

From 1552 BC to 2015: How Science Made Diabetes Treatable

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Outline

- 1. A (Very!) Short History of Diabetes**
2. Diabetes Research and Treatment Today

Diabetes: one of the oldest diseases known to man.

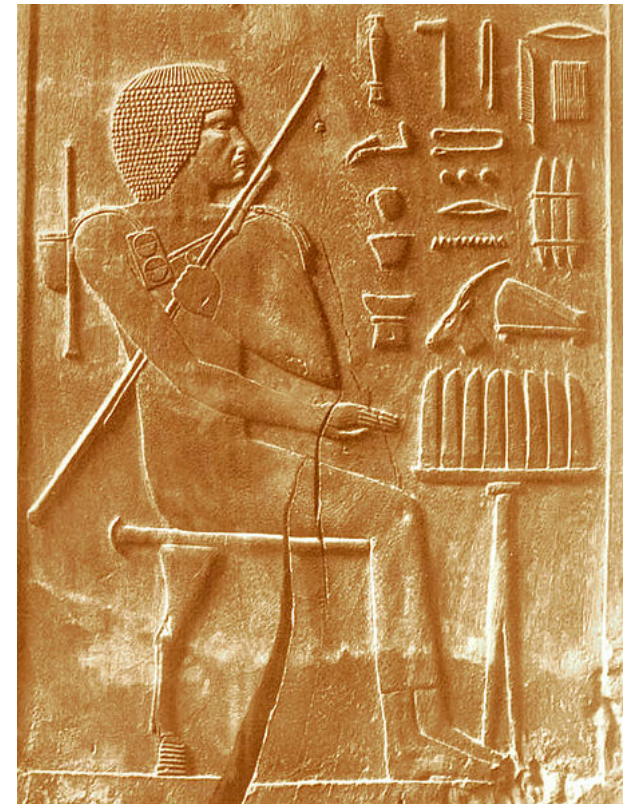
First documented in 1552 BC
Egyptian physician: Hesy-Ra

Symptoms:

Rapid weight loss

Frequent urination

Urine attracted ants



1st century CE: Arateus

“A melting down of flesh into urine”

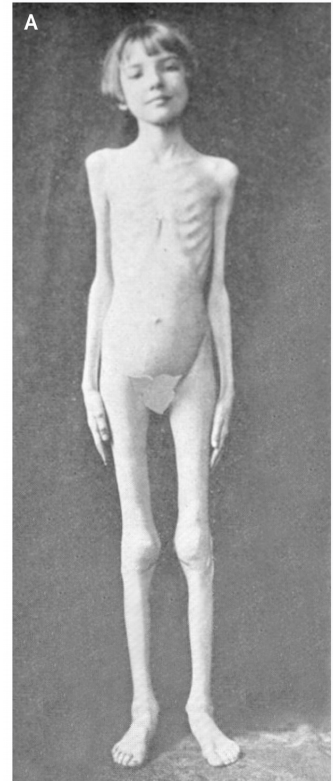
Coined the term “diabetes mellitus”

Diabetes: siphon, passing through

Mellitus: sweet (sugar)

Diabetes is a death sentence

through the early 20th century!



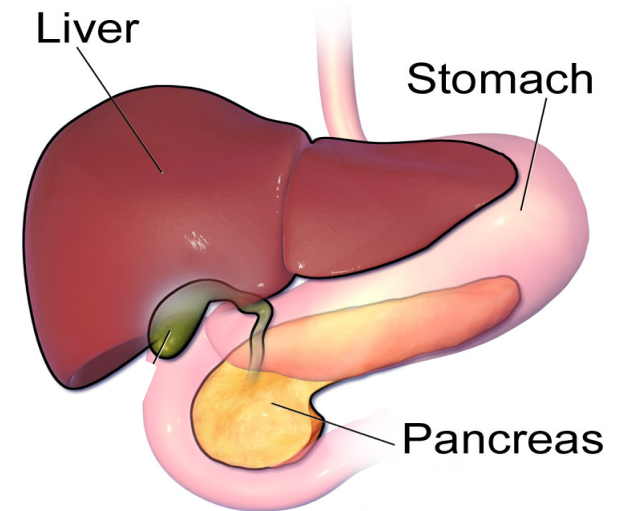
Scientific lesson: Must understand the disease biology, not just the symptoms!

1889: Finding a cause for diabetes

Minkowski/von Mering

Removed pancreas from dogs

Rapid onset of diabetes



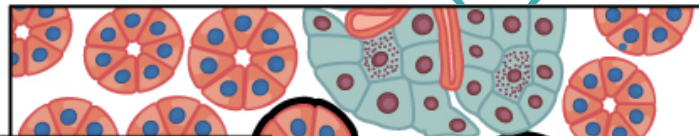
Scientific lesson: Key discoveries are often unexpected!

1869: Looking closely at the pancreas

Paul Langerhans – two types of pancreatic structures

Islets

(??)



Are the islets important
in diabetes?

**Diabetes = loss of an
islet protein (insulin)**

Can we isolate insulin
and use it to treat
patients?

(Digestion)



1921: Banting/Best and Macleod

Treated diabetic dogs with pancreatic extract

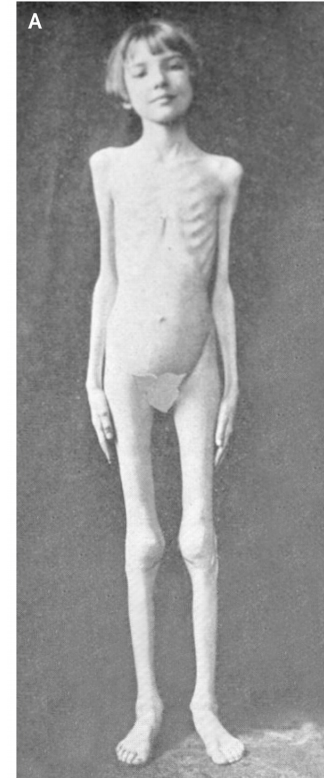
Some success...but lots of technical problems



Scientific lesson: If at first you don't succeed, try and try again.

Banting/Best and Macleod/Collip

1922: Treated diabetic children



Scientific lesson: When you find something big, run with it!

What does insulin do?

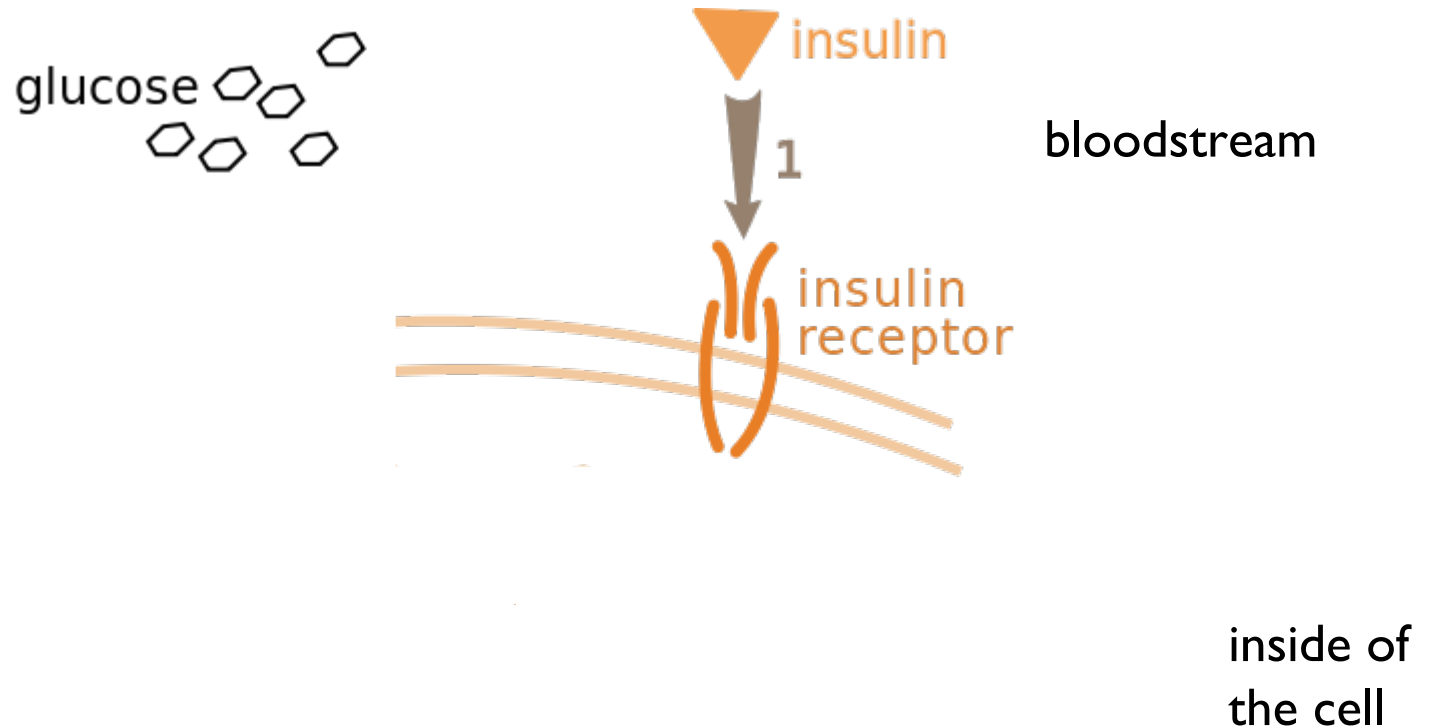


Insulin
(hormone)
“food signal”

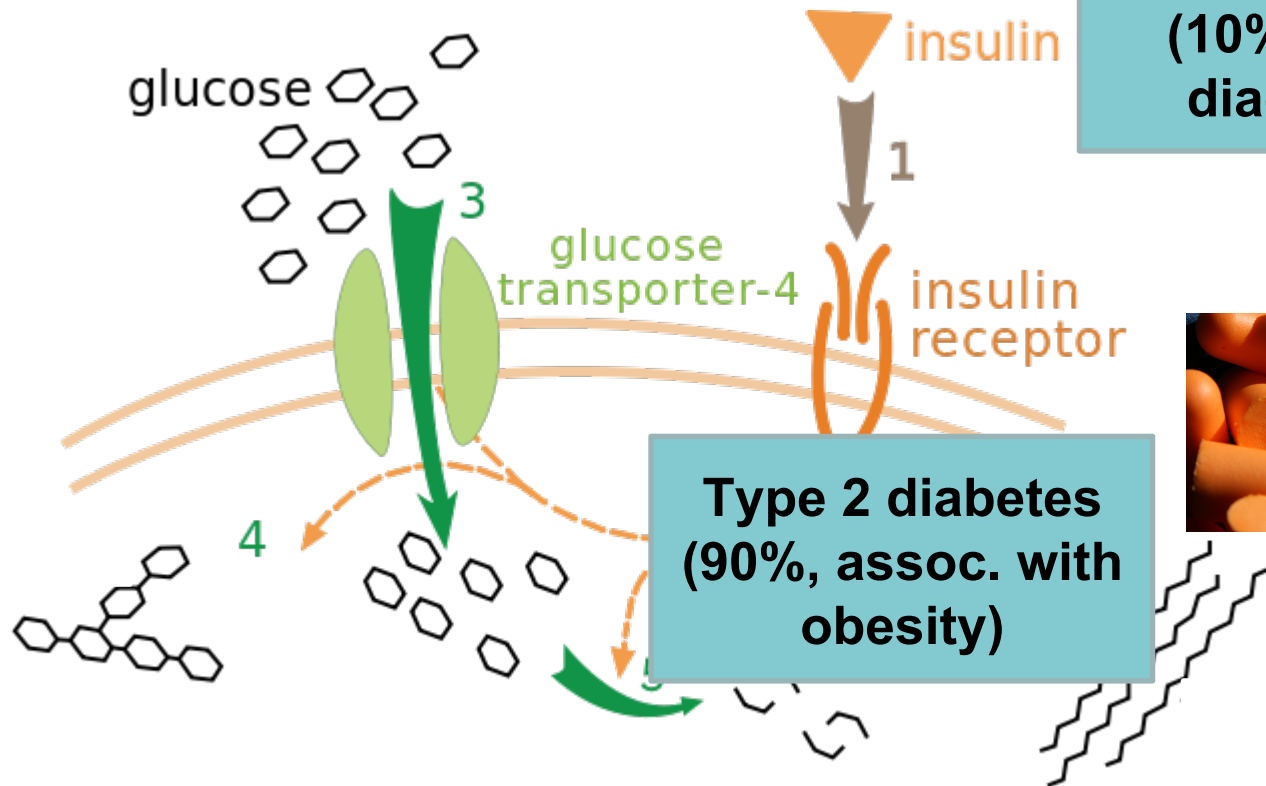
Energy uptake and storage

Breakdown of stored energy (fat, proteins)

Insulin and glucose (sugar)



Type 1 vs Type 2 diabetes



Type 1 diabetes
(10%, <30 at diagnosis)

Type 2 diabetes
(90%, assoc. with obesity)



Recap

Insulin is a hormone that controls glucose metabolism.

Type 1 diabetes: insulin is absent

Type 2 diabetes: the body doesn't respond properly to insulin

Questions??

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Current diabetes treatments



Insulin pumps



Synthetic insulin produced by engineered bacteria or yeast



Glucose-lowering drugs

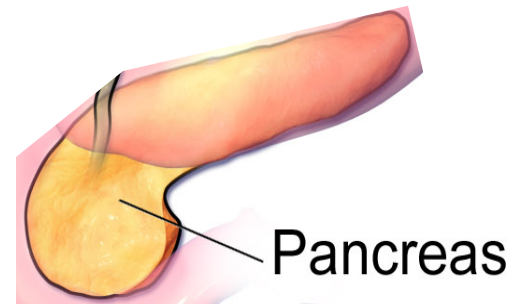
What problems remain

Today: diabetic life expectancy is 10-13 years lower than for non-diabetics.

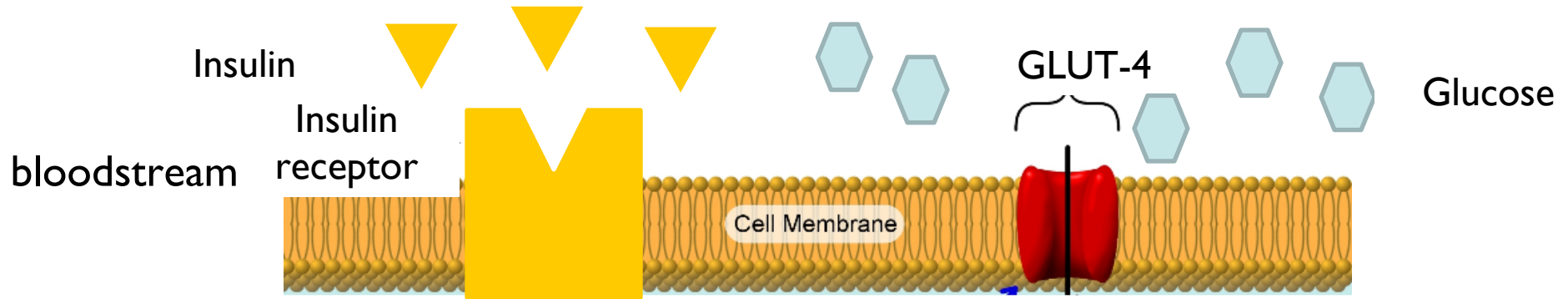
A cure has remained elusive.



**does not
equal**



Insulin is very complicated!



inside of
the cell

Complications: blood vessels

**Microvascular
(small vessels)**

**Kidney disease
Nerve death
Eye disease**

Pain/suffering

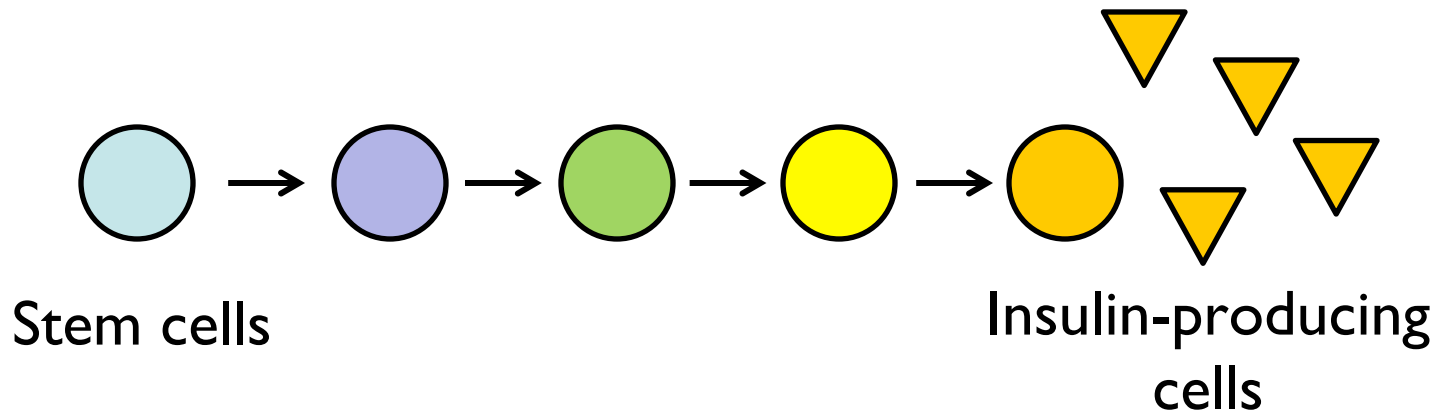
**Macrovascular
(large vessels)**

**Atherosclerosis
Heart attack
Stroke**

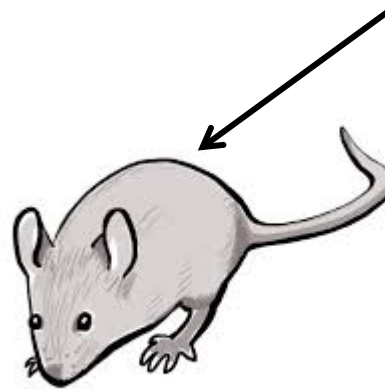
Death (>65%)

New research in type I diabetes

Stem cells!



**“Artificial
pancreas”**



**Transplantation
into diabetic
mouse**

Conclusions

Diabetes: a research success story

One door opens another...

Research today aimed at:

Decreasing diabetic complications

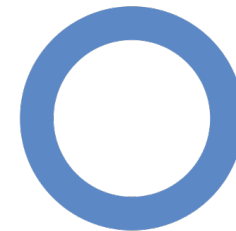
Stem cell therapies (type I)

Preventing type 2 diabetes and pre-diabetes (~30% of population)

What can you do?

Lead a healthy lifestyle (diet and exercise)

Support biomedical research



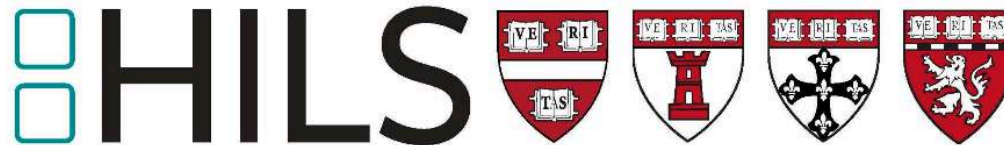
world diabetes day

14 November

Thank you!

SITN would like to acknowledge the following organizations for their generous support of this event.

Harvard Integrated Life Sciences



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