Eating the right foods to prevent disease
How your diet impacts DNA and gene functioning, and the link to long-term health outcomes

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Faculty of Land and Food Systems
Today's Presentation

• Chronic disease and modifiable risk factors
• Epigenetic alterations as a contributor to chronic disease
• Impact of diet on the epigenome
• Diet as a factor shaping our health and health of next generations
Chronic disease in Canada

- Cancer: 29.6%
- Heart disease: 19.2%
- Other: 26.7%
- Diabetes: 2.6%
- Chronic lower respiratory diseases: 4.6%
- Accidents: 4.7%
- Cerebrovascular diseases: 5.1%
- Liver disease: 1.3%
- Suicide: 1.5%
- Influenza and pneumonia: 2.3%
- Alzheimer's disease: 2.4%

© Canadian Cancer Society
Chronic disease in Canada

Direct health care costs: $70 billion a year

+ 

Indirect cost: $55 billion a year

from loss of productivity and foregone income
Chronic disease risk factors

<table>
<thead>
<tr>
<th>UNDERLYING SOCIOECONOMIC, CULTURAL, POLITICAL AND ENVIRONMENTAL DETERMINANTS</th>
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Chronic disease modifiable risk factors

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Altered epigenetic patterns in chronic disease
Twins
Lamarck got it right
Epigenetics & gene functioning

Condensed chromatin → Gene silenced

Open chromatin → Gene expressed
Dynamics of epigenetic modifications

Diet

Viral infections
Social-Economic Status
Maternal care
Chemicals

Ac Ac Ac Ac
Ac Ac
Ac Ac Ac Ac
Ac Ac
Ac Ac
Ac Ac
Ac Ac
Nutrition & the epigenome

SAM, the methyl donor

- Choline
- Betaine
- B vitamins
- Folic acid
- Methionine
- SAM
SAM reshapes the epigenome and protects from bone metastasis.
Bioactive compounds

Disease prevention

- Anthocyanins
- Curcumin (turmeric)
- Epigallocatechin Gallate
- Genistein
- Lycopene
- Organosulfides
- Pterostilbene
- Quercetin
- Resveratrol
- Sulforaphane
- Vitamin A (ATRA)
- Vitamin D (D3: Calcitriol)
Bioactive compounds

Disease prevention

- Resveratrol
- Pterostilbene
Grapes and blueberries: Disease Prevention through epigenetics
Grapes and blueberries: DNA-interacting proteins responsible for epigenetic activity
Healthy cells respond to foods through changes in the epigenetic patterns.
Diet and health of future generations

Diet

Environment

Lifestyle

Epigenetics
Gestational diabetes

- Defective insulin secretion
- Hyperglycemia
- Insulin resistance
- Accelerated growth and adiposity
- Increased insulin secretion

Predisposition of the offspring to diabetes

Epigenetic silencing of Leptin

Diabetes type 2 in the offspring
Leptin as a guardian of body weight.
Gestational diabetes and epigenetics of leptin gene

Inappropriately low leptin secretion for a given fat mass

Decrease in expression through hypermethylation
Project Ice Storm
Quebec 1998
Project Ice Storm
Quebec 1998
Animal models to track epigenetic effects
Woah, it's the end already. Questions? Comments?

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