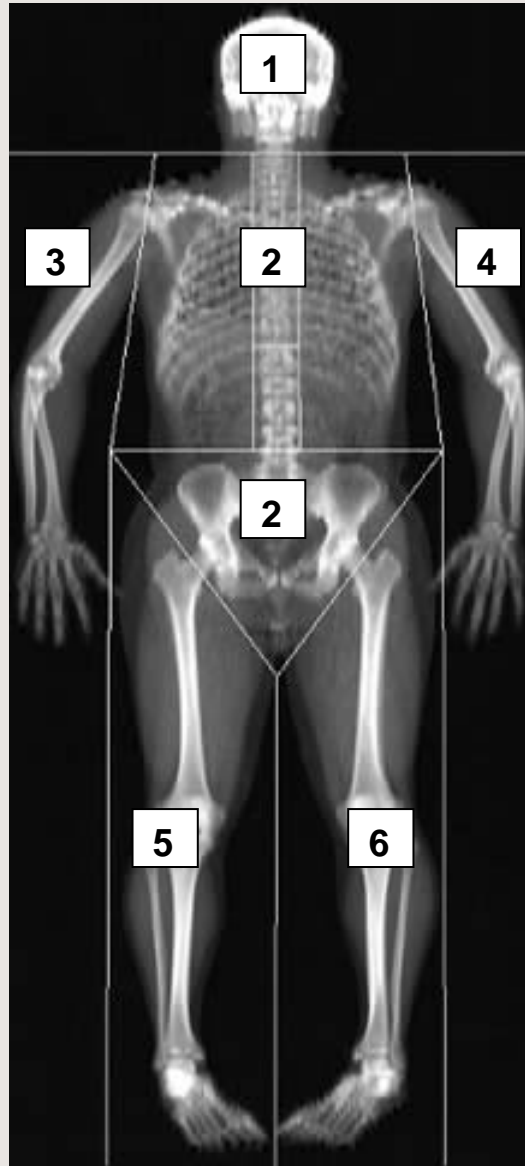
C57BL6J *Ob/Ob* Mouse





Do Central Adiposity and Epinephrine Interact to Determine Glucose Levels?

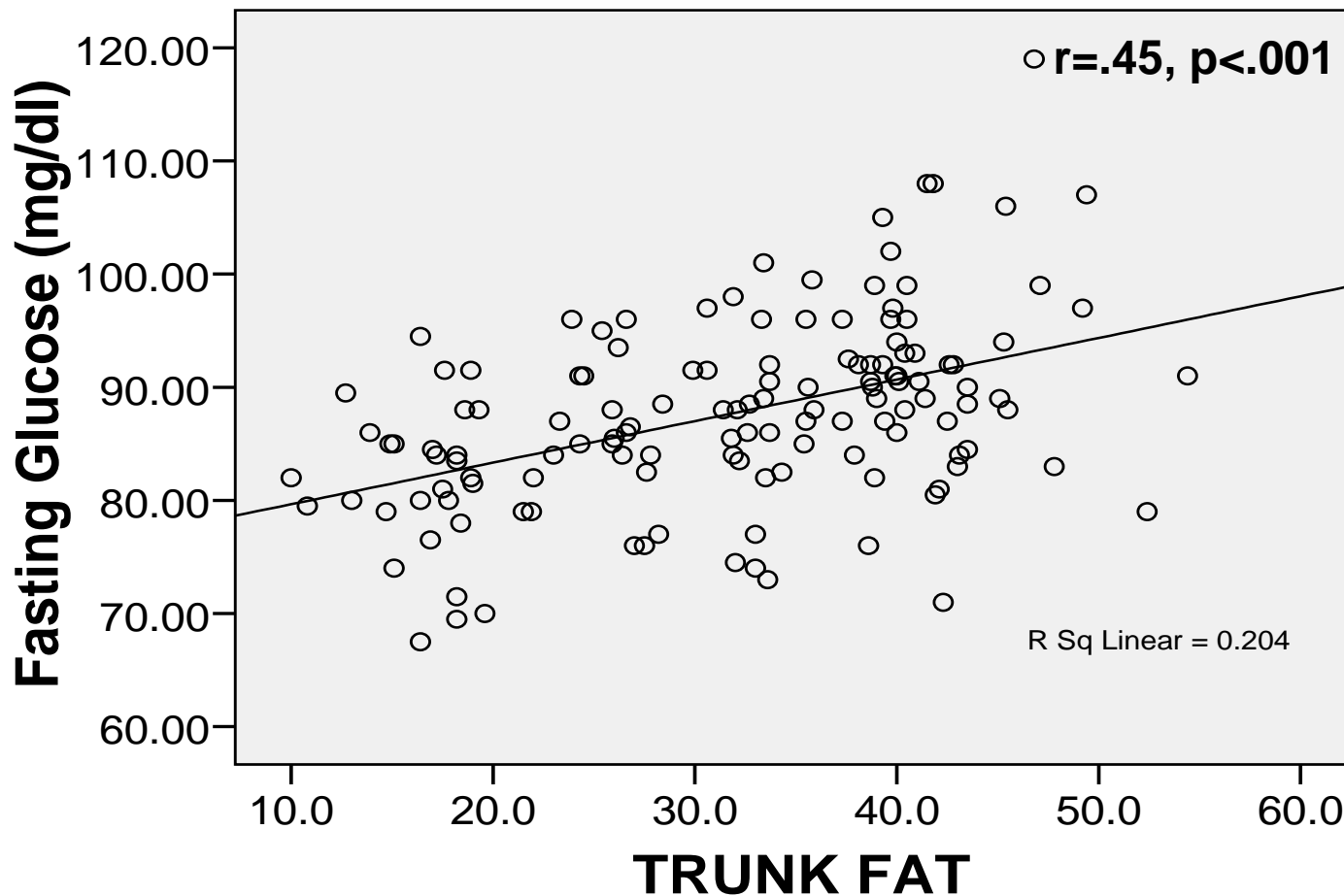
DEXA scan



Standard regions of a DEXA scan:

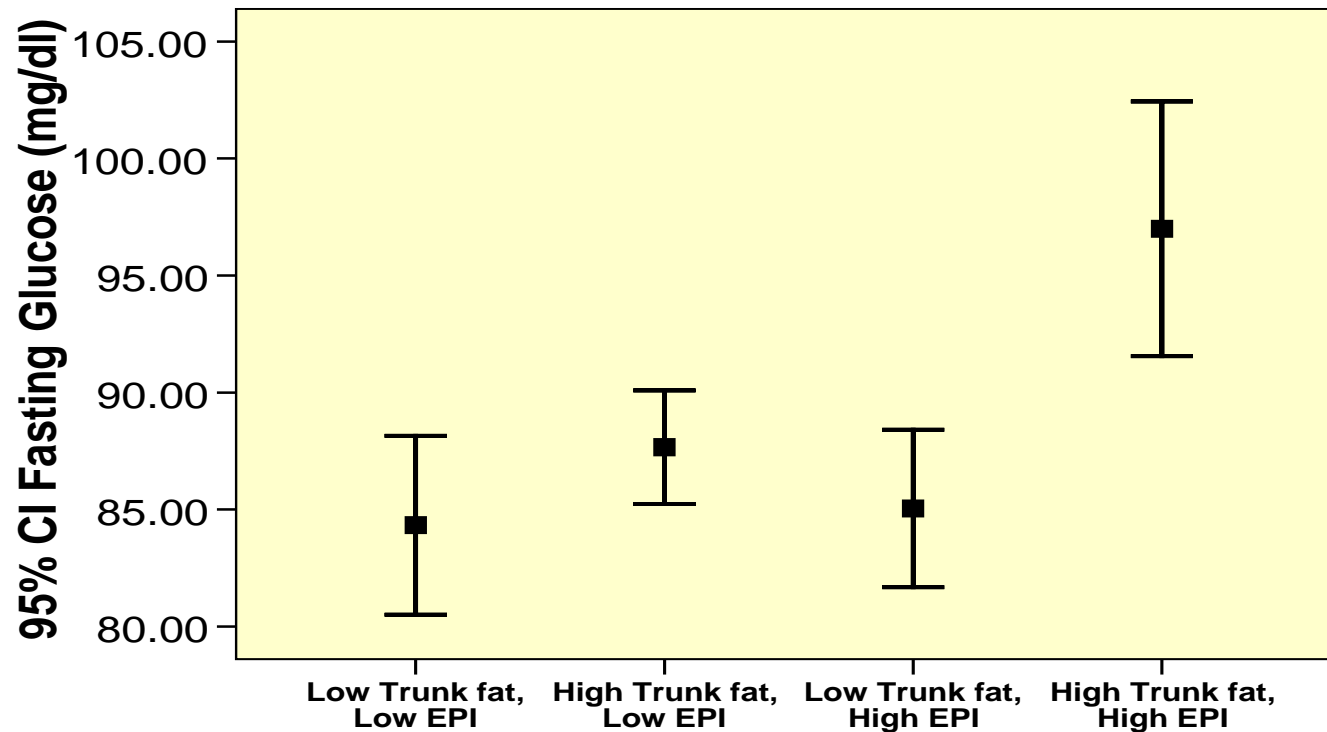
1. head
2. trunk
3. right arm
4. left arm
5. right leg
6. left leg

Association between % Trunk Fat and Fasting Glucose



Fasting Glucose Levels by Trunk Fat Group (Low/High) and Epinephrine Group (Low/High)

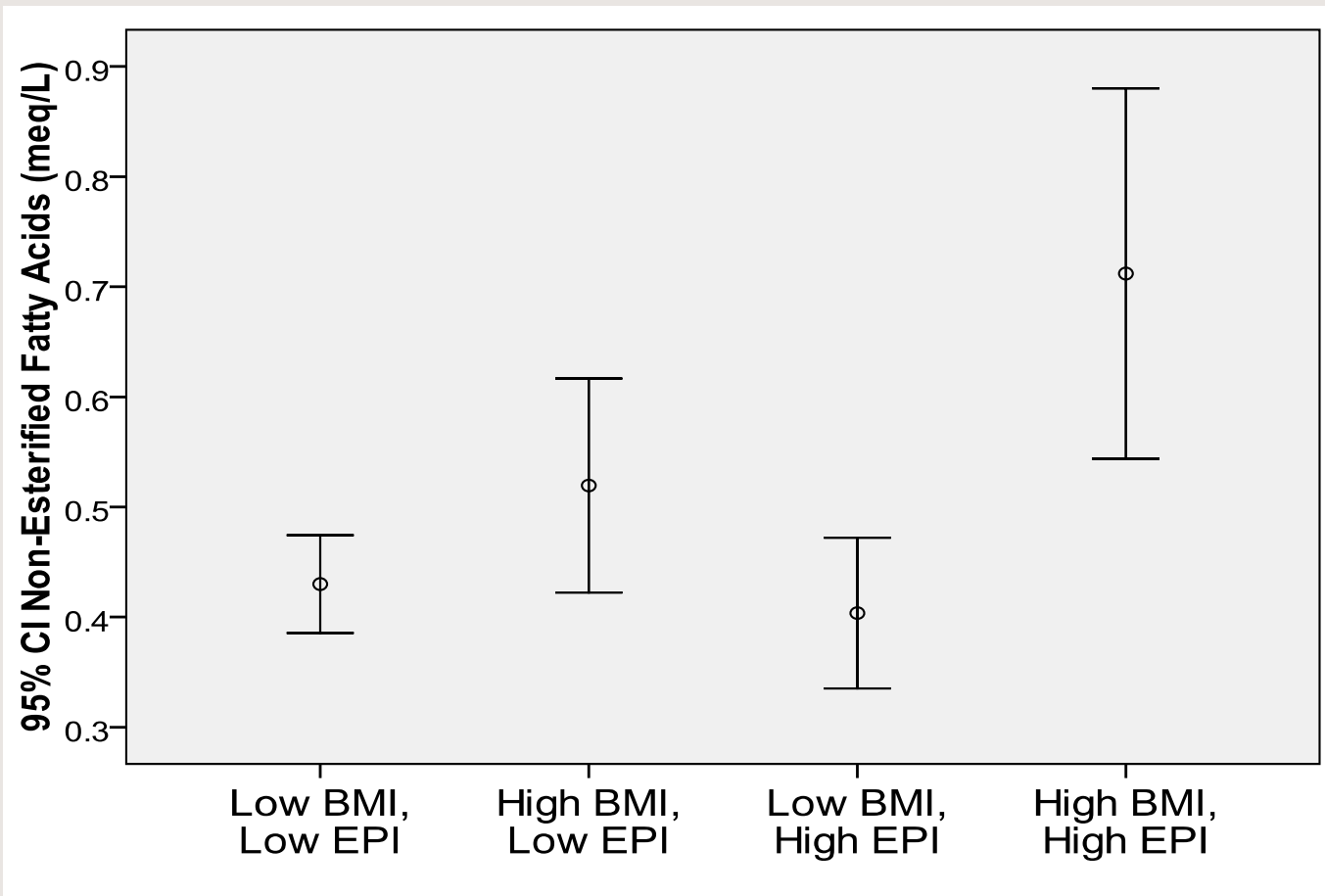
P<.003



Surwit et al. 2010, *Obesity*

NEFA levels by EPI and Obesity Group

$P < .01$



Conclusion

- Epinephrine interacts with central adiposity in determining fasting NEFA and fasting glucose.
- This is consistent with the notion that obesity, by itself does not lead to increased fasting NEFA and impaired glucose metabolism. Increased EPI may be required as well.

Does Adrenal Medullary Function Vary with Central Adiposity ?

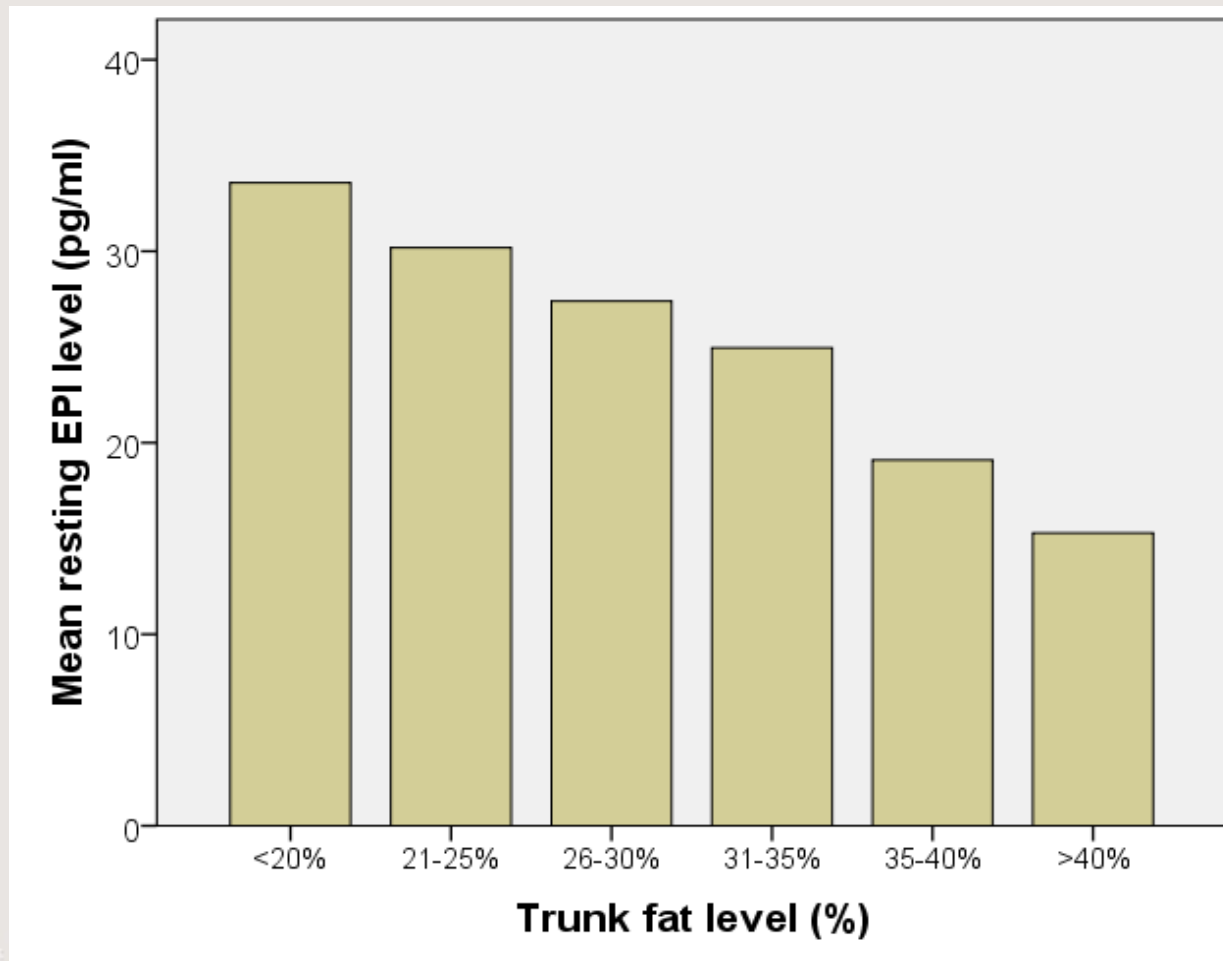
- Studies have found both positive and negative associations between SNS activity and obesity.
- The relationship of obesity to adrenal medullary function has not been directly studied.

Method

We examined 445 healthy non-diabetic individuals (159 white women, 156 white men, 75 AA women and 55 AA men) who had completed a DEXA scan as well as collection of both plasma and urine epinephrine measurements.

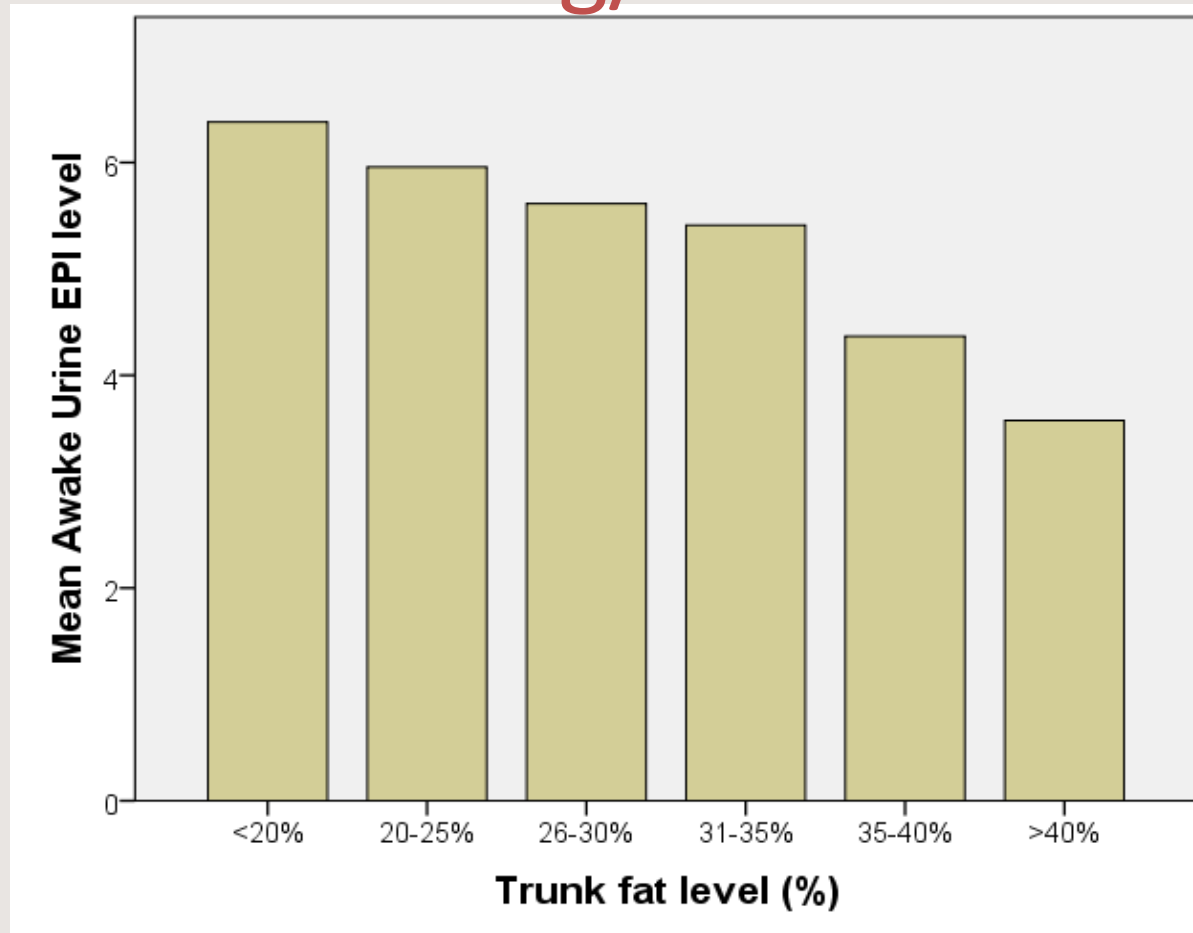
Plasma Epinephrine Levels In Men and Women With Fasting Glucose <95 mg/dl

Rho=-.35,
P<.001



Urinary Epinephrine Levels in Men and Women With Fasting Glucose < 95 mg/dl

Rho=-.20,
P<.01



Relationship of Urinary Epinephrine to BMI in Chinese Non-Diabetic Subjects

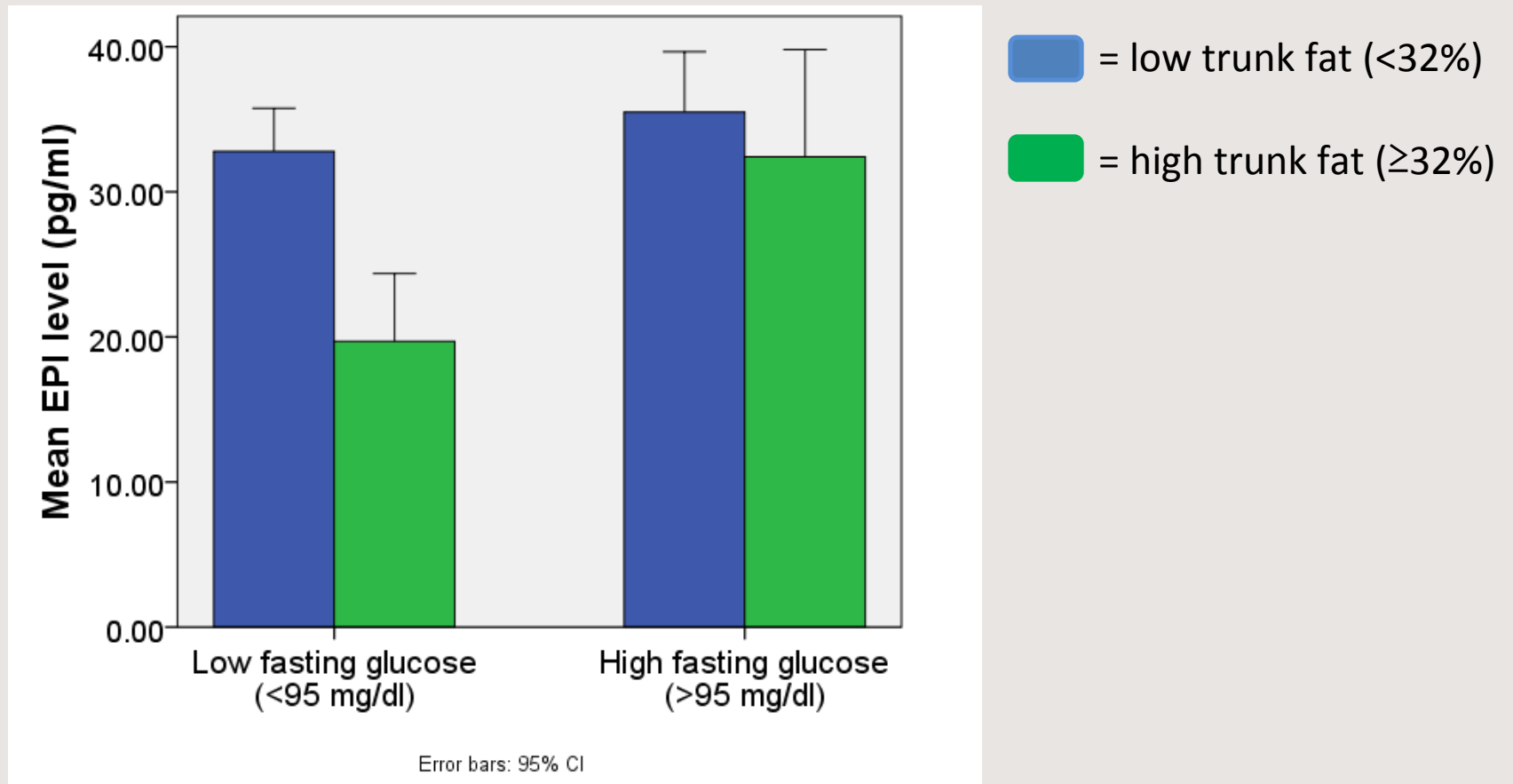
| BMI | 16-20 | 21-23 | 24-25 | 26-28 | 28-38 | N=577 |
|---------------------|-------|-------|-------|-------|-------|--------|
| Urinary EPI (nm/dl) | 72 | 67 | 53 | 62 | 41 | P<.001 |

Lee et al, 2001, *Metabolism*

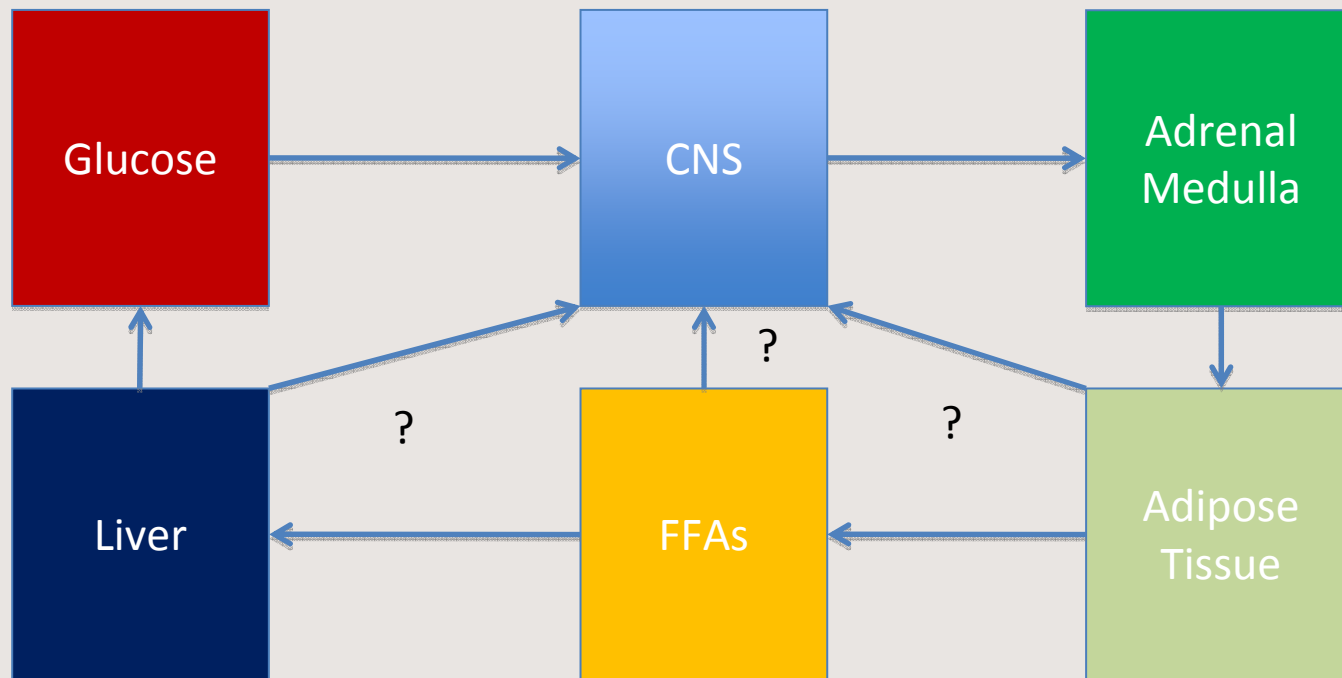
Several Smaller Studies Show the Same Phenomenon in Other Populations

- Caucasian men. Loebig et al, 2010, *PloS One*.
- Adolescent Boys. Jabbour et al, 2011, *Medicine and Science in Sports & Exercise*.

EPI Does Not Decrease With Increasing Trunk fat In Individuals with Fasting Glucose > 95 mg/dl



Does Adipose Tissue Mass Feed Back To Limit Adrenal Medullary Function to Maintain Normal Fasting Glucose?



Summary

- Adrenal medullary function interacts with central adiposity to determine fasting NEFA and fasting glucose.
- Adrenal medullary function decreases with increasing adiposity in individuals with normal fasting glucose, but not in individuals with impaired fasting glucose.
- Abnormal glucose metabolism could be due, in part, to a failure of the adrenal medulla to adapt to increasing adiposity.
- The mechanisms involved in this failure of adaptation are not known.

Collaborators

- Anastasia Georgiades
- James Lane
- Mark Feinglos
- Beverly Brummett
- Sharon Minda
- Rhonda Merwin
- Redford Williams
- Ilene Siegler
- John Barefoot
- Cynthia Kuhn
- Stephen Boyle

Distribution of EPI Levels Are Similar in Individuals with High and Low Adiposity

