胰岛素在将过剩的能量转变成胰岛素抵抗和 T2DM 中起一个关键作用

曹文洪
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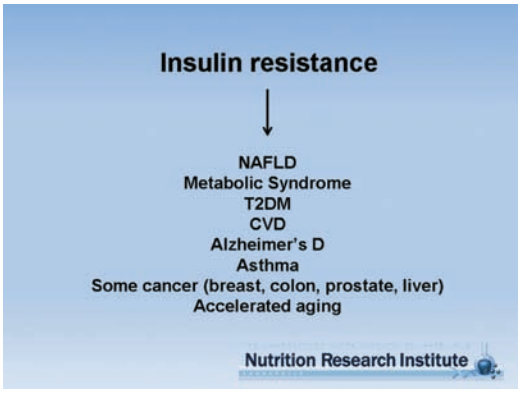

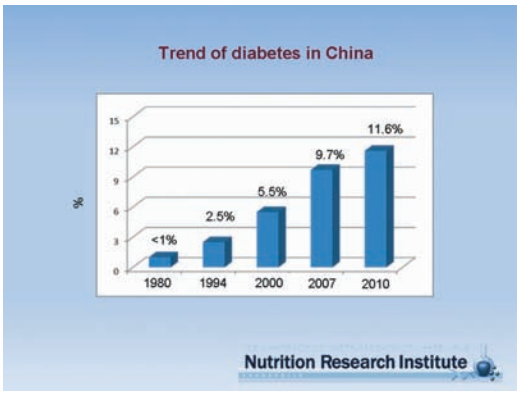

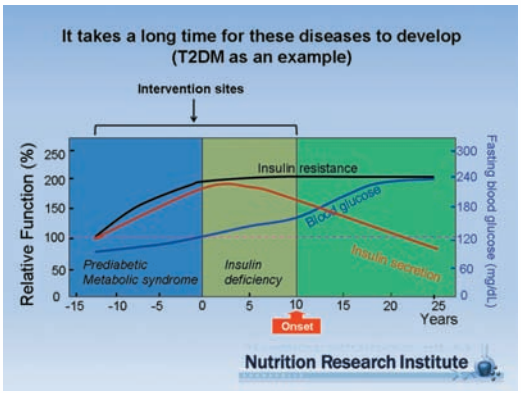

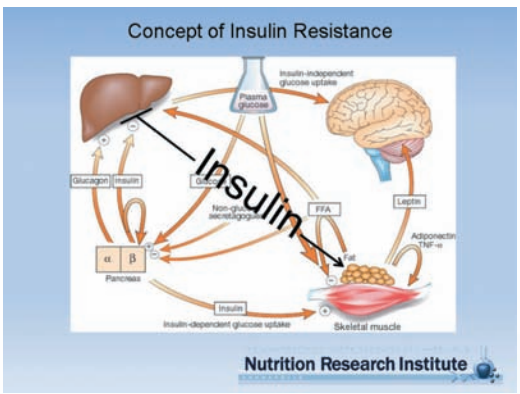

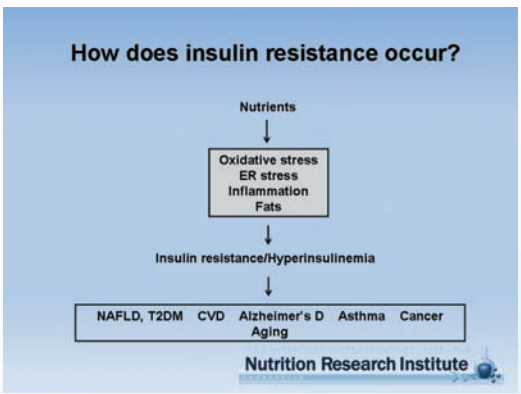

Macronutrients:

Glucose/carb

Fat

Amino acids/proteins

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Is carb/glucose necessary for insulin resistance?

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Does glucose itself cause insulin resistance?

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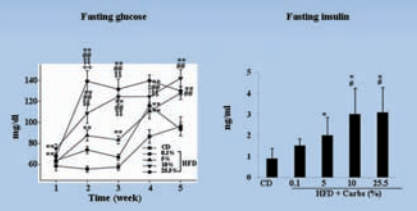

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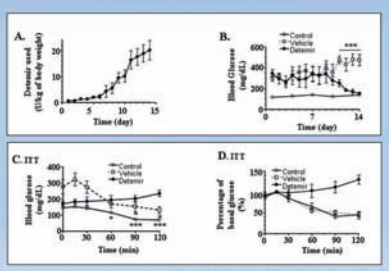
Hyperglycemia does not cause insulin resistance in the absence of insulin in NOD mice with T1DM



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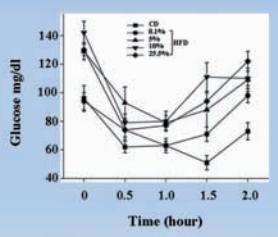
Insulin tolerance test



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No!

Glucose itself does not cause insulin resistance!

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Dietary carb is not necessary for insulin resistance!

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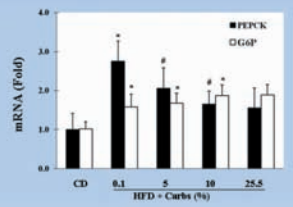
Hepatic gluconeogenesis in increased most in the absence of dietary carb



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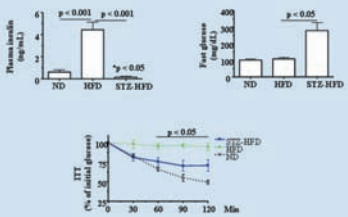
Dietary fat does not cause insulin resistance in the absence of insulin



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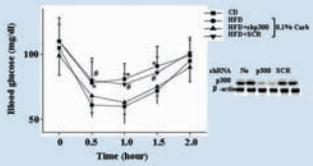
Inhibition of hepatic gluconeogenesis prevents the HFD-induced insulin resistance



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Fat alone is not sufficient to cause insulin resistance!

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Although dietary carb is not necessary, but glucose is essential for the development of insulin resistance

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Is fat necessary for development of insulin resistance!

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Is fat sufficient to cause insulin resistance?

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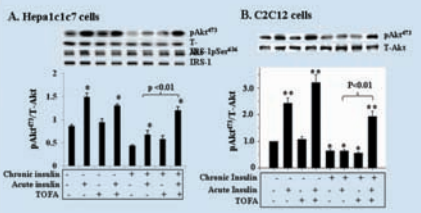
Fat is necessary for the development of insulin resistance



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Do proteins/amino acids themselves cause insulin resistance?

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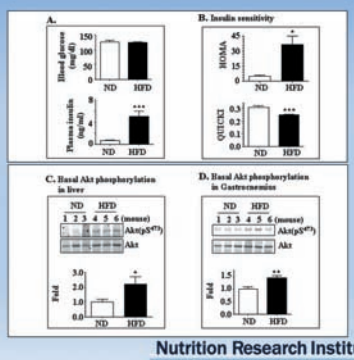

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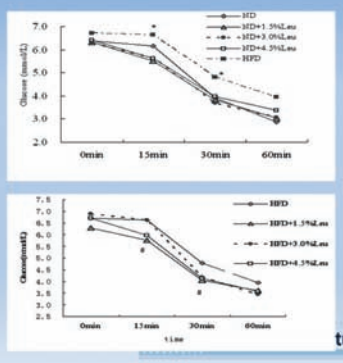

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The basal level of insulin signaling is increased in the presence of insulin resistance

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Are proteins/amino acids necessary for development of insulin resistance?

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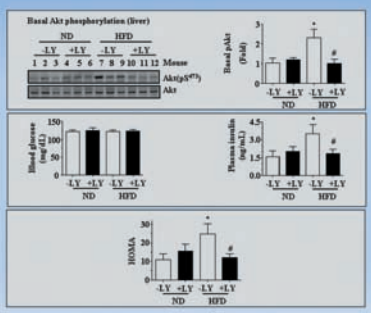

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How insulin mediates the diet-induced insulin resistance?

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Increased basal action of insulin signaling is responsible for the HFD-induced insulin resistance

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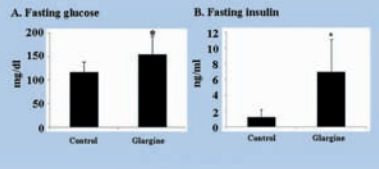
Can chronic exposure to excess amount of insulin cause T2DM?



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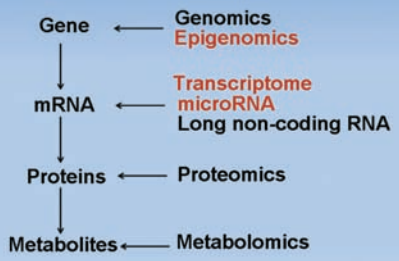

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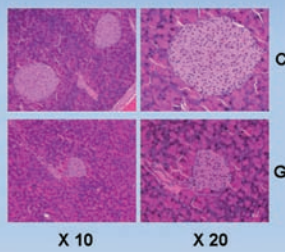

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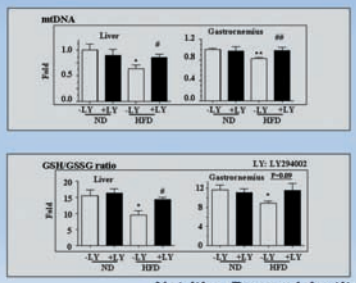
Insulin and mitochondrial biogenesis



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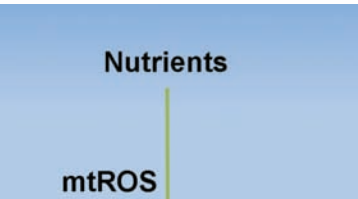

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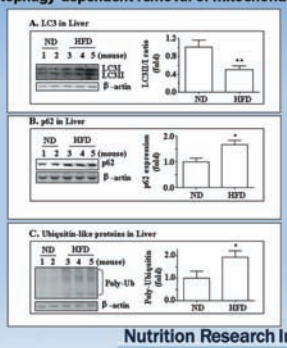
Autophagy-dependent removal of mitochondria



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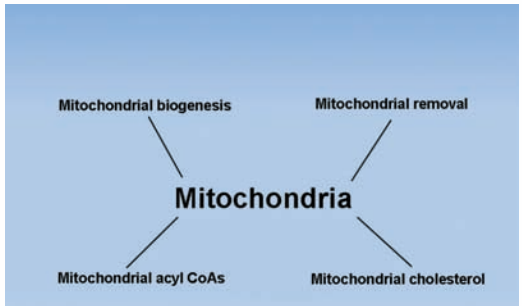

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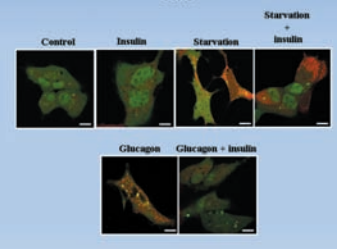
Prolonged exposure to insulin suppresses mitophagy in cultured cells



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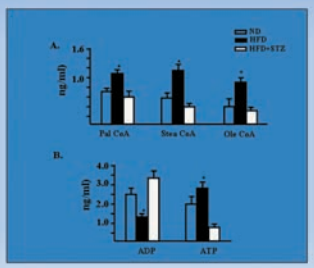
Insulin and mitochondrial content of LC-acyl CoAs (liver)



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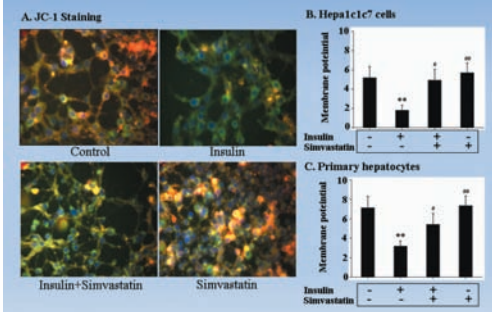
A. JC-1 Staining / B. Hepa1c1c7 cells / C. Primary hepatocytes



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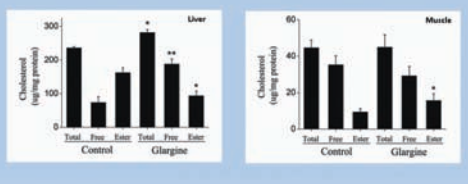
Insulin and mitochondrial content of cholesterol (tissue)



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Mitochondrial biogenesis / Mitochondrial removal / Mitochondria / Mitochondrial acyl CoAs / Mitochondrial cholesterol

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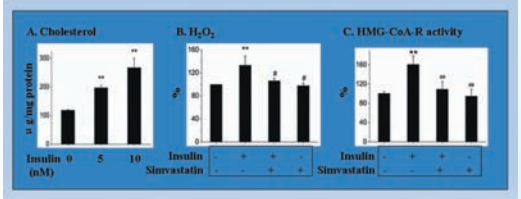
Insulin and mitochondrial content of cholesterol (hepatocytes)



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Role of micronutrients

Choline
Iron
Iodine

Human studies

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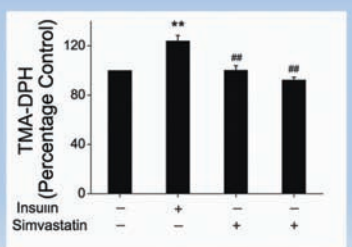
Increased mitochondrial cholesterol decreases mitochondrial membrane fluidity



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Lunch

Chicken (25%), potato(25%), bread(20%), Brownie (20%), salad(5%), fat (<5%)

Dinner

Noodle (50%), bread(25%), cookies (20), meat (5%)

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American Heart Association

American Diabetes Association

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GSK

Atherogenics

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