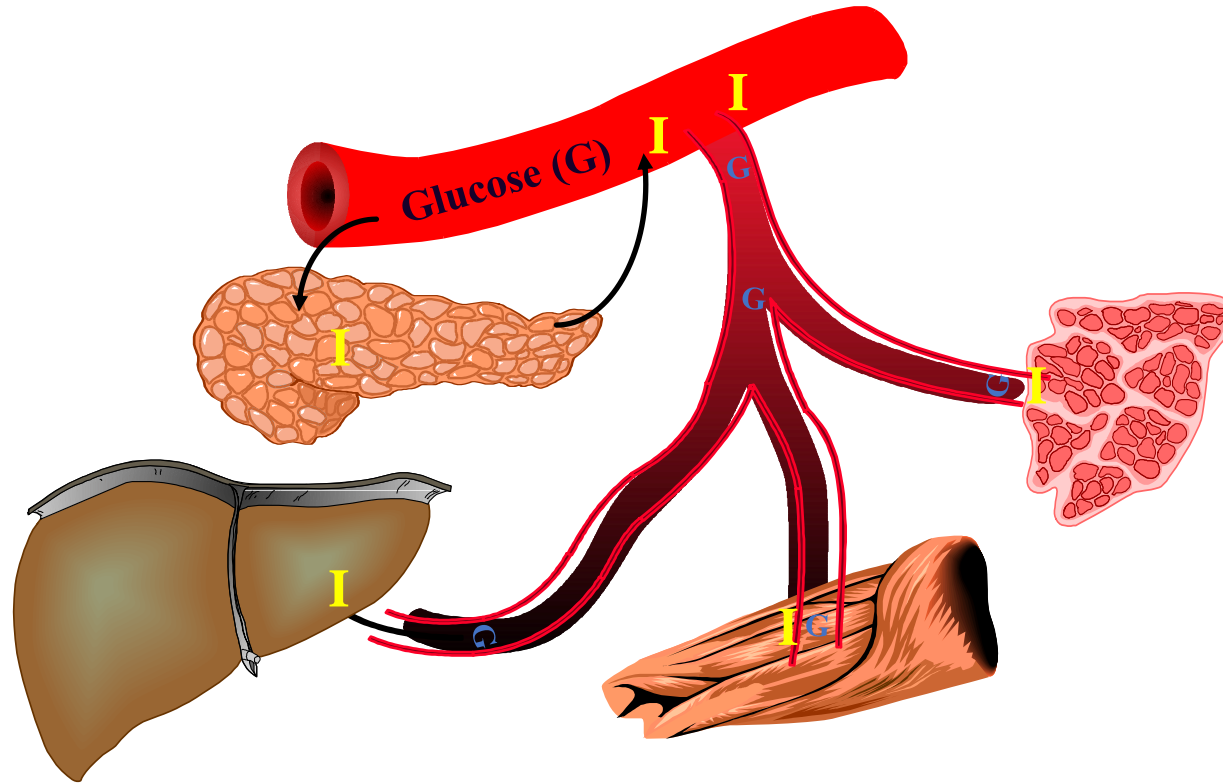


Diabetes



Prof Dr Chantal Mathieu
UZ Gasthuisberg KULeuven
Leuven, Belgium

What happens to glucose taken up from food?



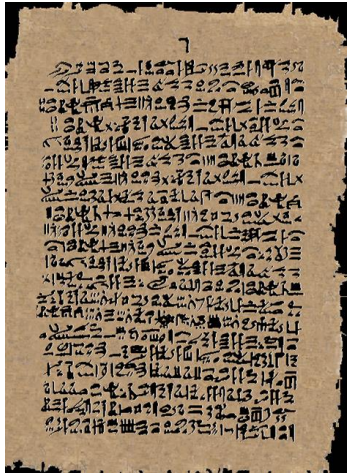
Diabetes mellitus

= excessive loss of glucose via urine

(διαβαινειν)

= group of diseases characterised by
hyperglycemia

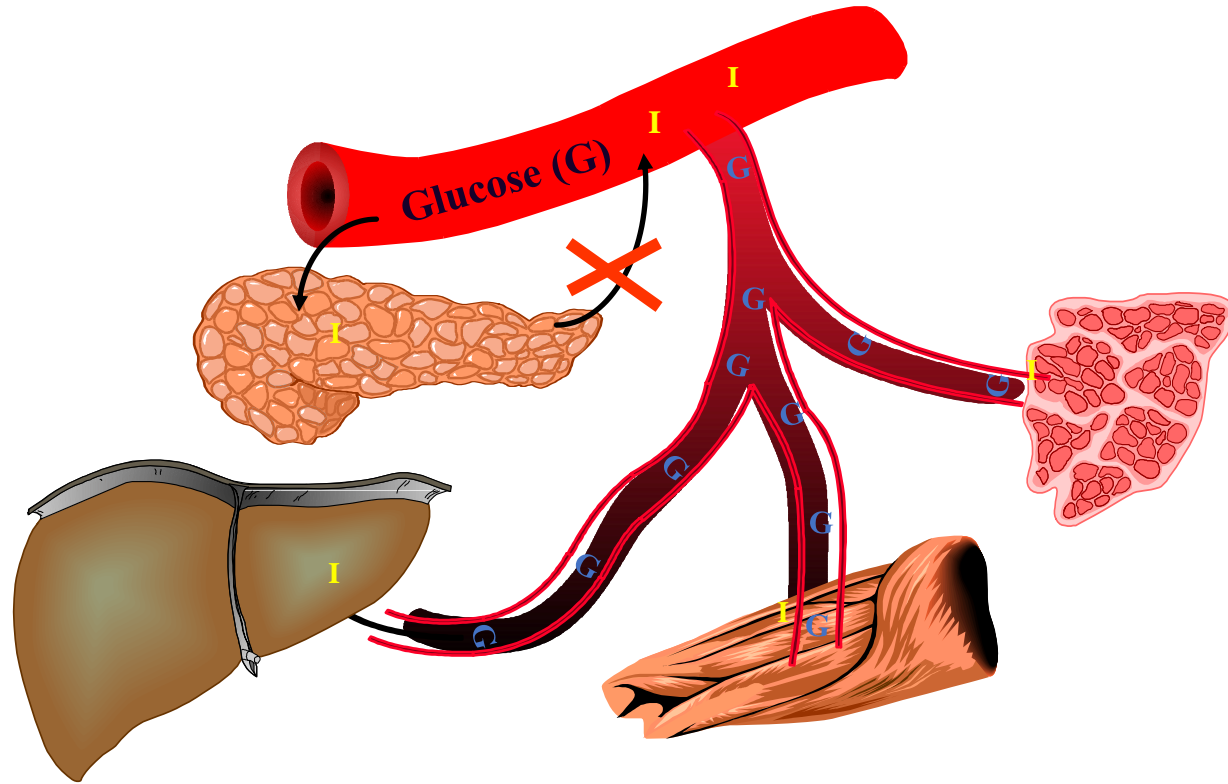
= syndrome characterised by
abnormalities in glucose-, protein- and
fat metabolism characterised by a
relative or absolute deficiency in
insulin(action)



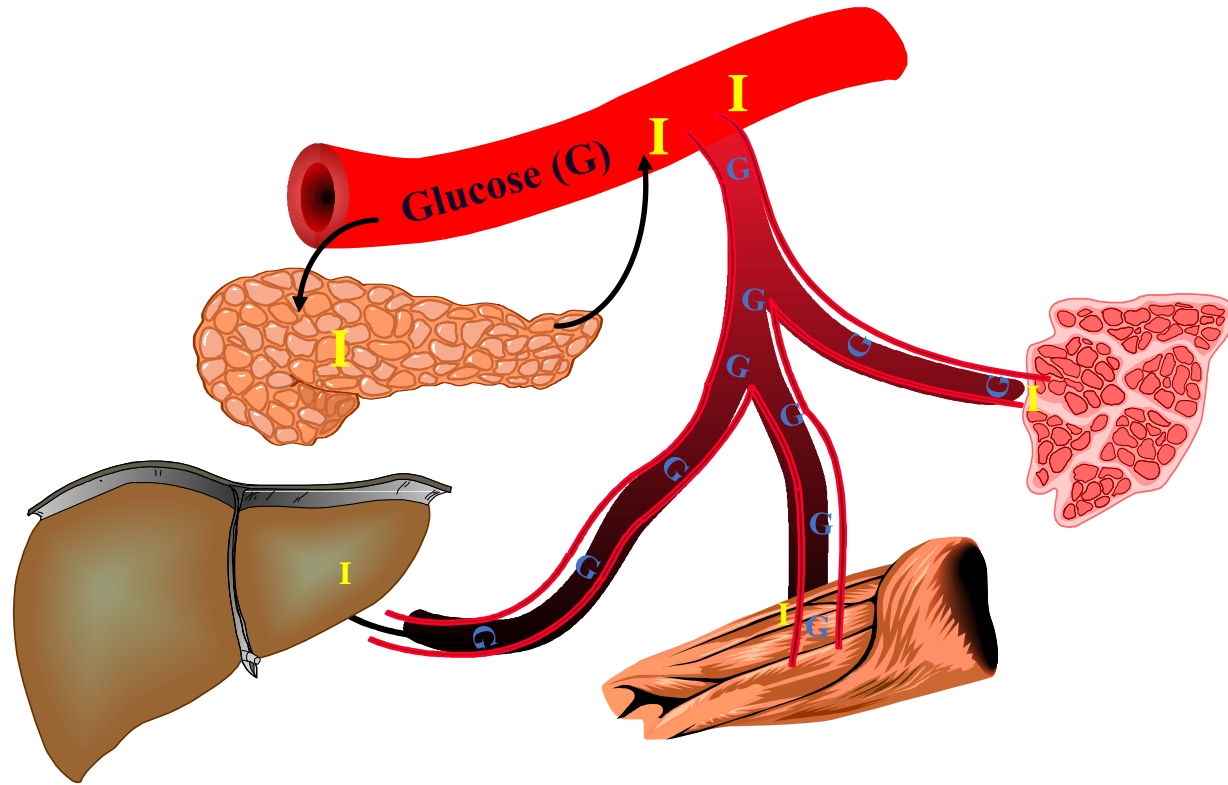
Ebers papyrus
1500 BC

Diabetes

Insufficient insulin production



Diabetes



Insufficient insulin action

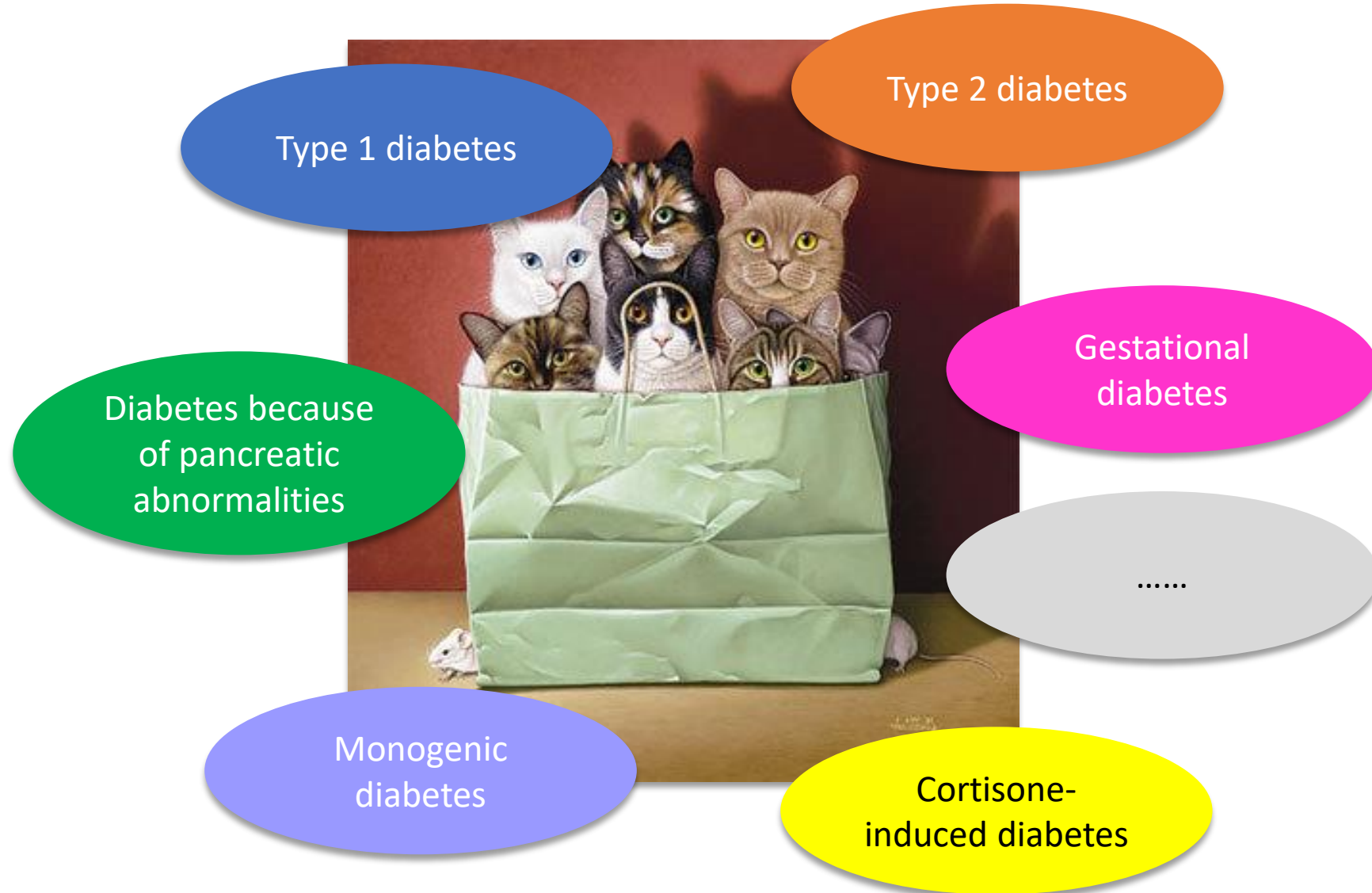
ADA criteria for diagnosis of diabetes mellitus

	NORMAL	Diabetes	Impaired glucose tolerance
Fasting	<100 mg/dl	≥126 mg/dl	≥100 and <126 mg/dl (IFG)
OGTT (2h after 75g glucose)	<140 mg/dl	≥200 mg/dl	≥140 and <200 mg/dl (IGT)
Random		≥200 mg/dl	
HbA1c	4-6%	>6.5%	

* In absence of symptoms (polyuria, polydipsia,...) second sample on different day.

Source: American Diabetes Association Standards of Care 2022 January

Diabetes



Symptoms of diabetes



- ◆ Rise in glucose in blood, glucosuria and loss of fluid: **excessive urine production, thirst**
- ◆ Loss of energy (glucose loss, catabolism of fat and protein: **fatigue, weight loss, waisting**
- ◆ Hyperglycemia: increased susceptibility to bacterial and yeast **infections**



Many people with type 2 diabetes are SYMPTOM-FREE for weeks, months, years....



Diabetes, why worry?



World

2045	784 million
2030	643 million
2021	537 million

↑ **46%**
increase

Europe (EUR)

2045	69 million
2030	67 million
2021	61 million

↑ **13%**
increase

Number of people with diabetes

Aged 20–79 years by IDF region



North America & Caribbean (NAC)

2045	63 million
2030	57 million
2021	51 million

↑ **24%**
increase

South-East Asia (SEA)

2045	152 million
2030	113 million
2021	90 million

↑ **68%**
increase

Western Pacific (WP)

2045	260 million
2030	238 million
2021	206 million

↑ **27%**
increase

South & Central America (SACA)

2045	49 million
2030	40 million
2021	32 million

↑ **50%**
increase

Africa (AFR)

2045	55 million
2030	33 million
2021	24 million

↑ **134%**
increase

Middle East & North Africa (MENA)

2045	136 million
2030	95 million
2021	73 million

↑ **87%**
increase



By age 40, Amy who got type
1 diabetes at age 5,

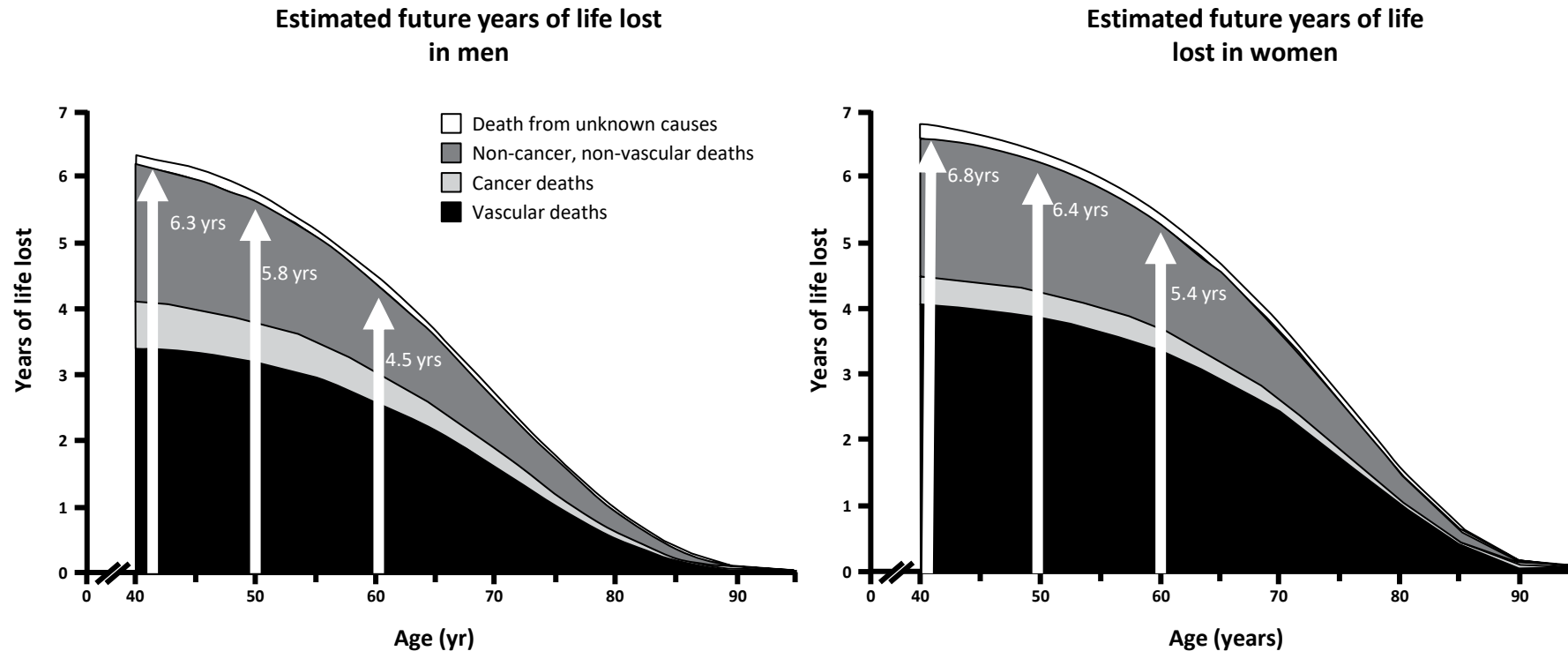
...will have measured her

bloodsugar **50,000**

times and have injected
insulin more than

50,000 times....

Type 2 diabetes is also associated with premature death from CV and non-CV causes....



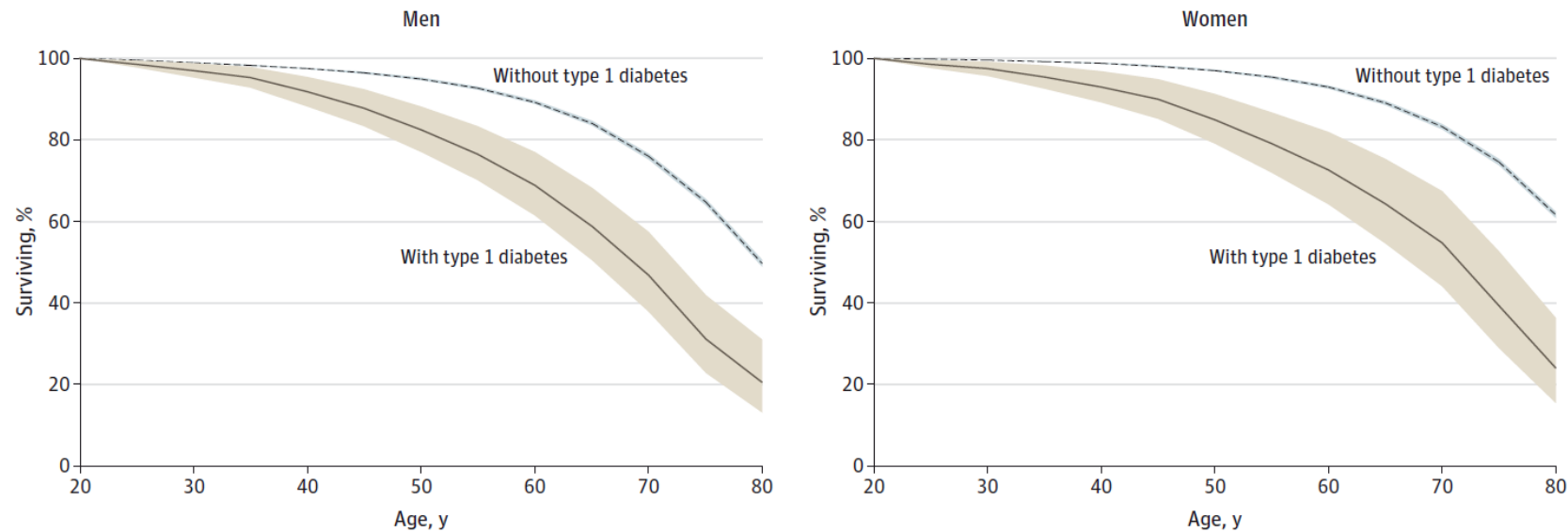
Arrows indicate the number of years of life lost incurred at specific ages by men or women with diabetes but without a history of vascular disease

CV, cardiovascular

Emerging Risk Factors Collaboration. *N Engl J Med* 2011;364:829–841

... but also Type 1 diabetes causes life-years loss

Figure. Percentage Surviving by Age Among Those With Type 1 Diabetes Compared With the General Population Without Type 1 Diabetes



-11,1y (-8,3y)

-12,9y (-7,9y)

Ischemic heart disease 36% in men, 31% in women

Diabetes coma or ketoacidosis (before 50y) 29,4% in men, 21,7% in women

Scottish cohort 2008-2010

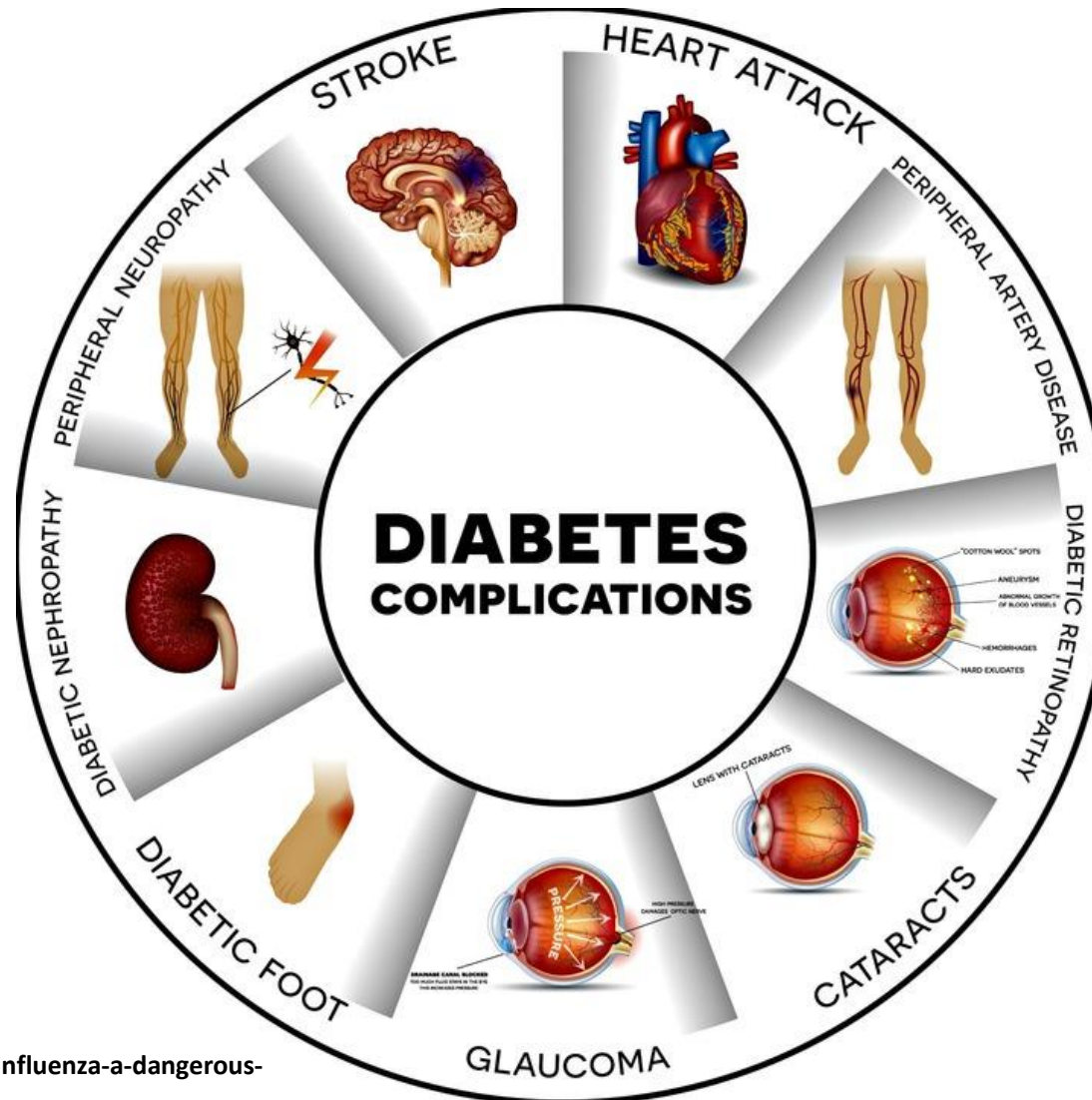
Livingstone SJ et al *JAMA*. 2015;313(1):37-44.

Complications of diabetes

6th cause of mortality worldwide

Leading cause of end-stage renal disease in Europe

Leading cause of non-traumatic foot amputations in Europe

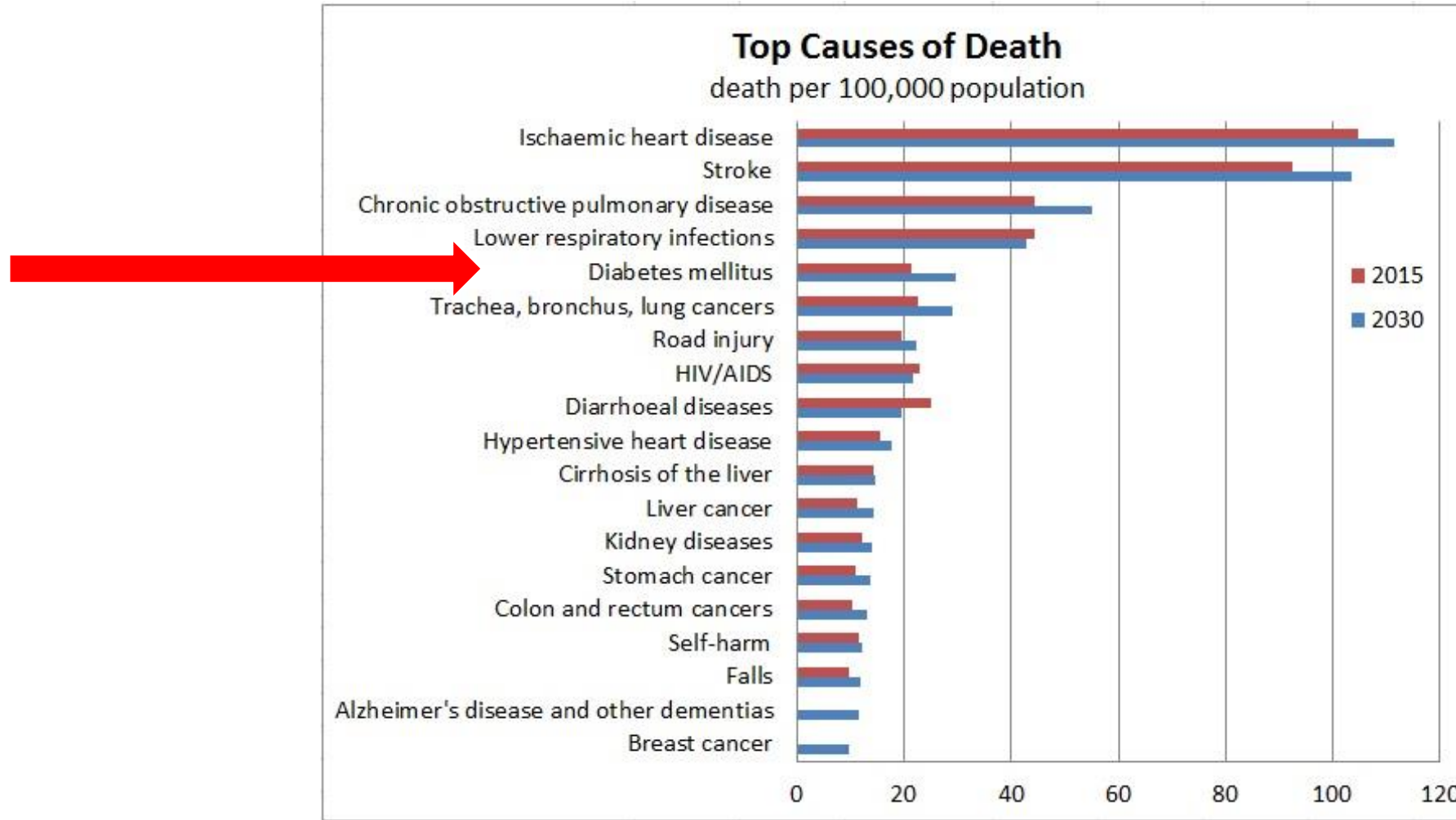


More than double the risk of stroke, myocardial infarction and cardiovascular death

Leading cause of blindness in Europe

Graphic source: https://www.huffpost.com/entry/diabetes-influenza-a-dangerous-combination_b_5a0909dde4b0cc46c52e6bde

Global Projections of mortality and causes of death 2015 and 2030



https://knowledge4policy.ec.europa.eu/visualisation/top-causes-death-global-projections-mortality-causes-death-2015-2030_en (source: WHO)

How to tackle this disease?



Attack



Defence

How to tackle this disease?



Prevention



Treatment

Type 2 diabetes



Beijgt u regelmatig de weegschaal en duid aan wat voor jou een gezond gewicht is. Er is alleen 1 antwoord mogelijk. Tel de punten op die bij elk antwoord horen samen om een eindscore te berekenen.

1. LEEFTIJD

Hoe oud ben je?

- ☐ Jonger dan 45 jaar 0 p.
- ☐ Tussen 45 en 54 jaar 2 p.
- ☐ Tussen 55 en 64 jaar 3 p.
- ☐ 65 jaar of ouder 4 p.

2. GEWICHT

Hoe hoog is je BMI (Body Mass Index)?

- ☐ Lager dan 25 (norm) 0 p.
- ☐ Tussen 25 en 30 (overw.) 1 p.
- ☐ Meer dan 30 (vold.) 3 p.

3. BUKKOMTREK

Wat is je bukkomtrek?

- | vrouw | man | |
|-----------------------------------|------------------------------------|------|
| <input type="checkbox"/> < 80 cm | <input type="checkbox"/> < 94 cm | 0 p. |
| <input type="checkbox"/> 80-89 cm | <input type="checkbox"/> 94-102 cm | 3 p. |
| <input type="checkbox"/> > 89 cm | <input type="checkbox"/> > 102 cm | 4 p. |

4. BILWEIGING

Bevoeg je dagelijks minstens een half uur?

- ☐ Ja 0 p.
- ☐ Nee 2 p.

5. GEZONDE VOEDING

Eet je dagelijks groenten en fruit?

- ☐ Ja 0 p.
- ☐ Nee 1 p.

6. BLOEDDRUK

Nemen je of Art je ook geneesmiddelen tegen hoge bloeddruk?

- ☐ Ja 2 p.
- ☐ Nee 0 p.

7. BLOEDSUKERWAARDE

Werd er ooit een overmatige bloedsuikervaarde bij je vastgesteld?

- ☐ Ja, bij diabetesdiagnose, bij een routinestandaard of zwangerschapstest 5 p.
- ☐ Nee 0 p.

8. ERFFELIJKHEID

Heb je ooit diabetes van type 1 of type 2?

- ☐ Nee 0 p.
- ☐ Ja, vroeger (of nu) met behulp van insuline (of met behulp van insuline en orale medicatie) of met behulp van orale medicatie 5 p.

TOTAAL: _____ p.

BMI TABEL

MIJN BMI

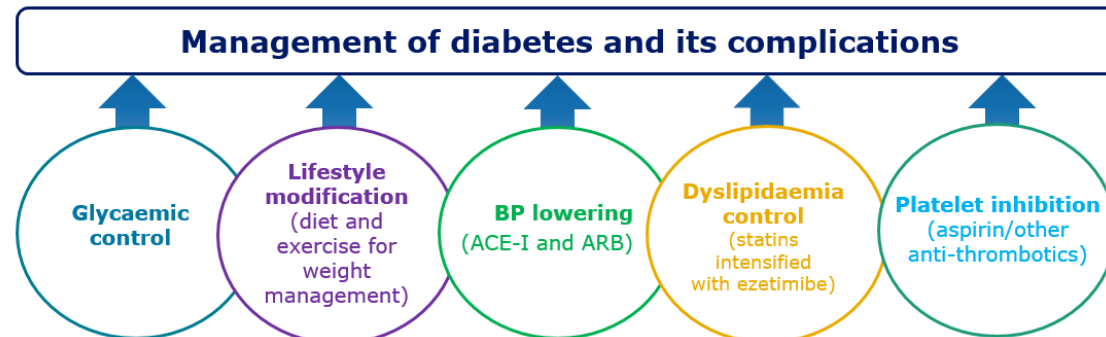
Duid in onderstaande tabel je BMI aan en kijk waar je je bevindt.

gewicht (kg)	1,50	1,55	1,60	1,65	1,70	1,75	1,80	1,85	1,90
55									
60									
65									
70									
75									
80									
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195									
200									

General population measures

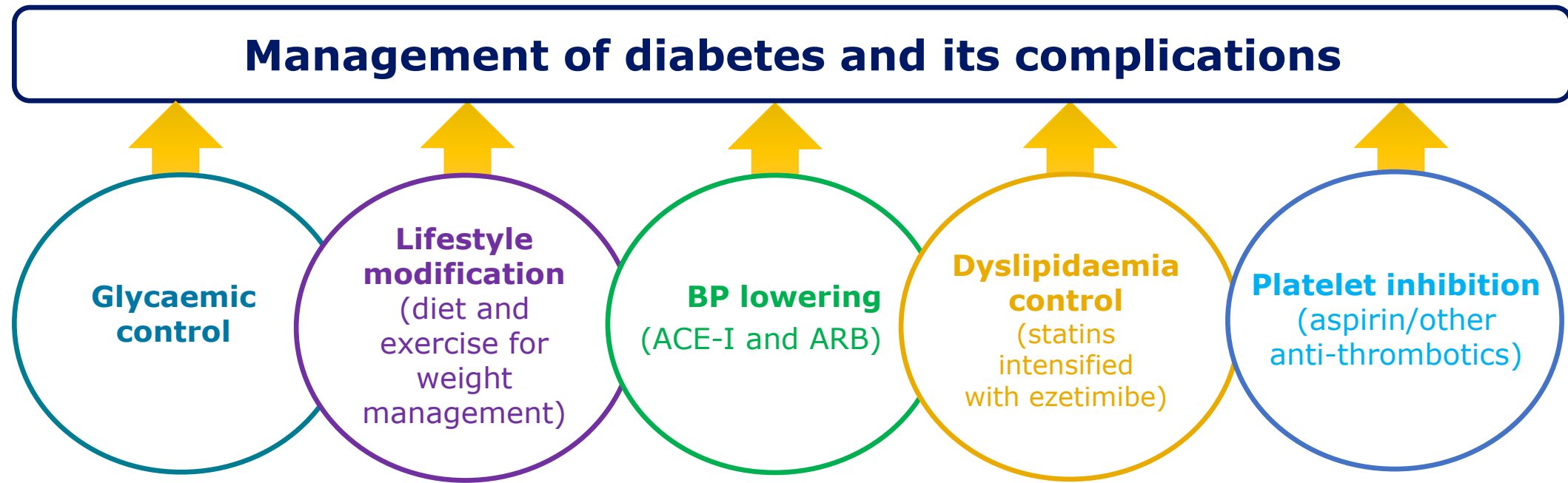
Screening and targeted lifestyle measures

Therapy



Type 2 diabetes:

Multifactorial approach to improve outcomes



- The ADA recommends that most adults with diabetes achieve the following targets:¹
 - HbA_{1c}: <7.0%
 - Physical activity: ≥150 mins per week*
 - Blood pressure: <140/90 mmHg
 - Triglycerides: <150 mg/dL (1.7 mmol/L)
 - HDL-C: ≥50 mg/dL (1.3 mmol/L)
 - LDL-C: <100 mg/dL (2.6 mmol/L)

*Physical activity of moderate to vigorous intensity.

ACE-I, angiotensin-converting enzyme inhibitor; ADA, American Diabetes Association; ARB, angiotensin receptor blocker; BP, blood pressure; HDL-C, high-density lipoprotein cholesterol.

Type 1 diabetes



General population measures

Research



Screening and targeted therapies

Therapy

TORONTO DOCTORS ON TRACK OF DIABETES CURE

RAILROAD UNIONS IN U.S. MAY JOIN IN MINERS' STRIKE

Coal-Diggers Expect Walkout
to Be Hundred Per
Cent. Effective.

PLANS ARE MATURING

President Harding May Make a
Public Appeal for Con-
ciliation.

Special to The Star.

Cleveland, Ohio, March 22.—Possibility that the railroad brotherhood, 250,000 strong, may support the 600,000 mine workers ordered to quit work at midnight March 31 was seen here to-day.

This possibility was revealed in the admission from brotherhood officials that "the protective agreement" between miners and brotherhoods "will doubtless receive the sanction of the railroad organizations." The executive board of the United Mine Workers, it was said, already have ratified the agreement.

Expect Effective Strike.

Special to The Star.

New York, March 22.—The great coal strike, called for midnight March 31, will be one hundred per cent. effective, officials of the United Mine Workers of America declared here to-day. Reports from the anthracite and bituminous fields throughout the United States indicate that virtually every one of the 600,000 miners will obey the order to suspend work.

President John L. Lewis of the United Mine Workers, who issued the order here yesterday, believes there will be no rebel movement in the union ranks. He asserted the 99,000

DIABETES SUFFERERS GIVEN MESSAGE OF HOPE

Discovery Made at University of Toronto Will Be Means of Prolonging Life Considerably—F. G. Banting and C. H. Best
Pushed Experiments All Last Summer.

BANTING STAKES HIS ALL ON THE RESULT

A message of hope to sufferers from diabetes came yesterday to-day from the medical research laboratories of the University of Toronto. The modesty of medical men and scientific investigators of the genuine brand attempts to minimize the results obtained. The harm of exaggeration and the insistence to both patients and research men in swamping false and premature hopes before the extracts can possibly be manufactured cannot be over-emphasized. But the fact remains that one of the most important discoveries in modern medical research has been made at the university here. It is not a cure for diabetes, the authors state. Within six months, however, their discovery will be used on a large scale. They hope to prolong life quite considerably at least. There will be no agony, as from the beginning. The medical profession will know all the facts.

Most significant of all the statements in the article issued by the experimenters to the medical profession to-day in the Canadian Medical Association Journal is the little sentence: "The effects observed in de-pauperized animals have been justified to man." An active pancreatic extract discovered and prepared by two young doctors, F. G. Banting and C. H. Best, the principal experimenters, first prolonged the life of a diabetic dog fifty-six days beyond the records established before. A definite improvement in the condition of seven human patients is reported in the article from a following highly potent extract discovered as a result of the animal experiment injected twice a day under the skin.

Knowing from the work of pre-

vious J. J. R. Macleod, an investigator himself in this field at research for over 15 years, that every opportunity was given to the young doctor from London to push on his experiments. As the best man to assist Dr. Banting, Prof. Macleod chose Charles H. Best, a clever young graduate in the physiology and biochemistry course, who celebrated his twenty-third birthday a few days ago. Together they concentrated upon the problem in hand.

Work on the new hypothesis began in May. All through the heat of the summer the two young men, upon fast friends, pushed their experiments night and day. Both had served overseas. They had this in common too, and they often slept beside their work.

Everything that Banting possessed in the world he staked on the result. He had just been appointed to a junior position in surgery and an assistant in general physiology at the University in London, Ontario, when he got his idea while reading an article dealing with the isles of Langerhans, a peculiar cluster of the pancreas to which no definite function had been proved up to that time. Banting had won his B.Sc. at the Royal College of Physicians and his membership in the Royal College of Surgeons overseas, and was not a "green" youth by any means.

"DRY" LAWS HERE CAUSE HARDSHIP IN OLD FRANCE

French Government Anxious for
New Trade Agreement
With Canada.

HOME FOR STUDENTS

Opportunity for Our Lumbermen, Says Philippe Roy
the Commissioner.

Canadian Press Despatch.

QUEBEC, March 22.—Prohibition in the majority of the provinces of Canada, in the United States, the closing of the Russian market, and high import duties on wine into Great Britain have, all combined, caused unusual hardships among the peasants and wine growers of France," remarked Philippe Roy, commissioner-general for Canada in France, who arrived in Ottawa yesterday to make a personal report to the prime minister.

Those connected with the last French wine industry can understand why people in other countries should deprive themselves of alcohol, but it is beyond their comprehension why anyone should want to do without wine, stated Mr. Roy.

Mr. Roy says the French people and government are anxious to enter into a new trade agreement with Canada.

Besides reporting progress to the government, Mr. Roy will endeavor to establish in Paris a Canadian home for students from this country attending the several universities there. He estimates that there are at present 100 students from Canada taking courses in Paris.

RESERVES OF COAL ARE HIGH IN CITY, PRICE TO GO DOWN

After Strike Trouble Prominent
Dealer Looks for a
Decline.

SHUT DOWN IN WEST

Canadian Diggers to Go On
Strike With the United
States Unions.

Between six and seven thousand coal miners in western Canada are involved in the order to cease work on April 1st, sent out by the heads of the United Mine Workers Federation, judging by the statements of railway officials and coal dealers in close touch with the situation. The general impression seems to be that on April 1st the mines in western Canada where the members of the United Mine Workers are employed will shut down. It may be that both sides in Canada will try and comply with the provisions of the Industrial Disputes Act before a cessation of work and representatives of the department of labor are in the western coal fields investigating the situation now.

It is stated that Toronto industries have a soft coal reserve which will carry them over six weeks and as a result of the dispute hard coal will be cheaper. The railways have reserves to carry on business for a considerable period.

Col. K. H. Marshall, president of the Standard Fuel Company, states that Toronto industries generally speaking have reserve supplies of soft coal enough to carry them over six weeks if a strike occurs in the coal regions. In addition, the coal points out there are many independent coal operators in the soft coal region, whose mines will continue to operate even in the event of



HAVE THEY ROBBED DIABETES OF ITS TERRORS?

Shown in these pictures are the four Toronto medical men on the University staff who figure most prominently in the discovery of a pancreatic extract to be used in the clinical treatment of diabetes in human beings. This is one of the most important medical discoveries of modern research, whose possibilities as an ultimate cure of this dread disease are very encouraging. It may be gathered from the announcement to-day of the success of the extract on seven human patients at the Toronto General Hospital since January that the

CIVIL WAR STAGE NOT YET REACHED, BUT DANGER GREAT

People on Both Sides of Ulster
Border Apprehend an
Attack.

NERVES ALL ON EDGE

No Real Massing of Troops Yet,
But Many Harrying
Raids.

Imperials May Separate Irish

Associated Press Despatch.

London, March 22.—The British government may have to consider whether it will be possible to draw a cordon of imperial troops between the warring elements on the Ulster frontier. Winston Churchill, the colonial secretary, stated in the House of Commons to-day.

By WILLIAM R. BRAYDEN.
Special Cable to The Toronto Star and the
Chicago Daily News, Copyright.

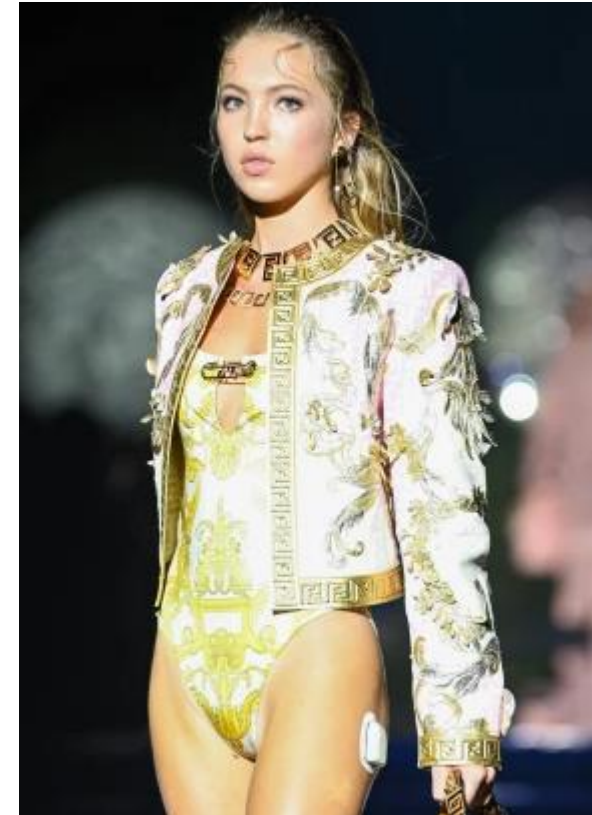
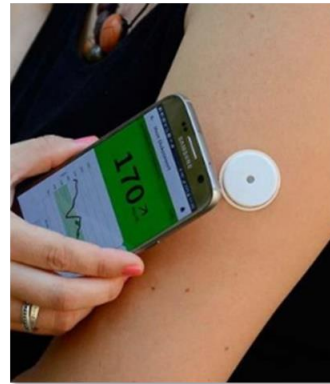
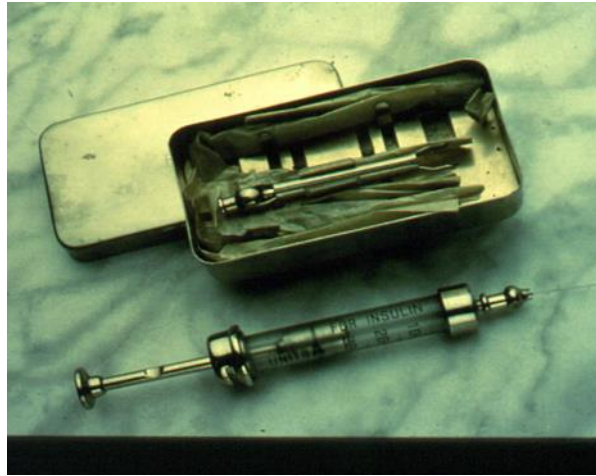
Dublin, March 22.—Along the 200 miles of border between the northern and southern Ireland practically the whole of the population on each side apprehends an attack from the other. Though the newspapers talk of civil war, the trouble has not yet reached that dimension. There is no massing of troops, but many small harrying raids are occurring in widely separated districts, keeping everybody's nerves on edge.

There is a conflict of testimony as regards the fact, but there is no where conviction as to the

We have come a long way

1922

2022



MEPs Mobilising for Diabetes

Blueprint for Action on Diabetes in the European Union by 2030

Conduct research into all types of diabetes, from basic science to translational and behavioural research, for actionable insights

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Diabetes



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Impact on: diabetes