

Ethnic implications of pancreatic steatosis

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Introduction Ethnic minorities – African American and Latinos – are disproportionately affected by obesity and type 2 diabetes for reasons not completely understood. Basic research provides vast evidence that fat deposition in beta cells is a mechanism responsible for beta cell dysfunction^{1,2}. We do not have yet noninvasive technology for measuring fat levels specifically in human beta cells but we have localized proton magnetic resonance spectroscopy (pancreatic MRS) allowing precise, reproducible, and quantitative measurements of fat within human pancreas (pancreatic steatosis)³. We tested hypothesis that pancreatic steatosis constitute a major mechanism leading to beta cell dysfunction in persons who have not adequate adipose fat storage pool. We further hypothesized a major disparity in fat storage pattern in African Americans (AA) compared to White (W) and Latinos (H).

Subjects We studied the total of 97 individuals of both genders: 21 African Americans, 40 Latinos, and 36 White with the average BMI (kg/m^2): 38 \pm 6 in African Americans, 33 \pm 1 in Whites, and 30 \pm 1 in Latinos.

Experiment Our experimental approach is illustrated in Figure 1. We could not measure every single step in this pathway but we used full promise of pancreatic MRS to measure pancreatic steatosis, abdominal MRI to measure adipose fat, and frequently sampled IV glucose tolerance test (FSIVGTT) to measure insulin secretion.

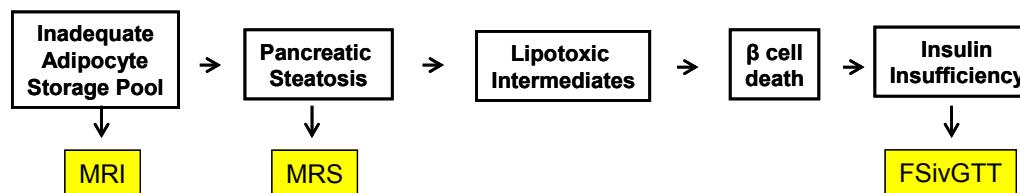


Figure 1
Experimental approach

MRS experimental parameters High-resolution images through the abdomen were collected to locate the pancreas. Subjects were in supine position holding their breath at exhalation. On three perpendicular images of the pancreas, a testing volume of 2cc ($10 \times 10 \times 20 \text{ mm}^3$) was selected within the body of the pancreas. Data were collected as patients breathed freely with signal triggering at exhalation, using a cardiac synergy coil and PRESS sequence for localization and data collection with $T_R=4\text{s}$, $T_e=40\text{ms}$, and $Na=32$.

Results and Discussion Figure 2 summarizes our results in three ethnic groups. In AA the highest ratios of subcutaneous to visceral adipose fat (S/V) was associated with the lowest pancreatic fat levels and the lowest insulin secretion (AIR_g). The opposite pattern, mainly low S/V, high pancreatic fat levels and low insulin secretion was present in W and H. The diverse patterns of adipose and pancreatic fat storage contributes to ethnic variations in pathogenesis of insulin secretion and seem to support hypothesis that in persons with not adequate adipose fat storage pool pancreatic steatosis leads to beta cell dysfunction.

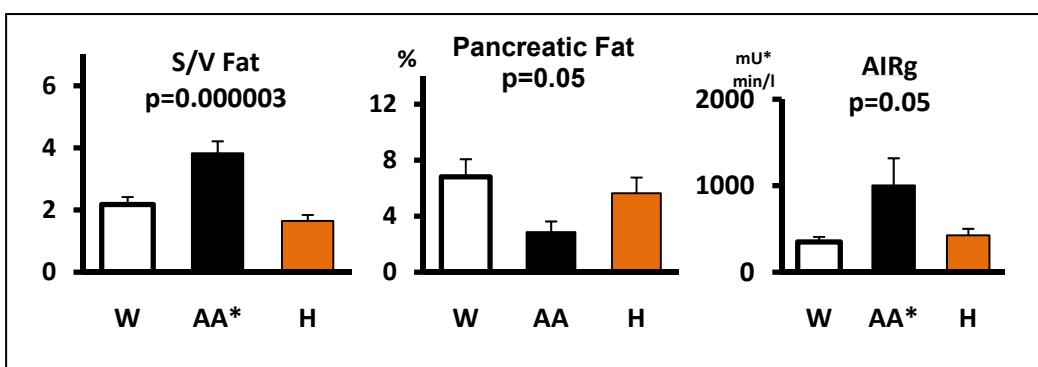


Figure 2. W-Whites. A-African Americans, H-Latinos; S/V- ratio of subcutaneous to visceral adipose fat, AIR_g- insulin secretion.

References: 1)Lee Y et al., *Proc Natl Acad Sci.* 1994; 91:10878; 2)Lingvay I, Szczepaniak et al *Int J Obesity* 2010;34:396; 3)Lingvay I, Szczepaniak et al, *J Clin Endo Metab.* 2009; 4070
Support: NIH RO1DK081524, NIH K23RR024470