

# Role of Nutrition in the management of Type I, Type II Diabetes and Obesity in children

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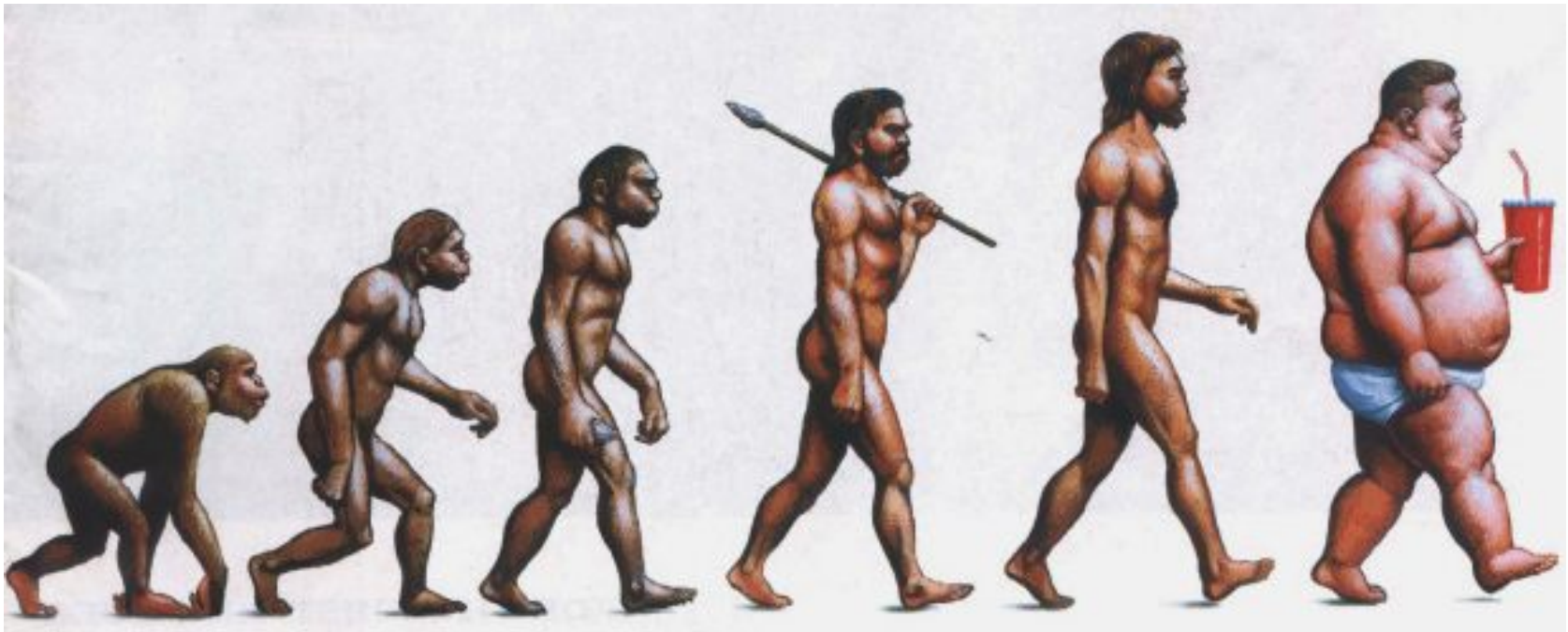
Pediatric Endocrinologist

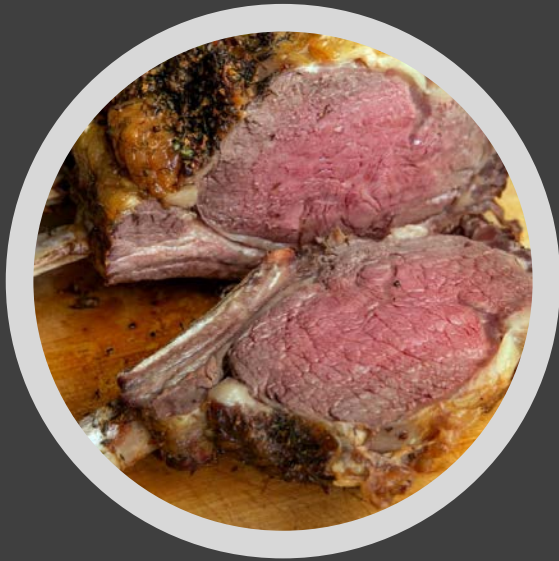
Coastal Children's Services

November 14<sup>th</sup>, 2019

# Evolution

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We are what we eat

# Paradox of modern society



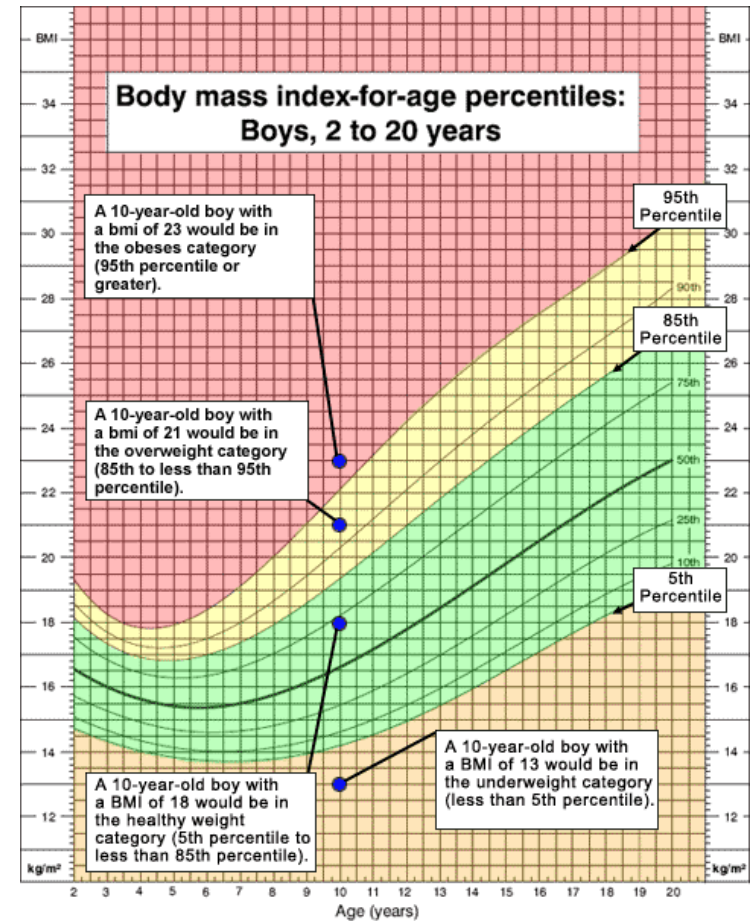
- Historically: poor people-hungry, starved people  
Rich people – fat people
- Modern society: poor people – fat people,  
wealthier people – leaner people





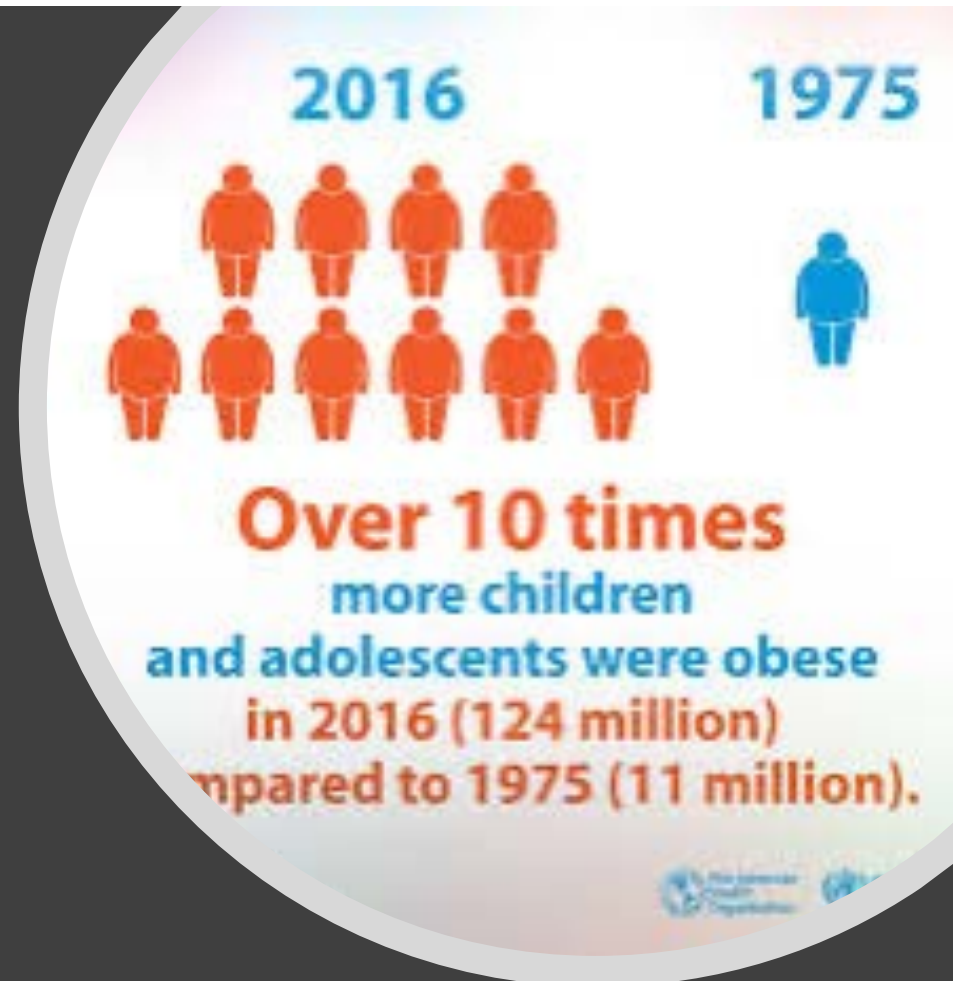
# Overweight, Obesity - definition

- BMI – 85-95% - overweight
- BMI >95% - obese
- There is no such a thing as healthy obese person



# WHO talks about obesity

- Worldwide obesity has nearly tripled since 1975.
- In 2016, more than 1.9 billion adults, 18 years and older, were overweight. Of these over 650 million were obese.
- 39% of adults aged 18 years and over were overweight in 2016, and 13% were obese.
- Most of the world's population live in countries where overweight and obesity kills more people than underweight.
- 41 million children under the age of 5 were overweight or obese in 2016.
- Over 124 million children and adolescents aged 5-19 were overweight or obese in 2016.
- Obesity is preventable.



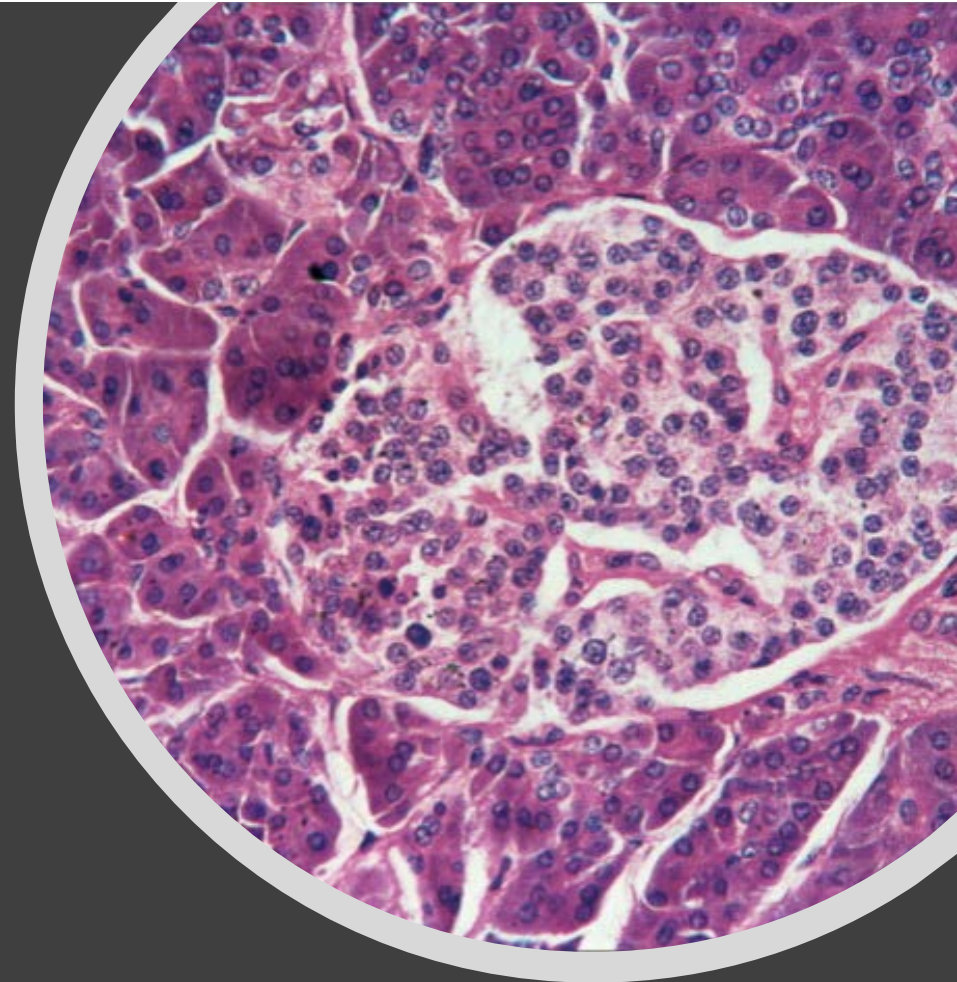


## Comorbidities of obesity

- Diabetes
- Cardiovascular disease
- Respiratory disease
- PCOS, early puberty, fertility issues
- Cancer
- Depression, anxiety, poor body image
- Orthopedic issues
- Gastrointestinal disease
- Vitamin deficiencies

# Diabetes Mellitus : Definition

- Diabetes mellitus is a syndrome characterized by disturbed metabolism of carbohydrate, protein, and fat resulting from an absolute or relative deficiency of insulin secretion.
- The **hallmark** of the fully developed clinical presentation of this syndrome is fasting and post-prandial hyperglycemia with varying degrees of insulin resistance.



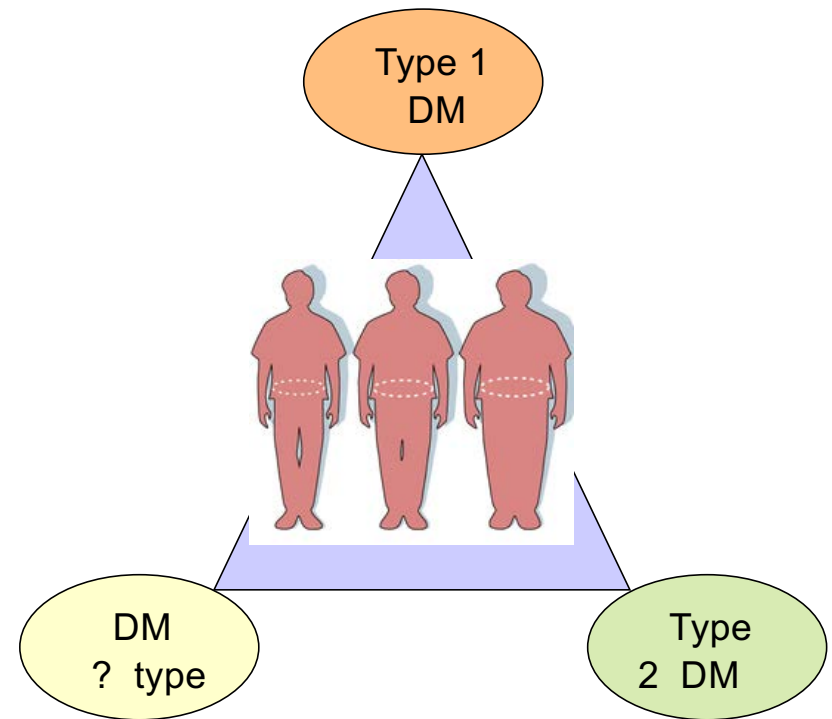


# Types of Diabetes

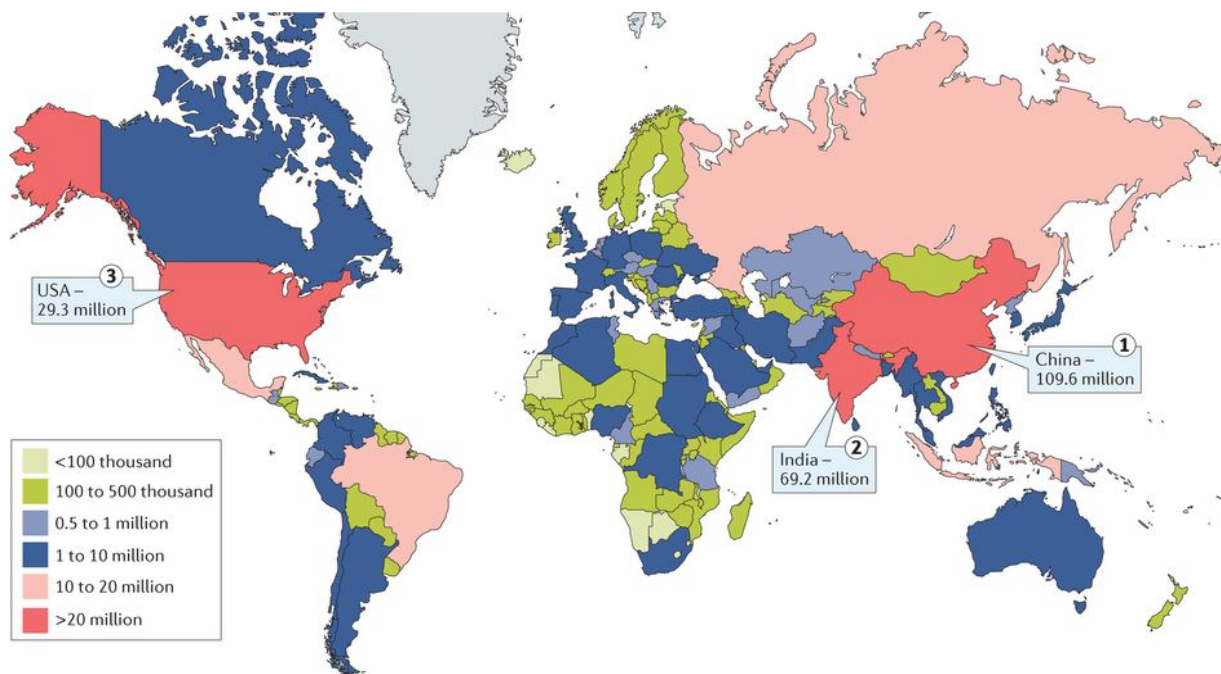
- I. Type 1 diabetes
  - ( $\beta$ -cell destruction, usually leading to absolute insulin deficiency)
  - **Immune-mediated diabetes**
  - **characterized by severe insulinopenia and dependence on exogenous insulin to prevent ketosis and to preserve life**
  - **Genetics multifactorial**
- II. Type 2 diabetes
  - (predominantly insulin resistance with relative insulin deficiency)
  - **Related to obesity**
  - **Stronger familial predisposition**
  - **Genetics multifactorial**

# COMPARISON OF T1DM and T2DM

	<b>T1DM</b>	<b>T2DM</b>
<b>Age at Onset</b>	<b>75% &lt;18 y/o</b>	<b>&gt;40 y/o; some pediatric</b>
<b>BMI</b>	<b>NI, decr.</b>	<b>Incr.</b>
<b>Hyperglycemia</b>	<b>severe</b>	<b>mild</b>
<b>Ketosis</b>	<b>+/-</b>	<b>uncommon</b>
<b>FHx</b>	<b>usually (-)</b>	<b>positive w/ relatives onset &gt;40 y/o</b>



# Statistics of diabetes worldwide



Nature Reviews | Endocrinology

1 in 11 adults have diabetes (415 million)



## CURRENT PROJECTION

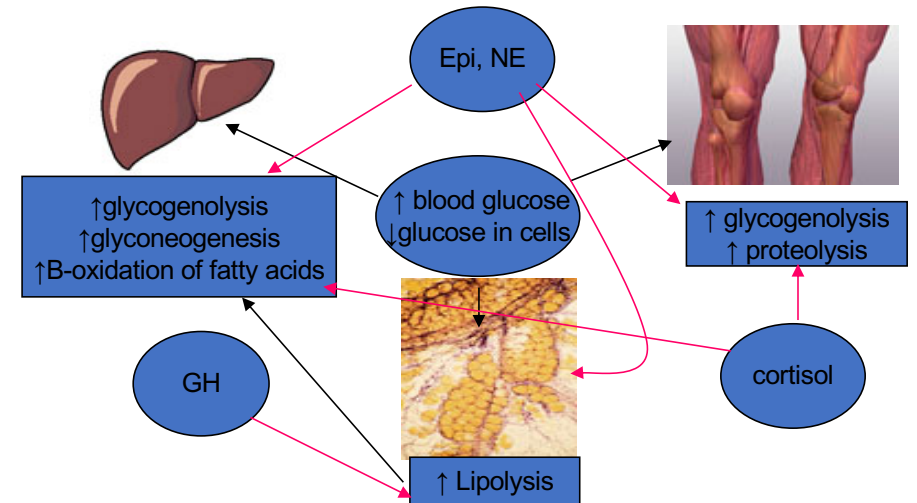
**2045**

GLOBAL DIABETES PREVALENCE



# Hormones involved in glucose homeostasis

Hormone	Glycogenolysis	Gluconeogenesis	Lipolysis	Ketogenesis
Insulin	Inhibits	Inhibits	Inhibits	Inhibits
Glucagon	Stimulates			Stimulates
Cortisol		Stimulates		
GH		Stimulates	Stimulates	
Epinephrine	Stimulates	Stimulates	Stimulates	Stimulates



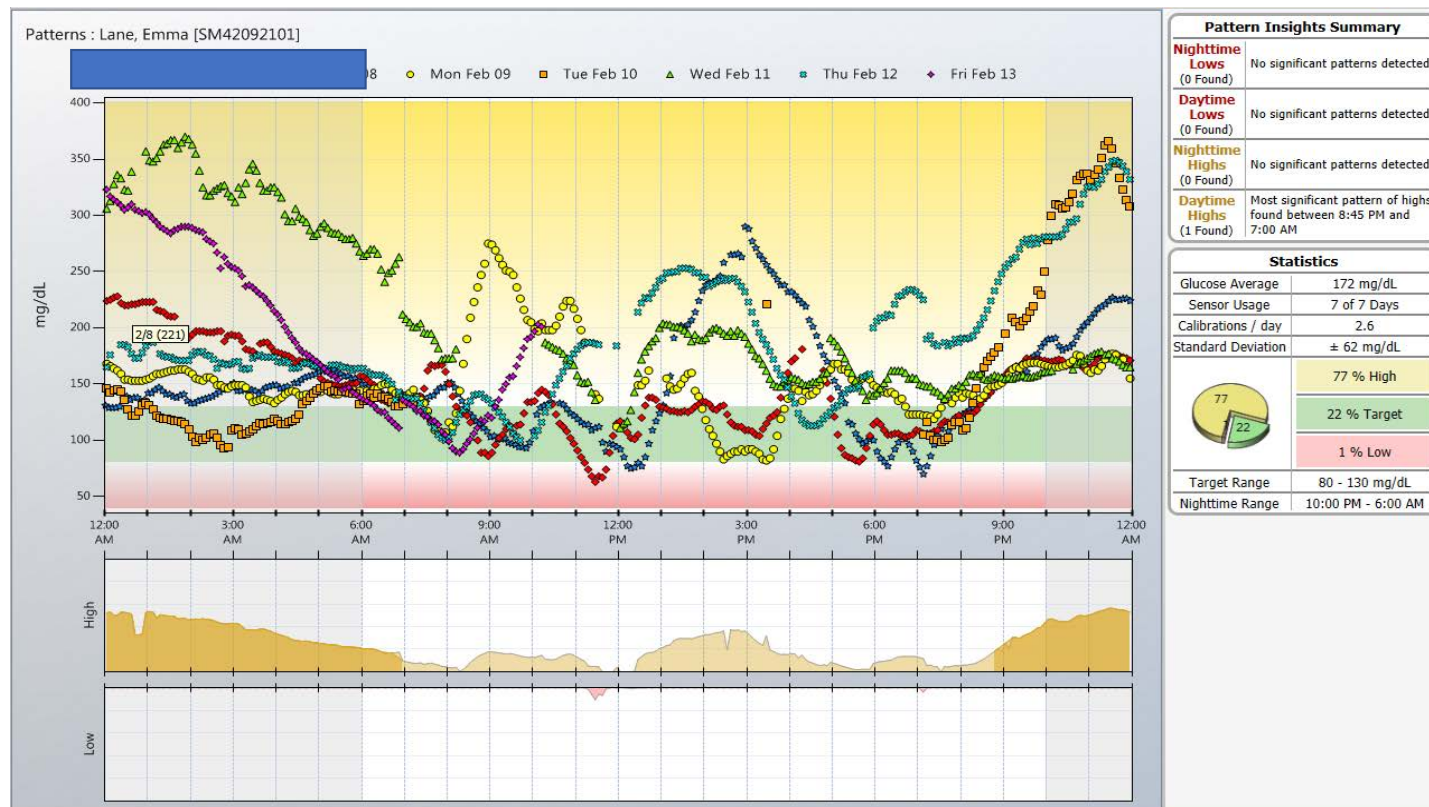


# Faces of type 1 diabetes – before and after insulin discovery



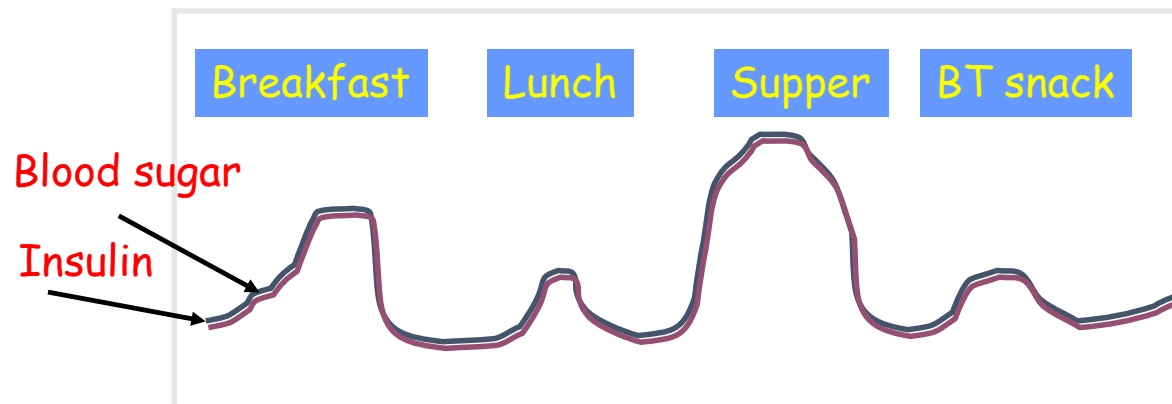
*Charles Best, Marjorie ("Dog #33") and Frederick G. Banting, Toronto 1921*

# Blood glucose fluctuations on CGM



# Insulin delivery

- Goals: mimic pancreatic insulin release
  - glucose regulated insulin release

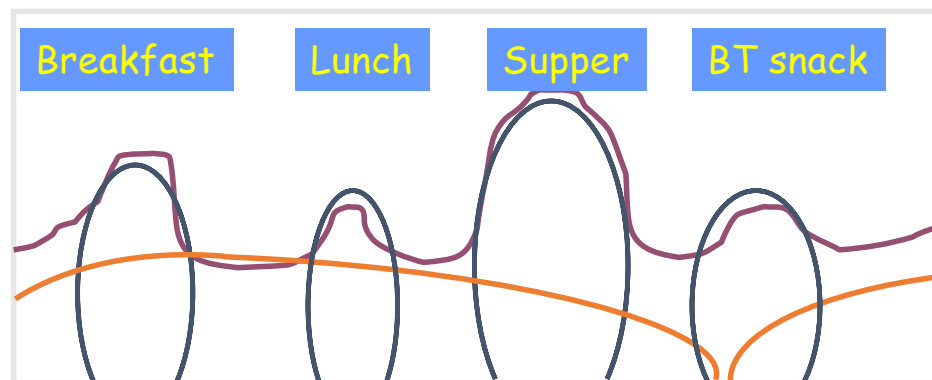


# Basal/Bolus “Flex” Regimens

- “Giving insulin like a pancreas”
  - Provides flexibility and good control

## Two choices:

- Injections: Combination of
  - Lantus + Humalog/Novolog
    - Background long-acting insulin
    - Humalog/Novolog injection with each meal
- Insulin Pump





# Short acting insulin dose



## INSULIN : CARB RATIO

- Amount of Humalog/Novolog to take for grams of carbohydrate eaten
- Initial dose calculation based on TDD of all insulins divided into 500
- Example: 50 total units would give a ratio of 1 unit of insulin for every 10 grams of carbohydrate eaten

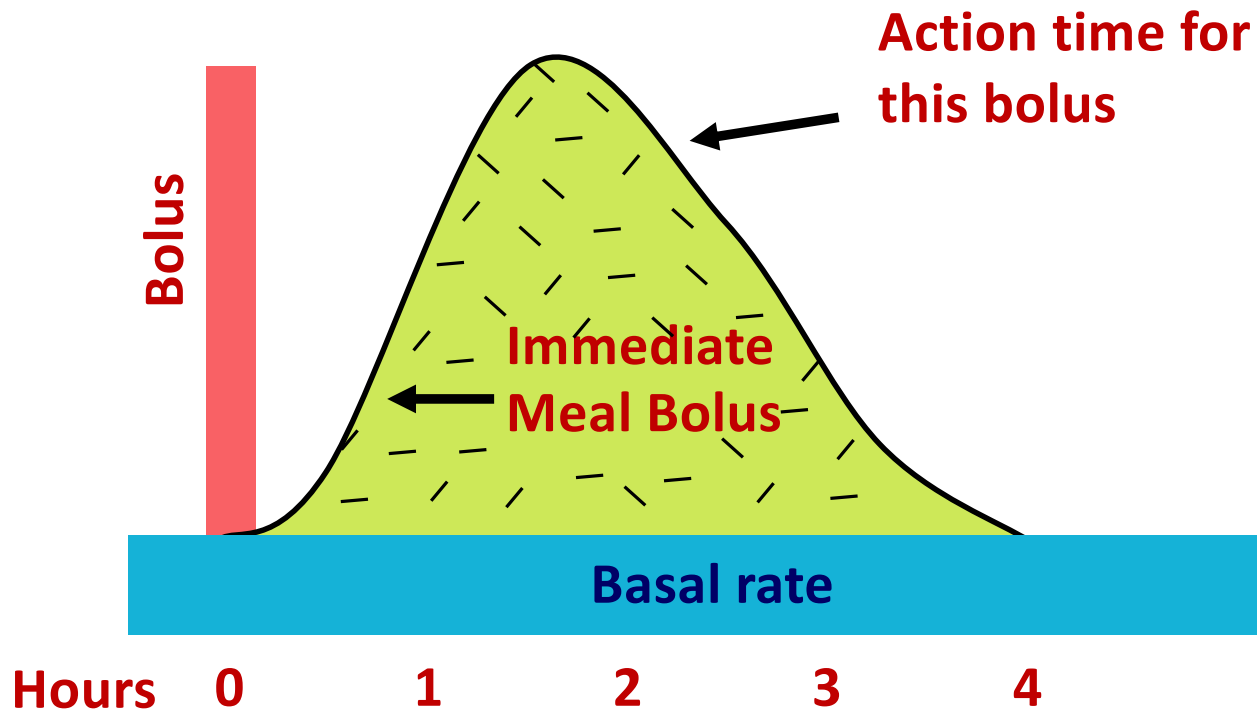
## CORRECTION FACTOR

- Amount of Humalog/Novolog to take to bring blood sugar into target range
- Initial calculation based on TDD of all insulins divided into 1800
- Example: 50 total units would give a ratio of 1:35

# Immediate Meal Bolus: Standard or Carbohydrate

Meal bolus delivered immediately.

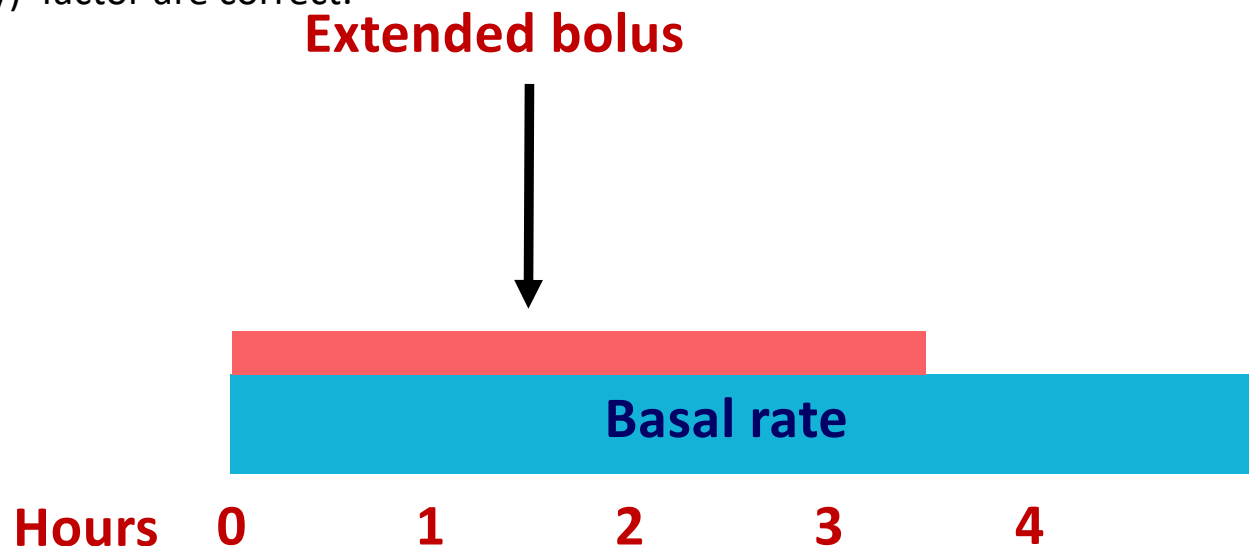
Can be programmed as units of insulin ( standard bolus) or grams of carbohydrates ( carbohydrate bolus).



# Extended Bolus

- Patient may need an **extended** or **combination** bolus if post-meal blood glucose level is above or below target glucose level.
- This is assuming that insulin-to-carb ratio AND insulin correction (sensitivity) factor are correct.

An **extended bolus** is a **meal bolus** delivered over an extended period of time. Can be programmed to deliver insulin over 15 min. to several hours



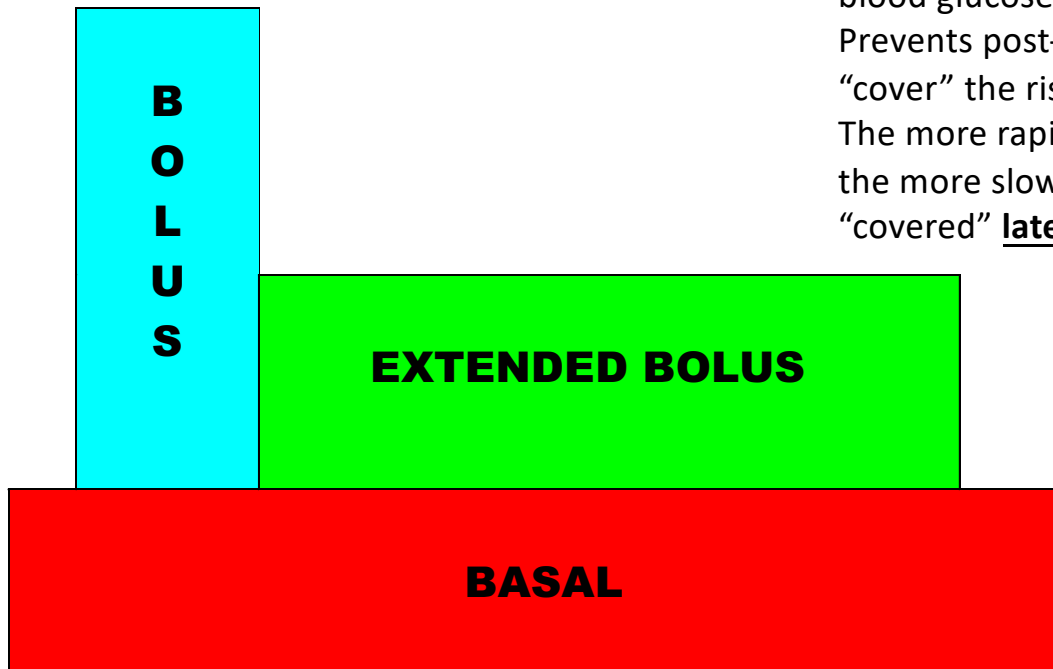
# Combination Bolus

A Combination bolus is a bolus that combines the features of an immediate bolus with those of an extended bolus

Prevents post-meal hypoglycemia (from insulin peaking before blood glucose rises)

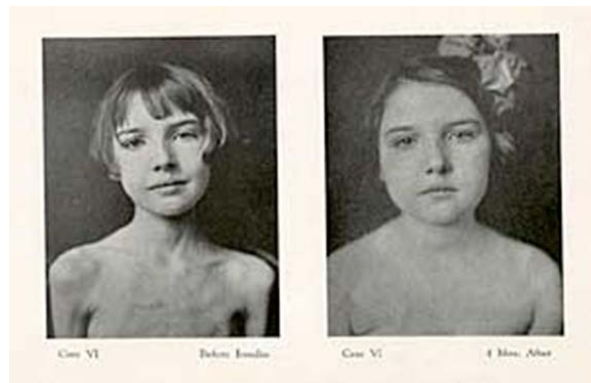
Prevents post-meal hyperglycemia (from not having insulin to “cover” the rise in glucose from carbohydrate)

The more rapidly-absorbed carbohydrate is “covered” now, and the more slowly-absorbed carbohydrate/protein/fat are “covered” later.





Now we have insulin but why people die from diabetes in our days?



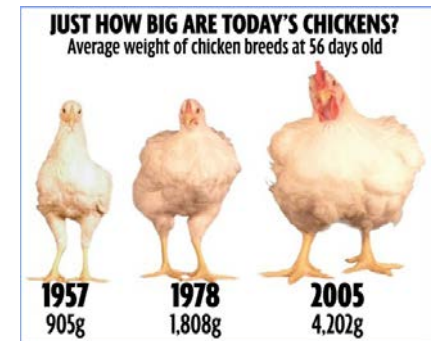
# Key elements in diabetes and obesity management

- Medications – insulin, oral agents
- Diet
- Exercise



# How our diet changed over time

- Fast foods
- Preservatives, hormones, fertilizers
- Genetically modified foods
- Too much sugar and too much salt






- Public transportation
- Access to parks, bicycle paths, parks, playgrounds
- PE at school
- Electronics and virtual reality

## Physical activity and Society issues





# Multidisciplinary team approach

- Primary care physician
- Nutritionist
- Exercise physiologist
- Psychologist
- Social worker
- Endocrinologist
- Pulmonologist
- Cardiologist
- Gastroenterologist
- Other specialists
- Family support
- School support
- Society support

# Conclusions

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There is a global pandemic of diabetes and obesity on the world. Diabetes is the most common endocrine disease in pediatric and adult population.

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Medical advancements allow patients with obesity and diabetes live longer life but does not eliminate risk of complications, poor quality of life and early death.

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Diet and exercise play crucial role in the management of obesity and diabetes

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Multidisciplinary team is required to provide adequate medical care to the patients with obesity and diabetes.

To Eat or Not to Eat?  
Is this the question?



The question should be:  
What to eat?

