Diabetes Prevention in Ageing

*Do diet and exercise work?*

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Ms JW comes with questions

- “I am 55 years old, both of my parents developed diabetes in their early 60s. Am I destined to get diabetes?”
- “What can I do to prevent diabetes? Any preventive strategy I employ would need to be very safe”
More questions

• I am overweight and slowly gaining weight. What can I do about that?
• Which diet should I follow? I should avoid carbs, right??????
• My sister is not overweight, she cannot be at risk of diabetes, right?????????
Type 2 diabetes

• What is it?
• Why do we get it?
Healthy person - glucose control

- Glucose absorption from food leads to an increase in blood sugar.
- The pancreas secretes insulin to help regulate blood sugar levels.
- Insulin helps muscles and other tissues absorb glucose from the blood.

SKELETAL MUSCLE
BLOOD SUGAR

PANCREAS
INSULIN
In type 2 diabetes, however.....
What causes this: genetics + environment

- too much food
- not enough exercise
- one set of genes inherited from parents make you hungry
- overweight: need extra insulin as body becomes 'resistant'
- another set of genes causes greater insulin resistance
- other set of genes inherited from parents make islet cells in pancreas wear out early; cannot make enough insulin
- body needs more insulin but cannot produce it
- type 2 diabetes
Is my chance of getting diabetes higher if I am older?

Middle Age:
That time when you finally get your head together—then your BODY STARTS FALLING APART!
Yes, ageing is a huge risk factor for diabetes
Prevalence of Diabesity by Age

BMI (kg/m²)

Age (years)

20 - 54  //  60 - 74
Obesity epidemic
“Don’t step on it, it makes you cry......”
Obesity epidemic
1985 rates of obesity reports

[Image of a map showing obesity rates across the United States in 1985, with color codes indicating different percentage ranges.]
2000
2001

[Map of the United States with color-coded data for the year 2001. The map includes a legend indicating different color categories for percentage ranges.]
2014

Percent of obese adults (Body Mass Index of 30+)

- 0 - 9.9%
- 10 - 14.9%
- 15 - 19.9%
- 20 - 24.9%
- 25 - 29.9%
- 30 - 34.9%
- 35%+

Map showing the percent of obese adults across different states in the USA.
Diabetes prevention

• To prevent diabetes, we need to talk about
  – prevention of obesity
  – prevention of ageing changes that cause diabetes

• Which is easier?
So how do we effect weight loss in order to prevent diabetes

- Diet
- Exercise
- Drugs
- Surgery
Which diet

- What works?
- What works long-term?
- Any particular components of the diet that work?
Which diet

• Low calorie
• Low fat
• Low carbohydrate
  – Atkins or South beach
• Vegetarian or vegan
• Mediterranean
• Paleolithic diet
Diabetes Prevention Program (DPP)
A Randomized Clinical Trial at 27 sites to Prevent Type 2 Diabetes in Persons at High Risk
Diabetes Prevention Program Intervention

• Healthy, low calorie, low fat diet
• Moderately intense exercise >150 mins / week
• Goal 7% weight loss
Effect of lifestyle on body weight
Effect of lifestyle on risk of diabetes
OK so....

• Lifestyle modification through low calorie low fat diet + exercise program $\rightarrow$ weight loss
  ➢ Prevents diabetes

• What about other diets?

• Should we not be lowering our carbs so we do not have to make as much insulin?
Mediterranean diet

• What is Mediterranean diet?
• Certainly not low fat
• Results from observational studies
Predimed study

• Prospective trial from Spain, randomized to low fat diet OR Mediterranean diet + 1L olive oil per week or 30 g/ day mixed nuts
• Not told to exercise
• Not told to lose weight
• 418 people without diabetes were followed for 4 years
Mediterranean diet +
Predimed Study: ~50% reduction

Diabetes Care 2011
So

• Evidence would support lifestyle modification low fat diet, calorie restriction and exercise $\rightarrow$ weight loss $\rightarrow$ lower the risk of diabetes

• Evidence would also support a Mediterranean diet emphasizing addition of olive oil or nuts to reduce diabetes risk even independent of weight loss
But...

• What about the lean folks who do not gain weight who DO go on to develop type 2 diabetes

• So called “age related diabetes”
  – ?what causes that
  – ?how to prevent ageing
Changes due to ageing

- Diabetes is caused by the pancreas being unable to make/release enough insulin.
- The less muscle mass you have, and the more fat and fat inside where the muscle should be, the more insulin resistant you are.
- The more “insulin resistant” you are, the more insulin you need to make.
Effect of ageing on body muscle

(a) 60-yr old woman  80-yr old woman

(b) Total number of fibres (x1000) vs. Age (years)
Not all is inevitable...
Change in lean body mass

• Between age 20 and age 80 lean body mass declines 20% - 25%
• More prominent in the lower limb
• Muscles are increasingly infiltrated by fat during ageing
• Both a decrease in size of muscle fibers and a decrease in number (disuse = decrease size)
• Training reverses the change in size but not number
How much exercise?

Growing Old Is Not For Sissies

Growing Old Is Not For Sissies
Summary
To prevent ageing-related diabetes

• Weight loss from low-fat, reduced calorie diet + 150 mins exercise per week
  – OR
• Mediterranean diet
  – AND
• Muscle bulking exercise
Thanks!!