Diabetes in children

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Type 1 diabetes

A. Immune-mediated
B. Idiopathic

Type 2 diabetes

Other specific types

A. Genetic defects of beta cell function
   1. Chromosome 12, hepatocyte nuclear fator (HNF)-1-alpha (MODY3)
   2. Chromosome 7, glucokinase (MODY2)
   3. Chromosome 20, HNF-4-alpha (MODY1)
   4. Chromosome 13, insulin promoter factor-1 (IPF-1MODY4)
   5. Chromosome 17, HNF-1-beta (MODY5)
   6. Chromosome 2, NeuroD1 (MODY6)
   7. Mitochondrial DNA
   8. Others

B. Genetic defects in insulin action
   1. Type A insulin resistance
   2. Leprechaunism
   3. Rabson-Mendenhall syndrome
   4. Lipoatrophic diabetes
   5. Others

C. Diseases of the exocrine pancreas
   1. Pancreatitis
   2. Trauma/pancreatectomy
   3. Neoplasia
   4. Cystic fibrosis
   5. Hemochromatosis
   6. Fibrocalculous pancreatopathy
   7. Others

D. Endocrinopathies
   1. Acromegaly
   2. Cushing's syndrome
   3. Glucagonoma
   4. Pheochromocytoma
   5. Hyperthyroidism
   6. Somatostatinoma
   7. Aldosteronoma
   8. Others

E. Drug- or chemical-linduced
   1. Vacor
   2. Pentamidine
   3. Nicotinic acid
   4. Glucocorticoids
   5. Thyroid hormone
   6. Diazoxide
   7. Beta-adrenergic agonists
   8. Thiazides (minimal effect with low dose therapy)
   9. Phenytoin
   10. Interferon alfa
   11. Others

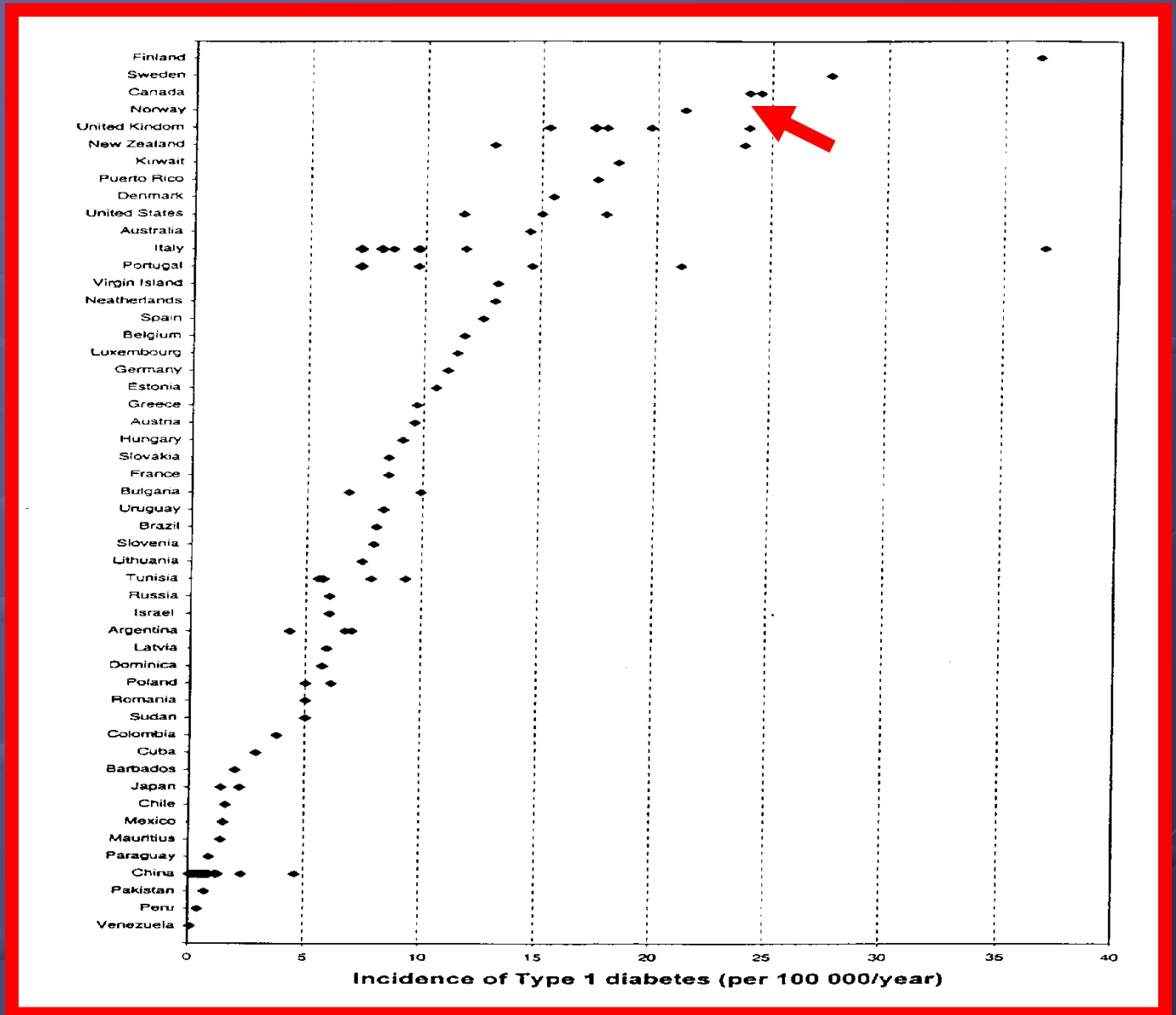
F. Infections
   1. Congenital rubella
   2. Cytomegalovirus
   3. Others

G. Uncommon forms of immune-mediated diabetes
   1. "Stiff man" syndrome
   2. Anti-insulin receptor antibodies
   3. Others

H. Other genetic syndromes sometimes associated with diabetes
   1. Down syndrome
   2. Klinefelter syndrome
   3. Turner syndrome
   4. Wolfram syndrome – diabetes insipidus, diabetes mellitus, optic atrophy and deafness (DIDMOAD)
   5. Freiderich ataxia
   6. Huntington chorea
   7. Laurence-Moon-Biedl syndrome
   8. Myotonic dystrophy
   9. Porphyria
   10. Prader-Willi syndrome
   11. Others

Gestational diabetes mellitus

Worldwide Incidence of Type 1 Diabetes



T1DM Finnish Incidence

NZ

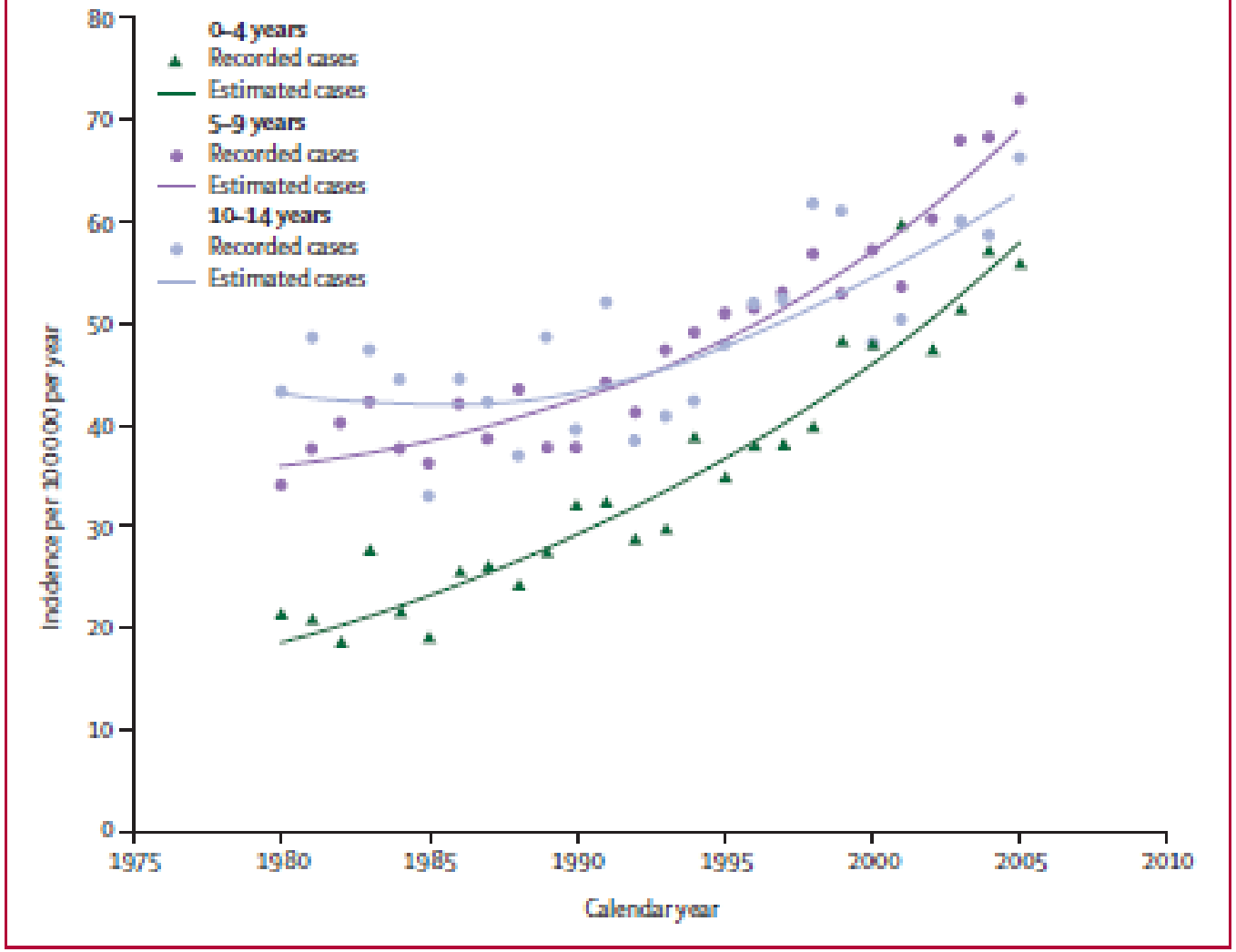


Figure 2: Time trends in age-specific incidence rates of type 1 diabetes

- Harjutsalo Lancet 2008

T1DM Auckland incidence

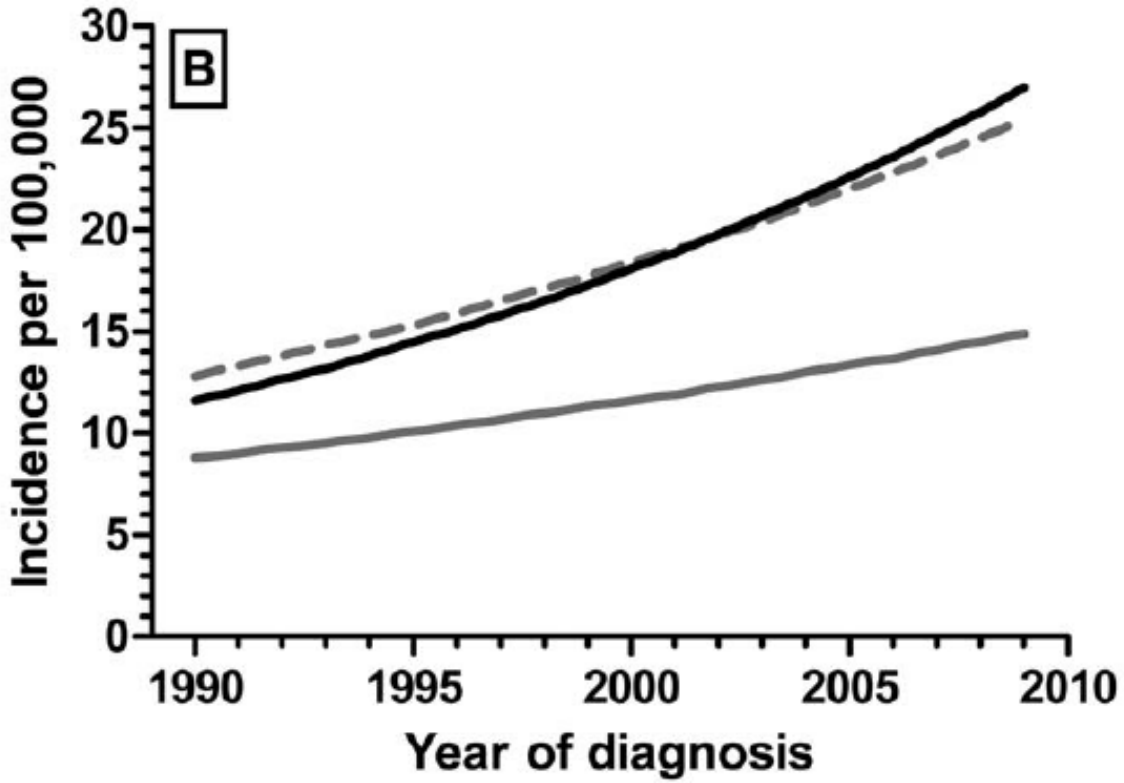


Figure 1. Incidence of new cases of type 1 diabetes mellitus per 100,000 age-matched inhabitants diagnosed in Auckland (New Zealand) during 1990–2009. A) For all children <15 yr; B) for children 0–4 yr (solid gray line), 5–9 yr (dashed gray line), and 10–14 yr (solid black line).

Derraik, J. G. 2012 PloS one

T1DM Auckland incidence

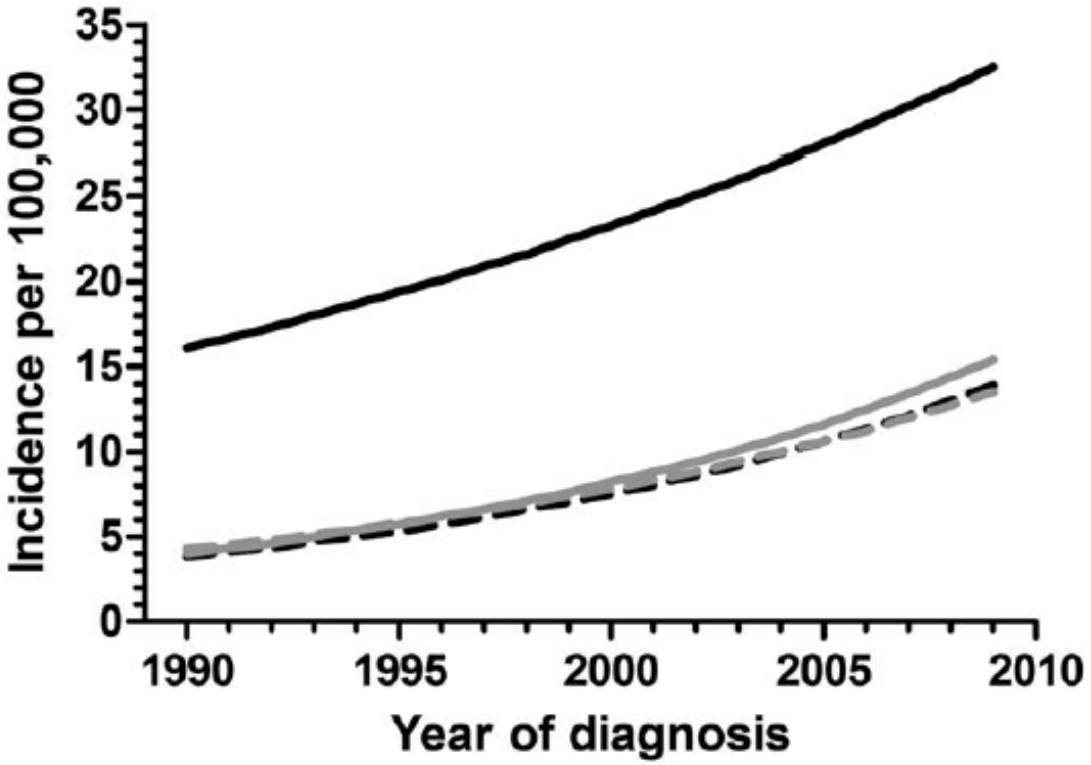
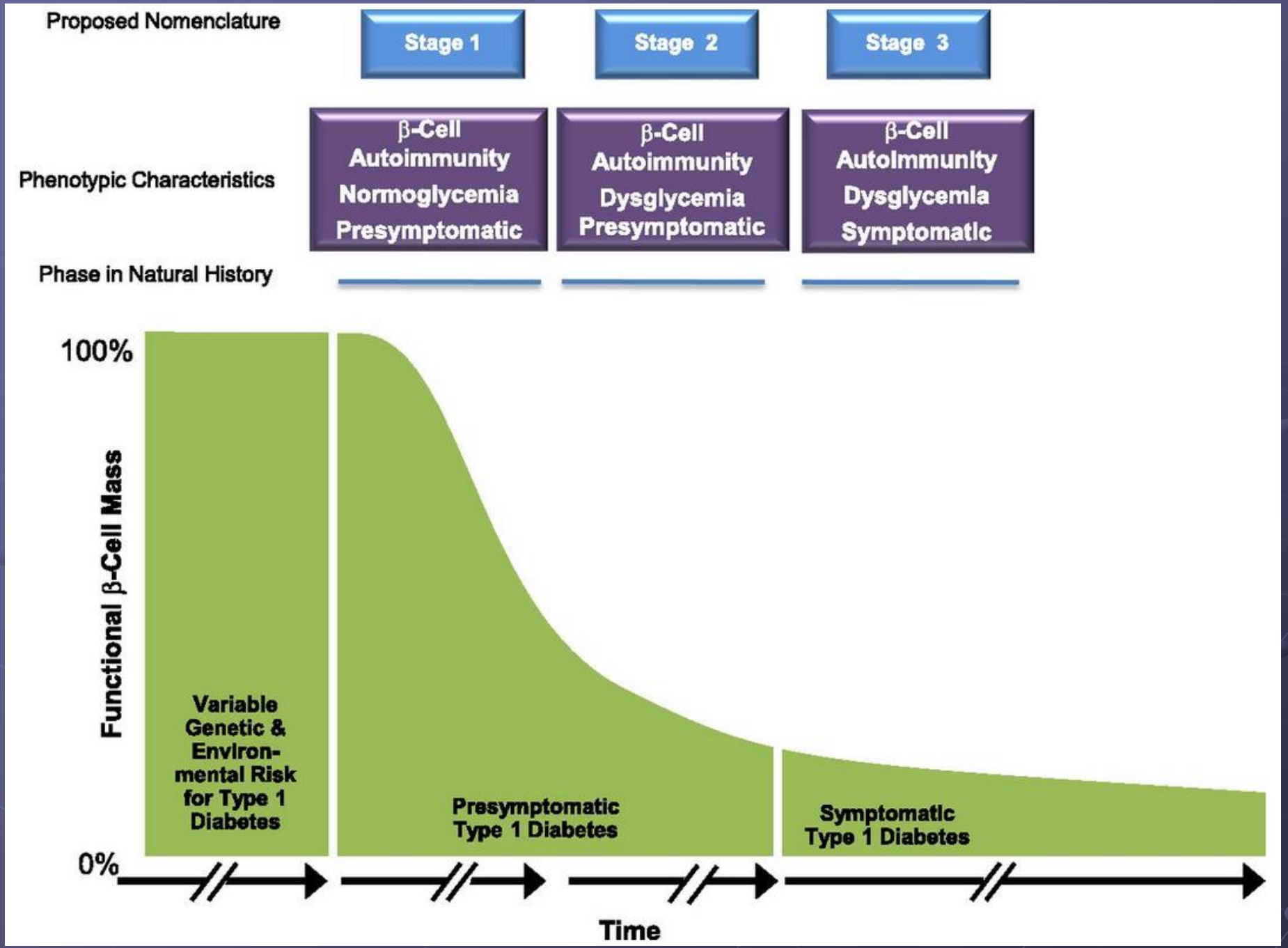
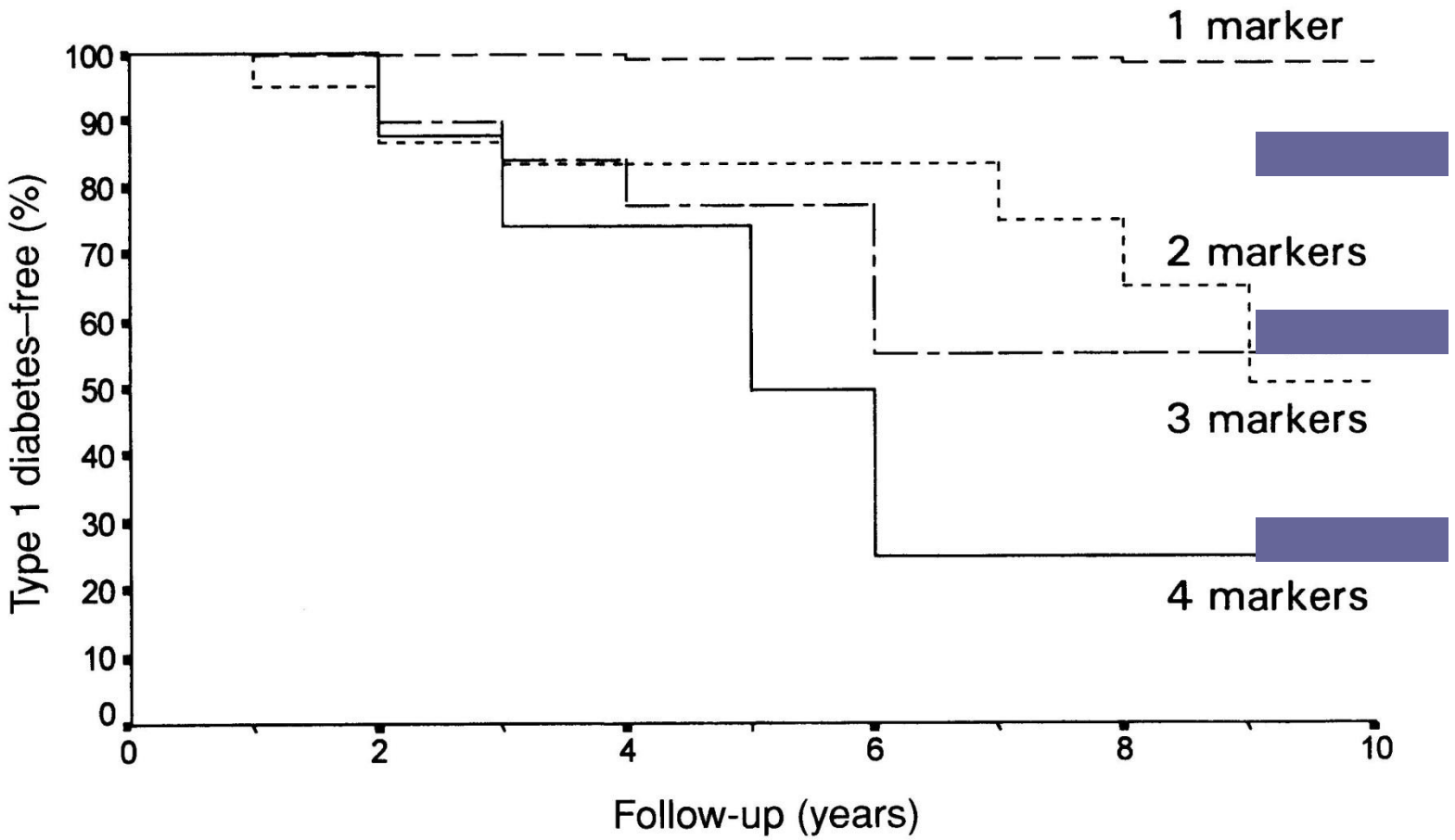


Figure 2. Incidence of new cases of type 1 diabetes mellitus per 100,000 age-matched inhabitants diagnosed in Auckland (New Zealand) among different ethnic groups during 1990–2009: New Zealand Europeans (solid black line), Maori (dashed black line), Pacific Islanders (solid gray line), Others (dashed gray line).

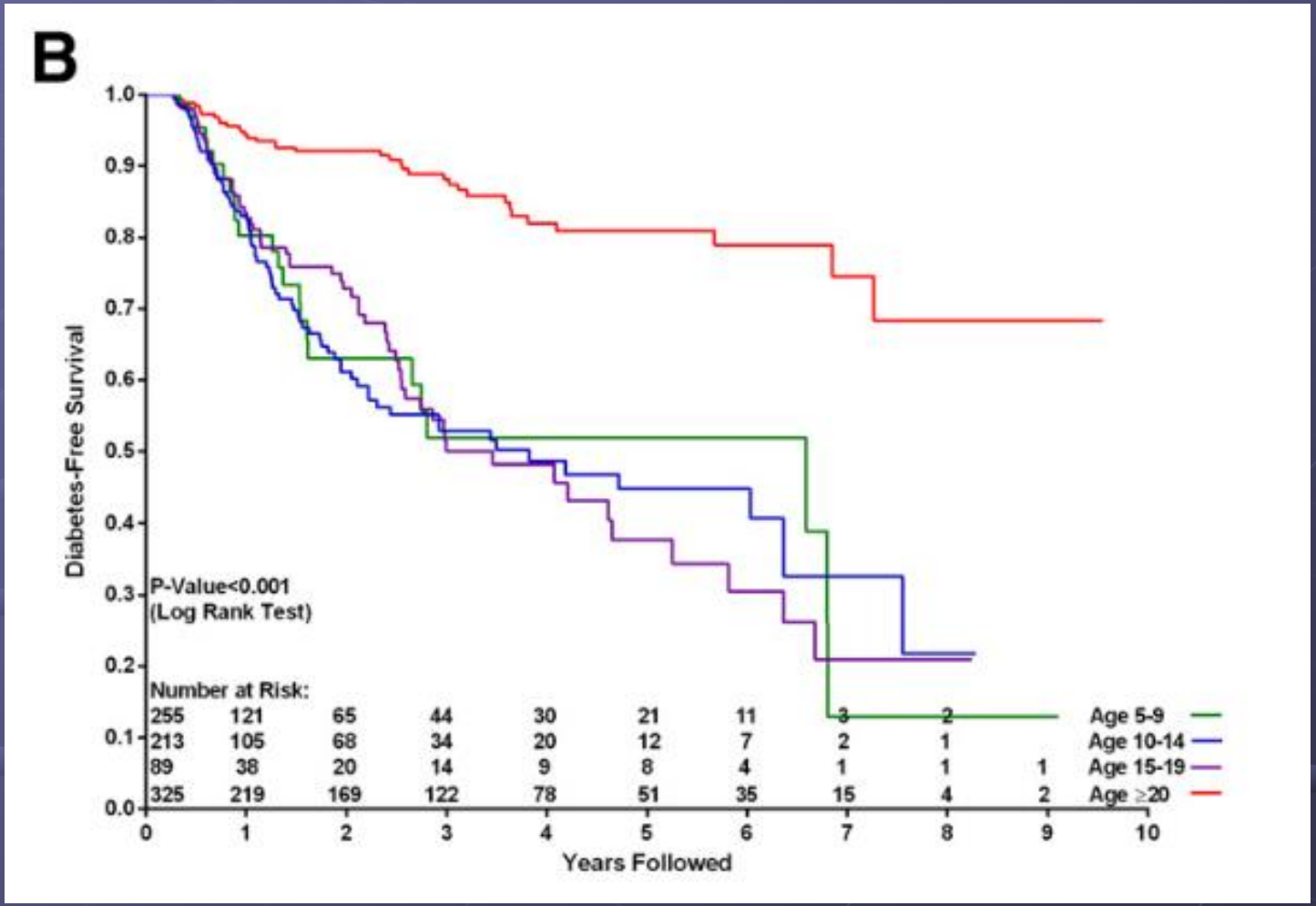
Derraik, J. G. 2012 PloS one


Proposed Nomenclature
Stage 1
Stage 2
Stage 3
Phenotypic Characteristics
β-Cell Autoimmunity Normoglycemia Presymptomatic
β-Cell Autoimmunity Dysglycemia Presymptomatic
β-Cell Autoimmunity Dysglycemia Symptomatic
Phase in Natural History
100%
Functional β-Cell Mass
Variable Genetic & Environ-mental Risk for Type 1 Diabetes
Presymptomatic Type 1 Diabetes
Symptomatic Type 1 Diabetes
0%
Time

T1D risk increases with number of antibodies
GAD IA2 Insulin AA Islet and ZnT8

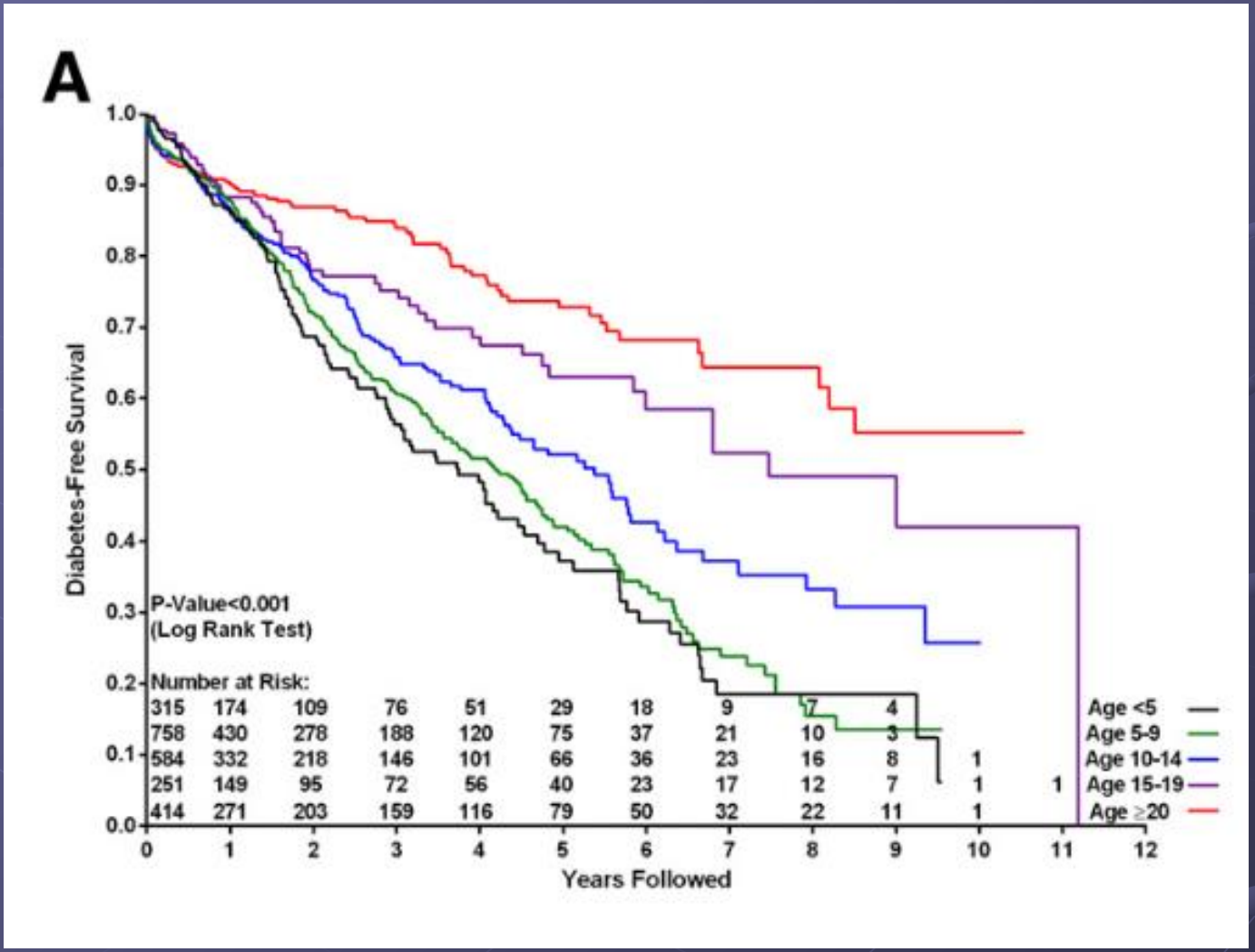


Children develop T1DM faster



From Time point of Abnormal glucose tolerance

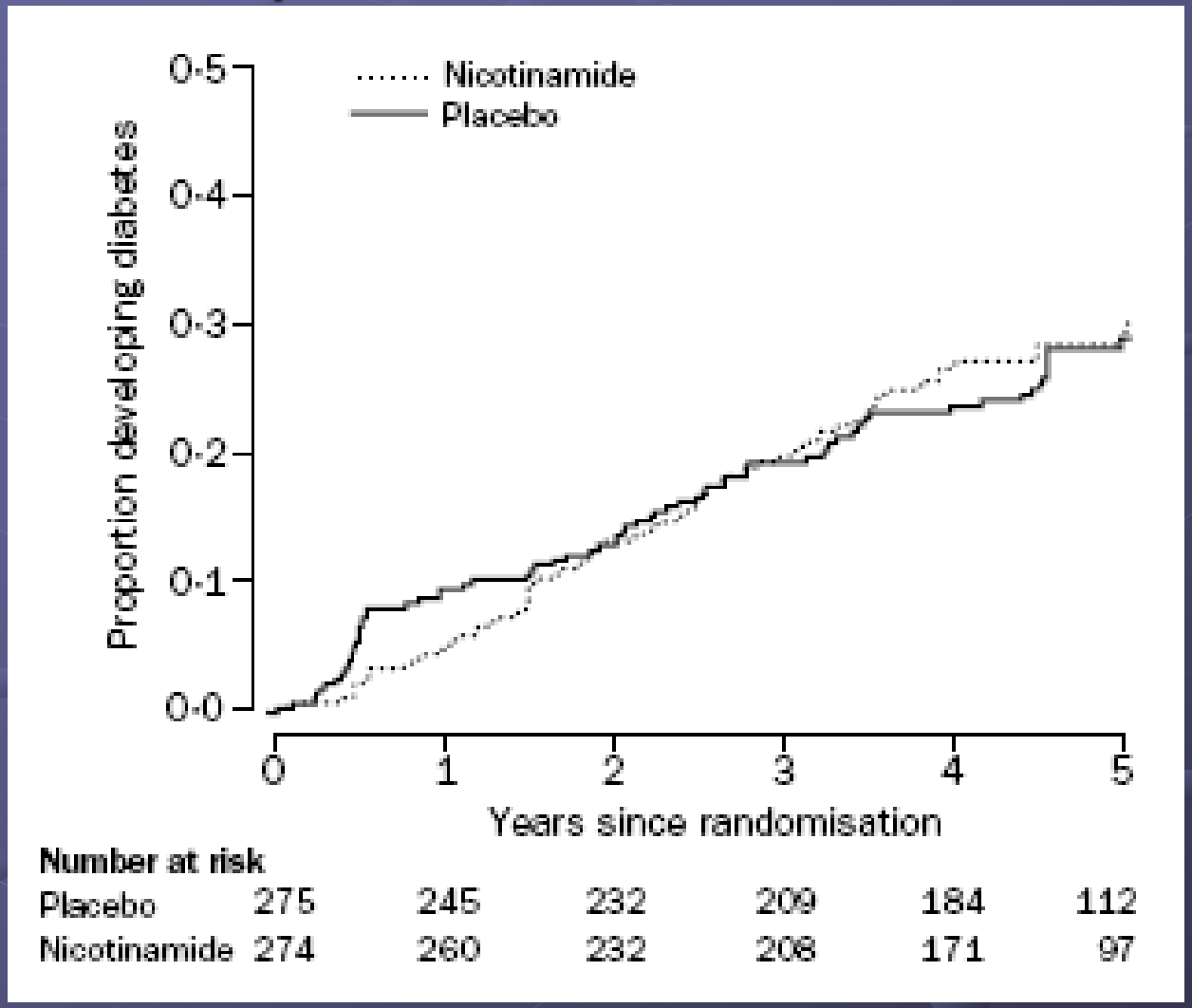
Children develop T1DM faster



From appearance of double AB positive

ENDIT

European Nicotinamide Diabetes Intervention Trial

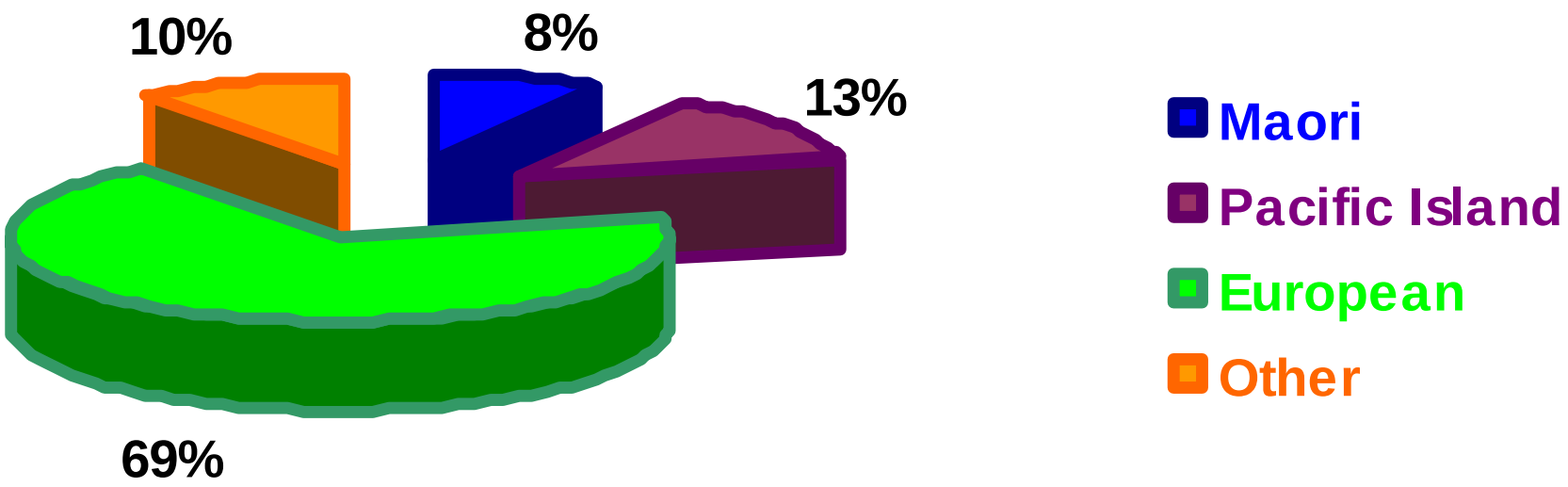


Lancet 2004; **363**: 925–31

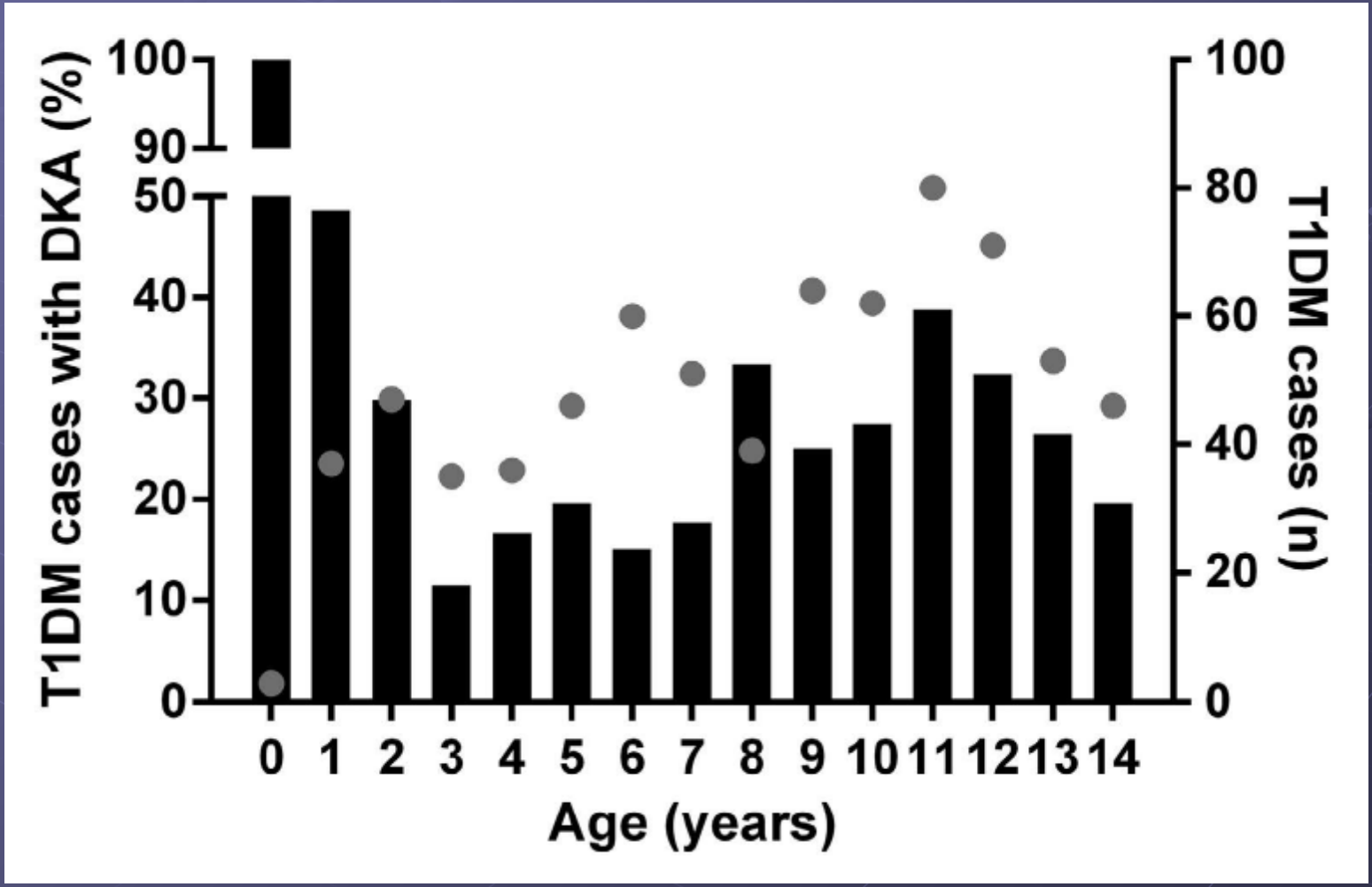
T1DM 2016

- Averaging 60-70 new cases per year.
- 27% New onset DKA rate
- ~450 in clinic in total
  - 30 T2DM/ 20 Other
- 20% of all children on insulin pumps
- Adolescent cohort is 150
  - Feeds into 3 DHB and other

Starship service
Type 1 Diabetes Mellitus
(~450- 500 patients)

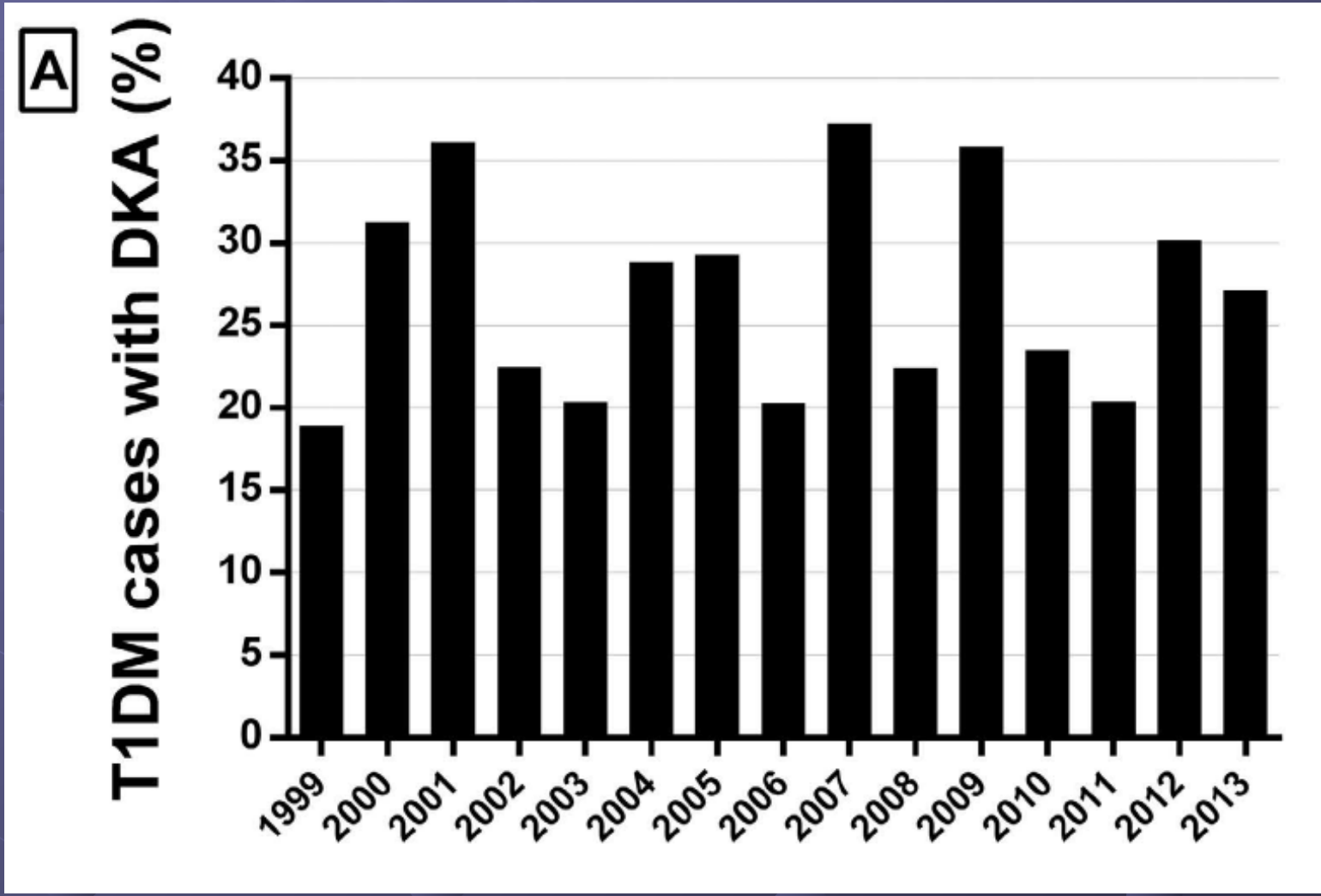


T1DM Auckland DKA at new onset



Jefferies, C. 2015

T1DM Auckland DKA at new onset



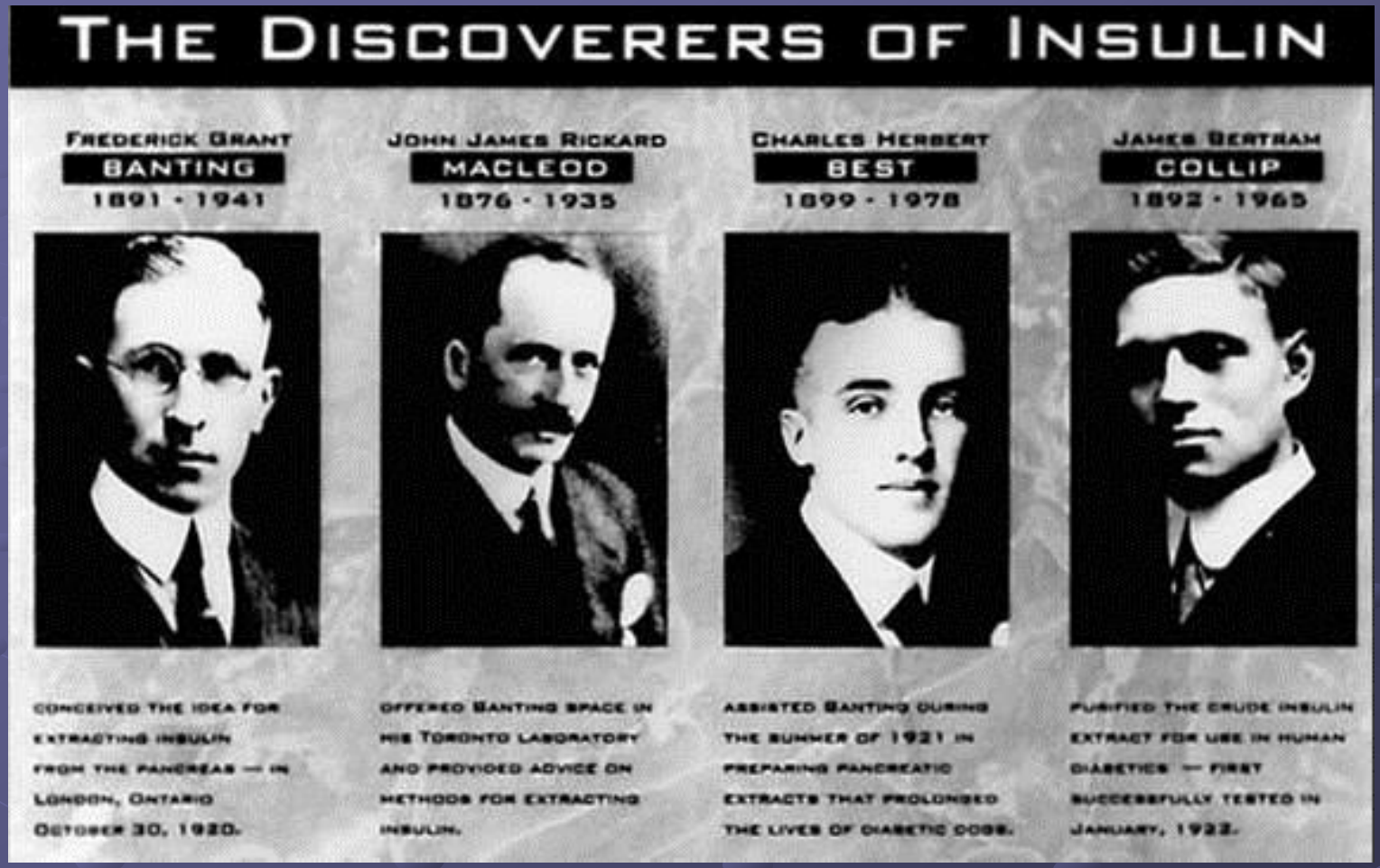
Jefferies, C. 2015

Particulars of children

- Tiny doses (0.5 u/kg/day)
- Tend to mix insulin with syringes
- Sensitive to short acting
- Major impact of intercurrent illnesses
- Increased risk of cognitive loss with recurrent severe hypoglycaemia (<5 years) (or DKA)
- Constant need to adjust for growth
- Adolescence is looming

Diabetes Time Line

- Oct 1920
  - Conception of idea of extracting insulin
- 1921 The “team”
  - Student Best
  - Macleod Supervisor
  - Collip pharmacologist
- 1921 Treat first
- De-pancreactomised dog

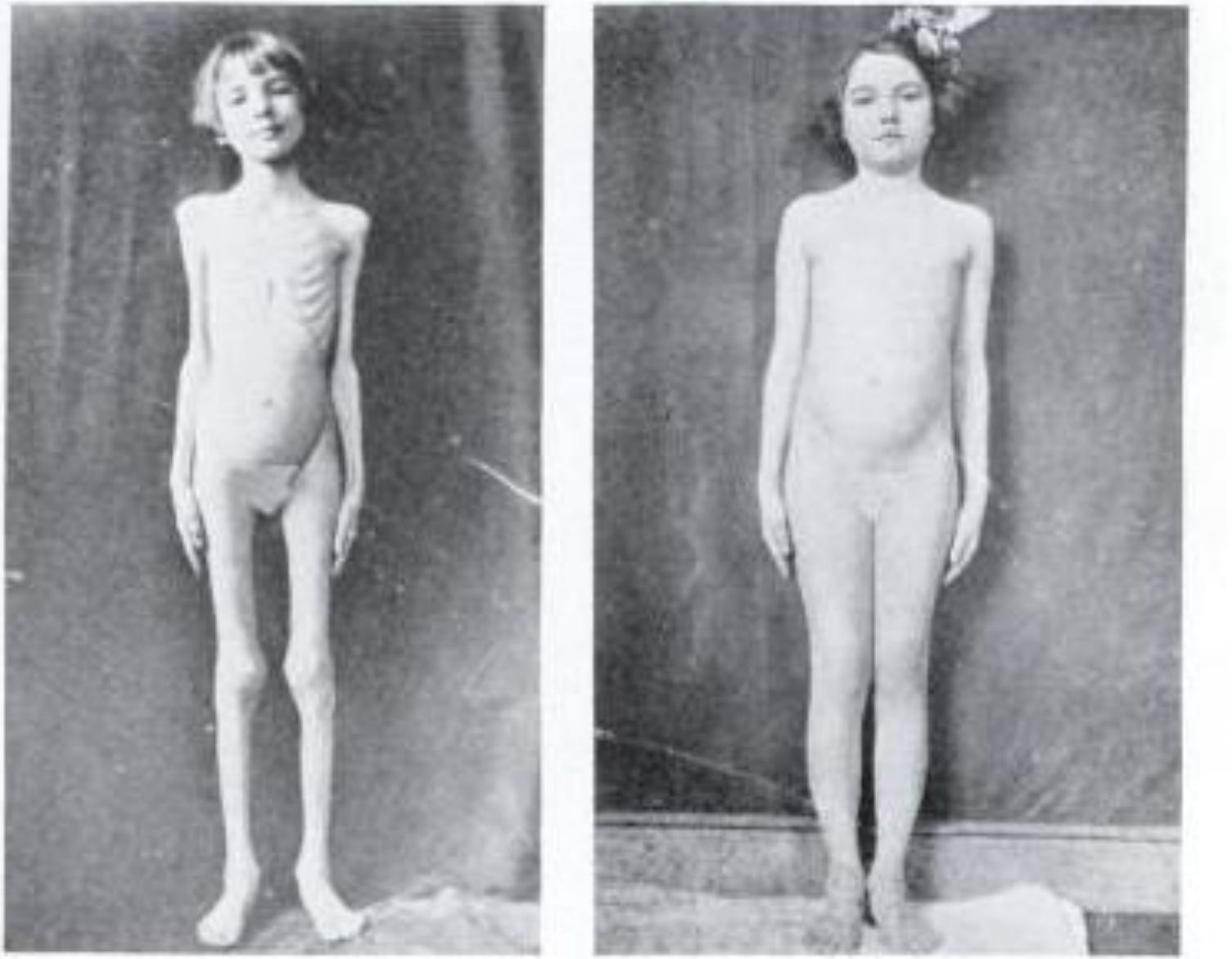


1923 Nobel prize
Macleod and Banting

- 1922 First Human subject
  - Leonard Thompson
  - 7.5 cc each buttock of “Macleod’s serum”
  - Reduction in glycosuria
  - Secondary abscess formation

Diabetes – history of treatment

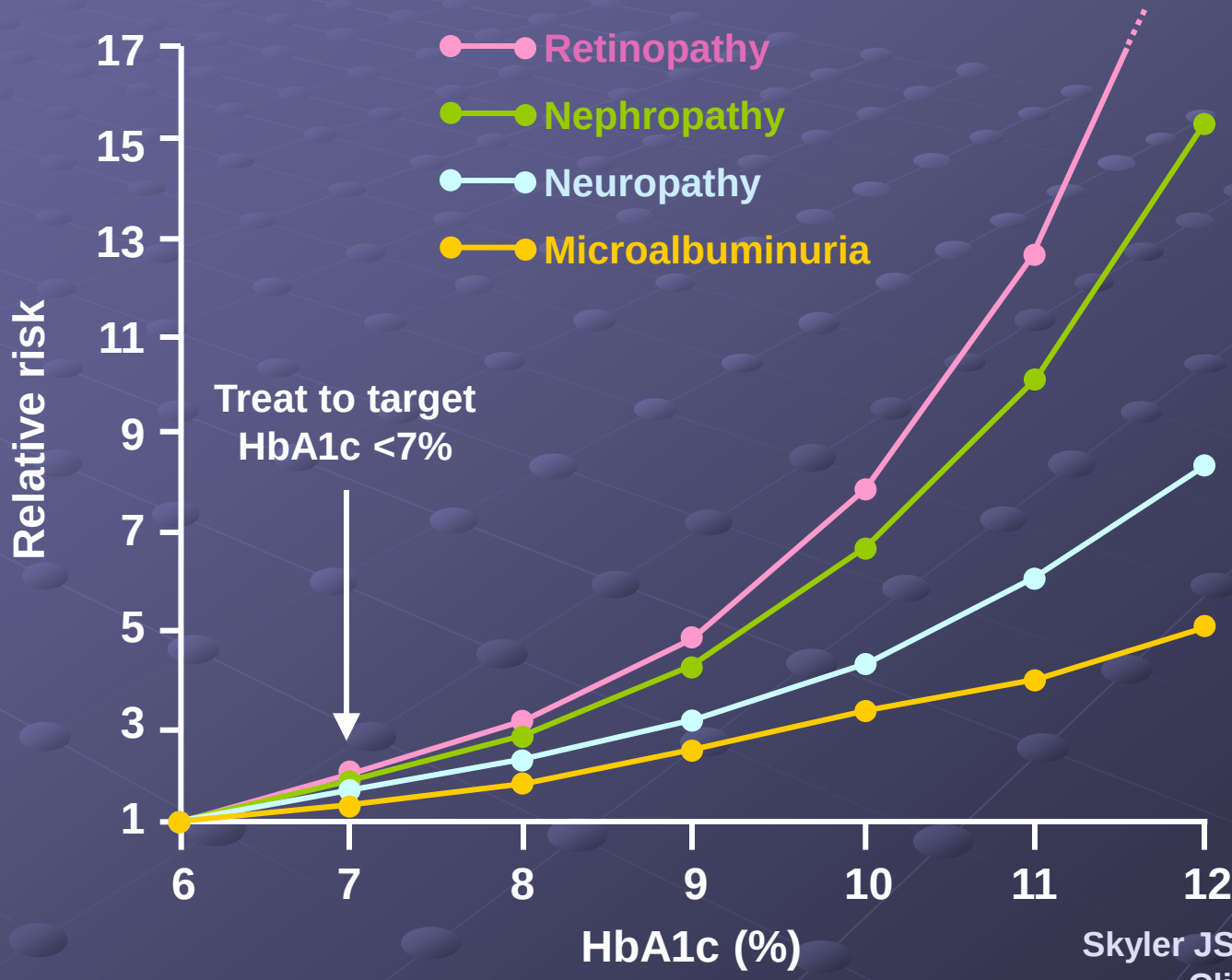
- 1923
- Eli Lilly and Company markets Iletin® (animal source insulin), the first commercially available insulin.




1980

Benefits of treating to target: type 1 diabetes

Achievement of HbA1c targets reduces costly complications



Skyler JS. Endocrinol Metab Clin 1996;25:243–254.

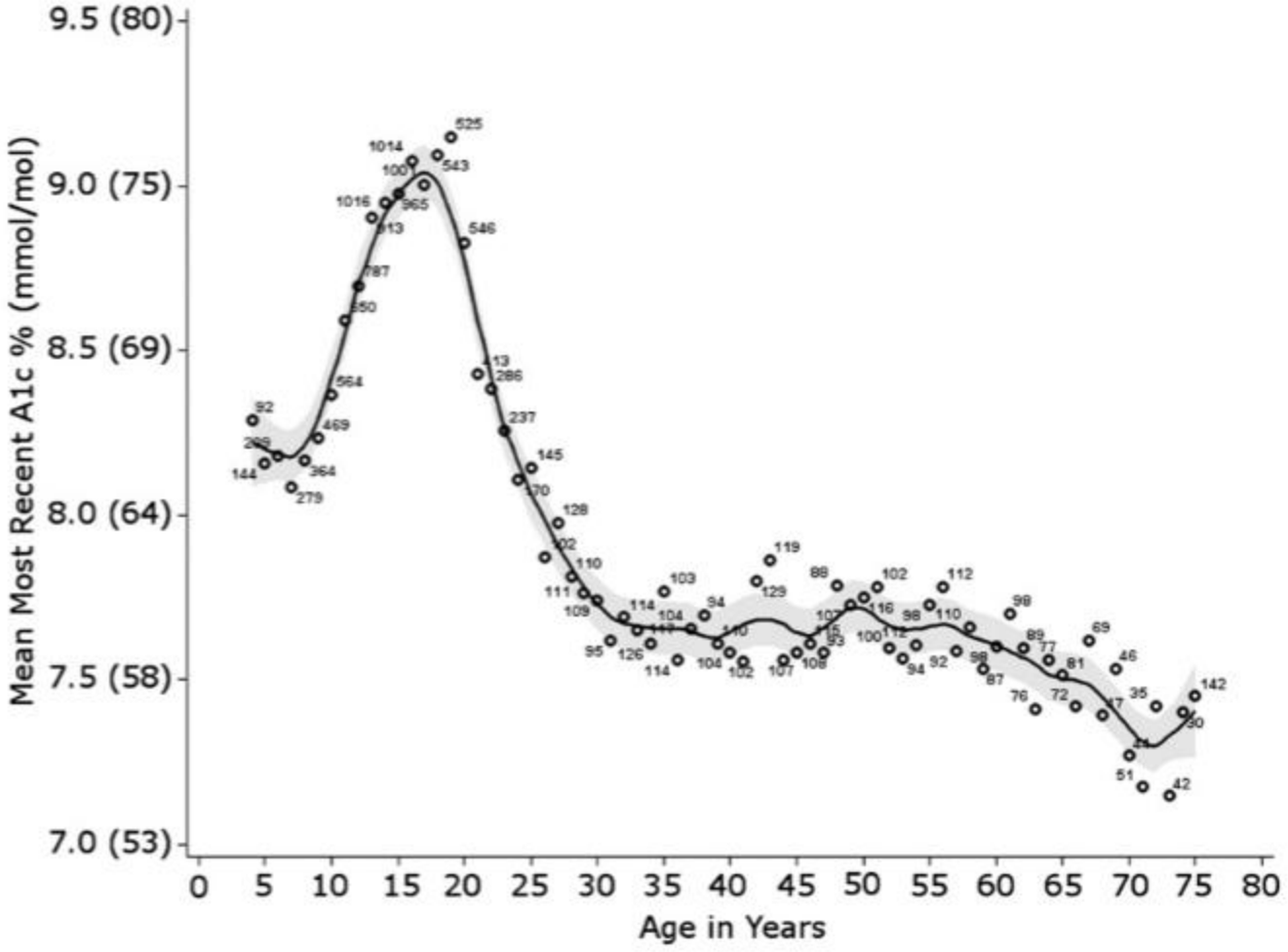
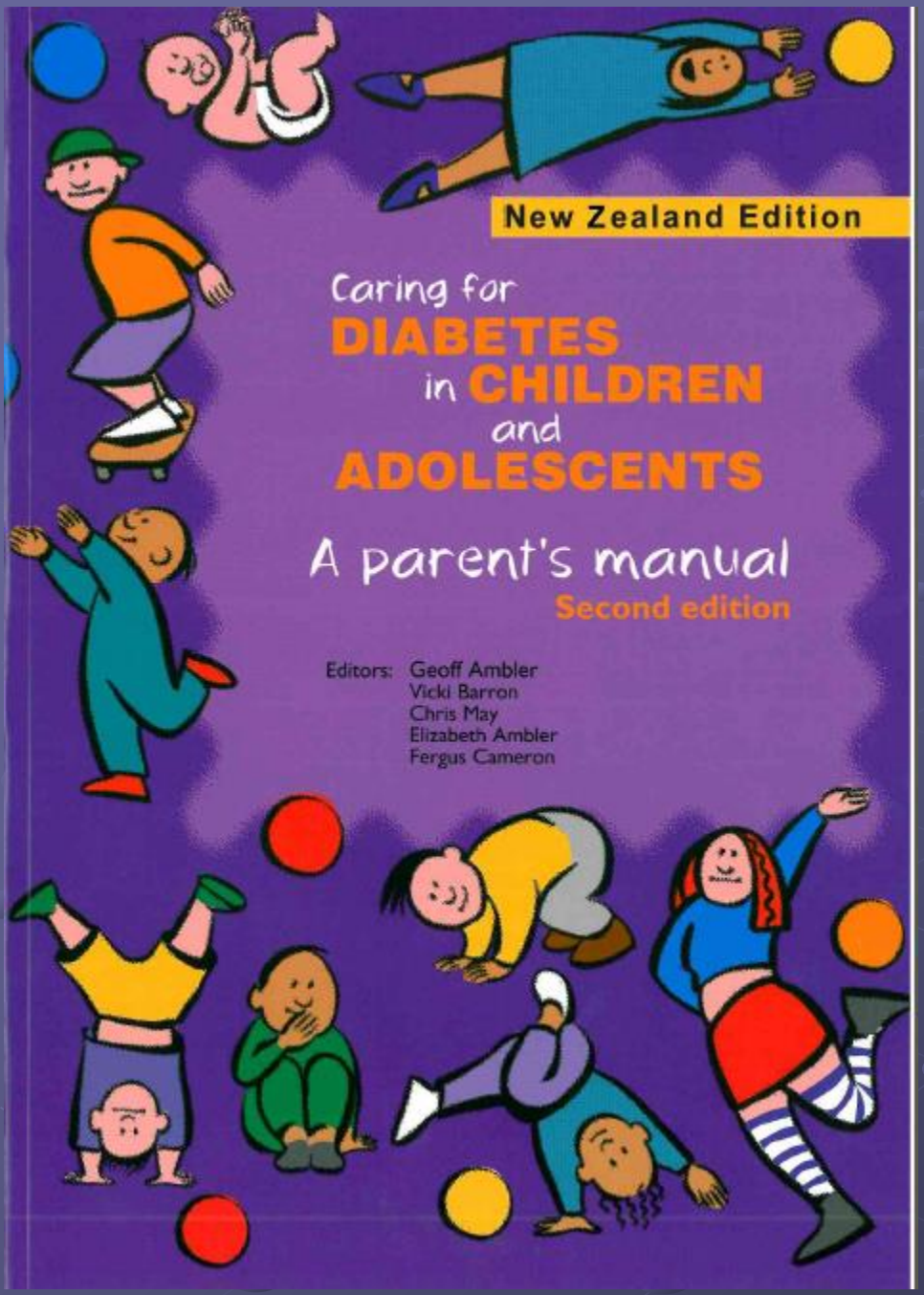


Figure 1—Mean HbA_{1c} levels by age. Circles represent mean HbA_{1c} values for each year of age from 16,057 T1D Exchange registry participants. Participants aged <4 years were grouped as age 4 and those aged ≥75 years were grouped as age 75. Shaded area represents the 95% CI around smoothed line. Numbers next to circles are the *N* for each year of age. Reprinted with permission from Miller et al. (10).



CHAPTER 15

DIFFERENT AGE GROUPS AND DIABETES

KEY POINTS

Diabetes affects children differently throughout the age groups. Different issues arise at different ages.

Toddlers and preschoolers

PRESCHOOL children are imaginative thinkers, and are in what is called the trust stage and fantasy stage. During this stage parents look after all aspects of the diabetes, but a gradual increase in participation in diabetes routines is encouraged. It may be helpful to play games around the diabetes procedures, gradually letting the child help (eg, fingerpricks, choosing the injection site, pressing the plunger during injection). Letting them practise on their dolls or teddy bears is very helpful.

Young children often have difficulty recognising hypos, but there is a gradual increasing recognition of hypo symptoms, which should be encouraged by discussion about feelings at the times of hypos. Hypos are more risky during this age because the toddler is unlikely to recognise or be able to treat them and therefore the child requires constant supervision by a responsible person.

Children may have some understanding of foods they can eat, but apart from giving simple choices, control needs to be taken by the parents or carers. Young children have little concept of time and their routines need to be controlled. Toddlers often don't have set meals and have a grazing style food plan in which they snack often throughout the day.

During this time the aim is to keep blood glucose levels between 5–12 mmol/l

https://www.starship.org.nz/for-health-professionals/new-zealand-child-and-youth-clinical-networks/clinical-network-for-children-and-young-people-with-diabetes/diabetes-in-schools/

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Diabetes in schools

NZCYCN
New Zealand Child & Youth Clinical Network

This information has been produced by the New Zealand Child and Youth Clinical Networks in partnership with the Paediatric Society of New Zealand and supported by the Ministry of Health

This site does not accept referrals or provide clinical advice in response to questions. If you are a New Zealand health professional seeking clinical advice, please use your local clinical pathway. If you are a New Zealand child patient, parent or caregiver seeking clinical advice, please contact your usual doctor. You can read the full site disclaimer ***here****.*

The National Child and Youth Clinical Diabetes Network, in consultation and collaboration with consumer representatives, has undertaken significant work looking at available school diabetes health resources across New Zealand, identifying educational gaps and determining specific resources required to support the safe care of children and youth with diabetes in schools.

One of the primary outcomes of this work is the development of a collection of diabetes action and management plans. This collection of documents is intended to provide a formal guide for the consistent care and management of children and young people with diabetes in schools and early childcare organisations.

In addition the Clinical Diabetes Network have created NZQA medical certificate templates for both type 1 diabetes mellitus and type 2 diabetes mellitus treated with insulin, to be used to support **'special assessment condition' applications** for students with diabetes.

Download or view a pdf of the following diabetes action and management plans for kindergarten or early childhood settings:

2016 New Zealand Diabetes Management Plan (Twice daily injections)

2016 New Zealand Diabetes Action Plan (Twice daily injections)

2016 New Zealand Diabetes Management Plan (Multiple daily injections)

2016 New Zealand Diabetes Action Plan (Multiple daily injections)

2016 New Zealand Diabetes Management Plan (Insulin pump)

2016 New Zealand Diabetes Action Plan (Insulin pump)

Download or view a pdf of the following diabetes action and management plans for primary and secondary schools:

2015-16 New Zealand Diabetes Management Plan (Twice daily injections)

2015-16 New Zealand Diabetes Action Plan (Twice daily injections)

2015-16 New Zealand Diabetes Management Plan (Multiple daily injections)

2015-16 New Zealand Diabetes Action Plan (Multiple daily injections)

2015-16 New Zealand Diabetes Management Plan (Insulin pump)

2015-16 New Zealand Diabetes Action Plan (Insulin pump)

Paediatric Society New Zealand

NZCYCN
New Zealand Child & Youth Clinical Network

DIABETES & EXAMS
Information for Young People with Diabetes Mellitus

Anxiety and Preparing

Diabetes adds an entire new level of anxiety to exams. To perform at your best cognitively, you will need to have close to normal blood glucose levels. When the BGL is too high you may be thirsty, tired, have difficulty concentrating and may need to go to the toilet a lot. When the BGL is too low, you will have trouble concentrating and may become confused. Stress can also affect your blood glucose levels however this is very individual i.e. some people go very high and others experience low levels. It really is worth making the extra effort to try and get the BGL's under control before exam time starts. Some students with diabetes trial different approaches to management around the "mock exam" period to try and ascertain what will be the best approach to control blood glucose levels around the actual exams. Your Diabetes team will be able to support you with this so do talk to them about exams and exam planning well before your final exams are scheduled.

Diabetes Food

It is imperative that you have access to "quiet hypo food" (such as sucking sweets or juice and fruit bars rather than crunchy crisps), your blood glucose testing equipment and insulin administration equipment during exams. School personnel supervising the exam need to know in advance that you have Type 1 diabetes and that you may need to carry out a blood test, eat, administer a dose of insulin or go to the toilet during the exam.

Rest Breaks

NZQA prefer schools to advance apply for formal "Rest Breaks" for all young people with diabetes during exams. A "Rest Break" is defined as when a student can put up their hand to indicate to the supervisor they are starting the break, then they can do their blood testing, eat and drink if they want to, and then indicate to the supervisor that they are ready to start writing again. The supervisor notes the time taken, and adds it to the end of the exam session so that the student doesn't lose writing time for the medical necessity (usually this is no longer than 30 minutes in total).

The first insulins

Introduction of Insulin in the United States by Lilly

Product	Concentration	Introduction
Insulin	U-10	1923
Insulin	U-20	1923
Insulin	U-40	1925
Insulin	U-80	1925
Regular Insulin	U-80	1926
Protamine Zinc Insulin	U-40	1937
Protamine Zinc Insulin	U-80	1938
NPH Insulin	U-40	1950
NPH Insulin	U-80	1950
Regular Insulin	U-500	1952
Lente® Insulin	U-40	1954
Lente® Insulin	U-80	1954
Semilente® Insulin	U-40	1957
Semilente® Insulin	U-80	1957
Ultralente® Insulin	U-40	1957
Ultralente® Insulin	U-80	1957
Regular Insulin	U-100	1973
NPH Insulin	U-100	1973
Protamine Zinc Insulin	U-100	1973
Lente® Insulin	U-100	1973
Semilente® Insulin	U-100	1973
Ultralente® Insulin	U-100	1973

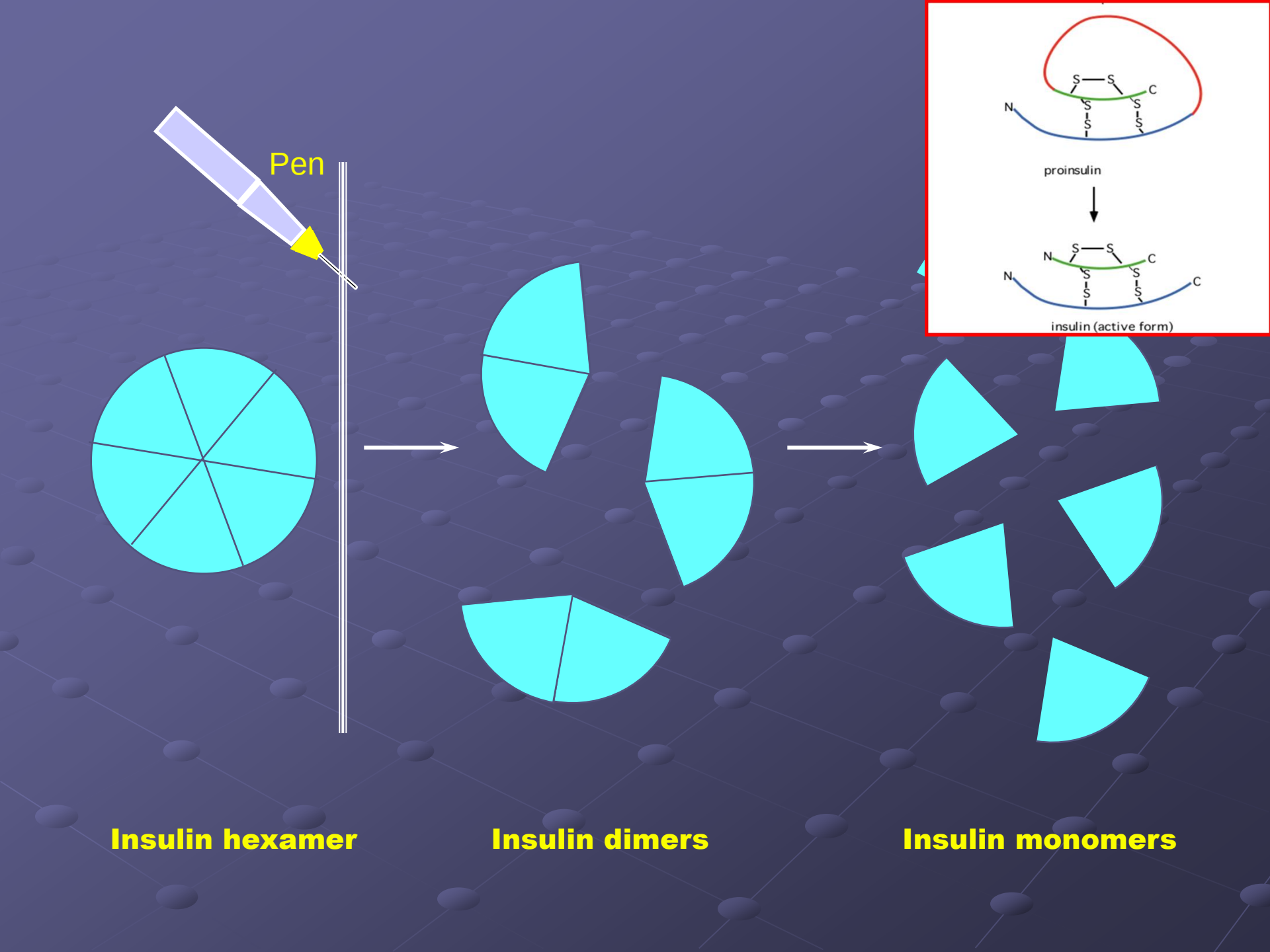
Additional information available to the profession on request.

The first name in Insulin therapy

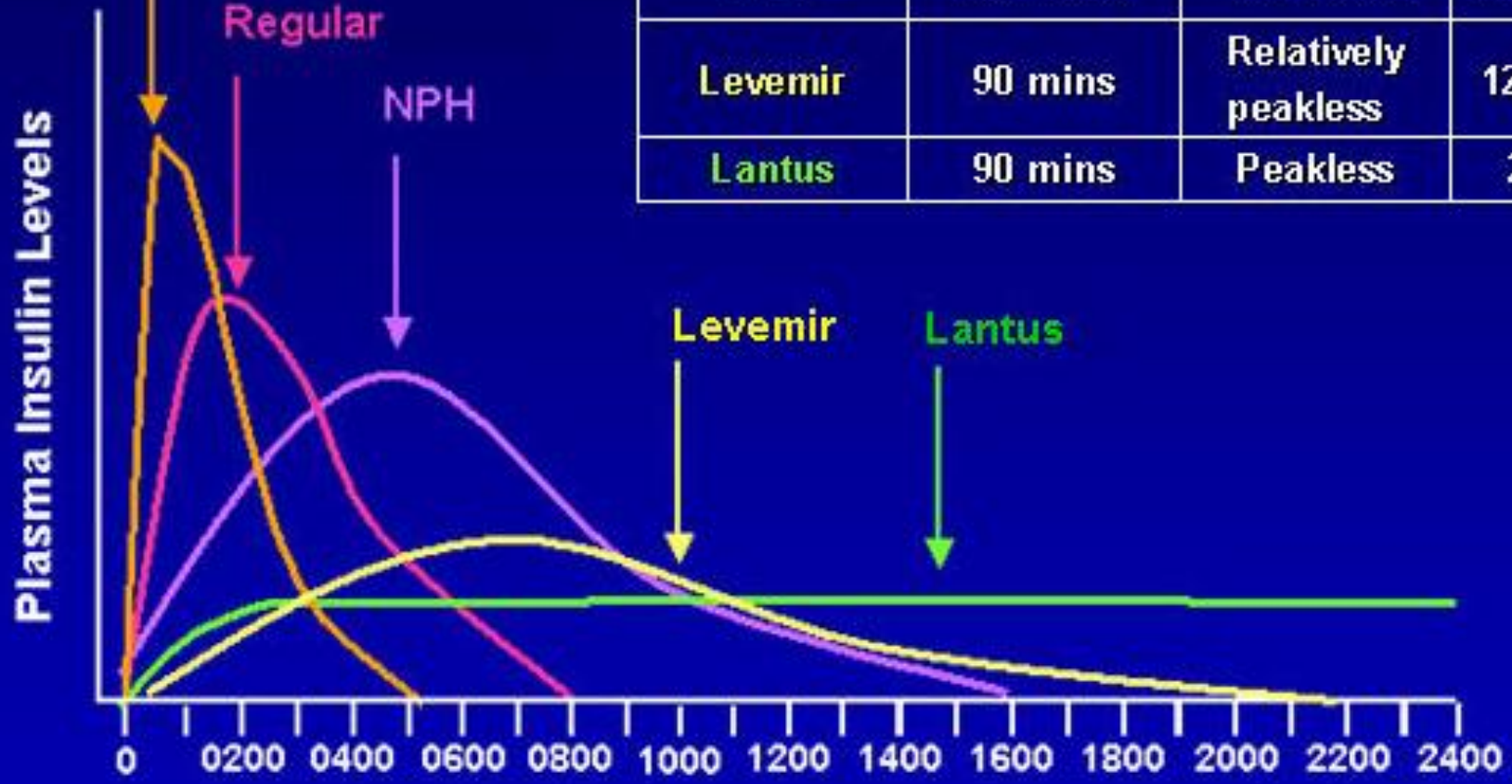
Lilly

400495

Eli Lilly and Company
Indianapolis, Indiana 46206

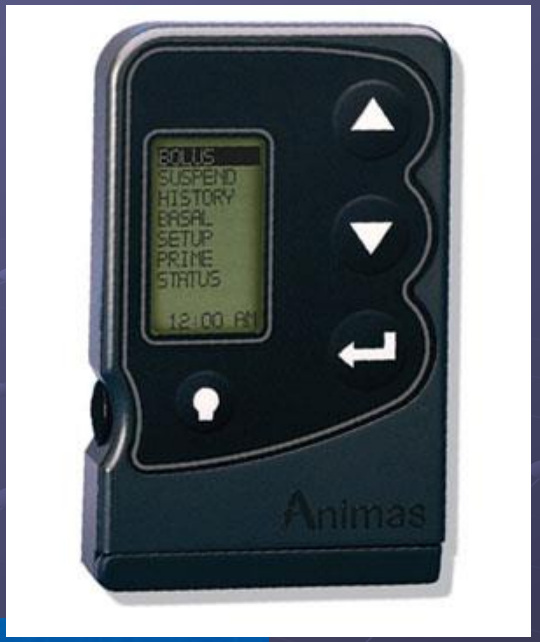

Pen
proinsulin
insulin (active form)
Insulin hexamer
Insulin dimers
Insulin monomers

Insulin	Onset	Peak	Duration
Apidra Humalog Novolog	10-15 mins	60-90 mins	4-5 hours
Regular	30-60 mins	2-4 hours	5-8 hours
NPH	1-3 hours	5-8 hours	12- 18 hours
Levemir	90 mins	Relatively peakless	12-24 hours
Lantus	90 mins	Peakless	24 hours



Why not inhale insulin?

Insulin Pumps



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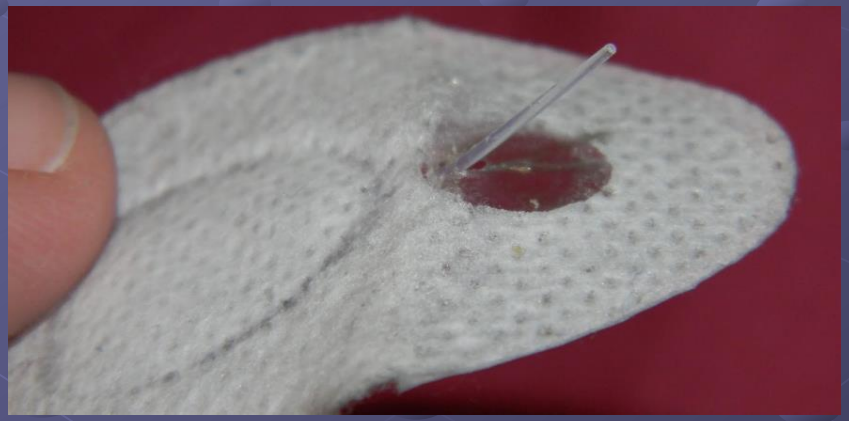
Animas® Vibe™ Insulin Pump

Hello. Meet the Animas® Vibe™ insulin pump.

It's here to help you perform at your best.

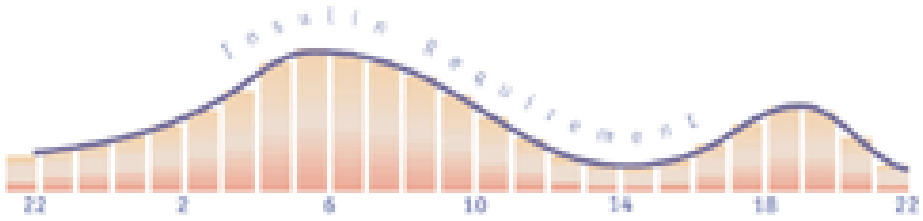
Life is full of places to go, things to do, games to play, birthday cake to eat and the list goes on. The Animas® Vibe™ insulin pump was designed to be your companion through it all. Animas® Vibe™ has a lot of great features designed to make using a pump the best experience it can be. And that goes well beyond giving an insulin dose. Here's a closer look at the kinds of things our pumps can do to help you perform at your best.

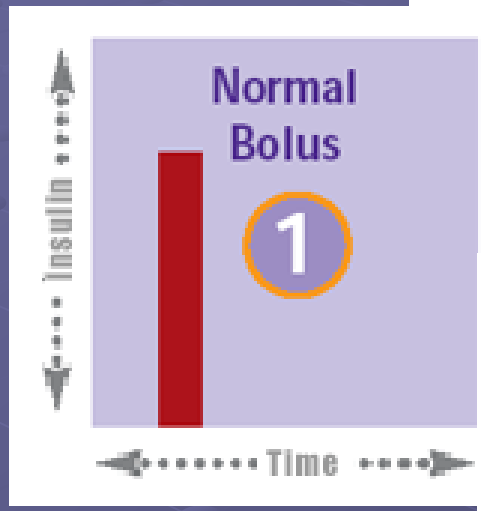
Medtronic Paradigm

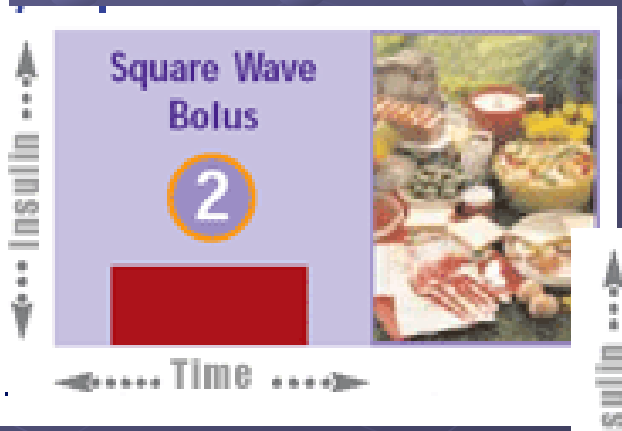


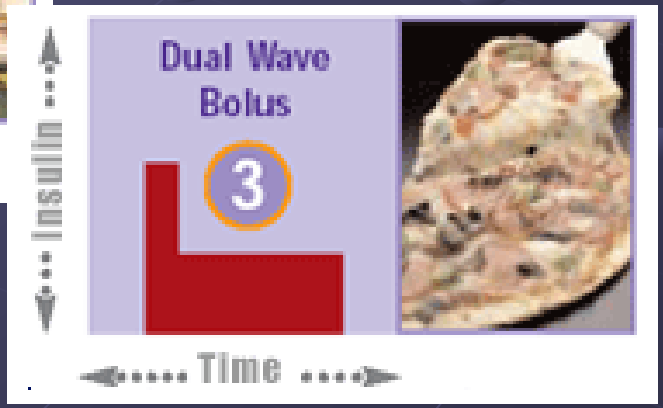

contact™ detach

Basal Delivery Every 3 Minutes







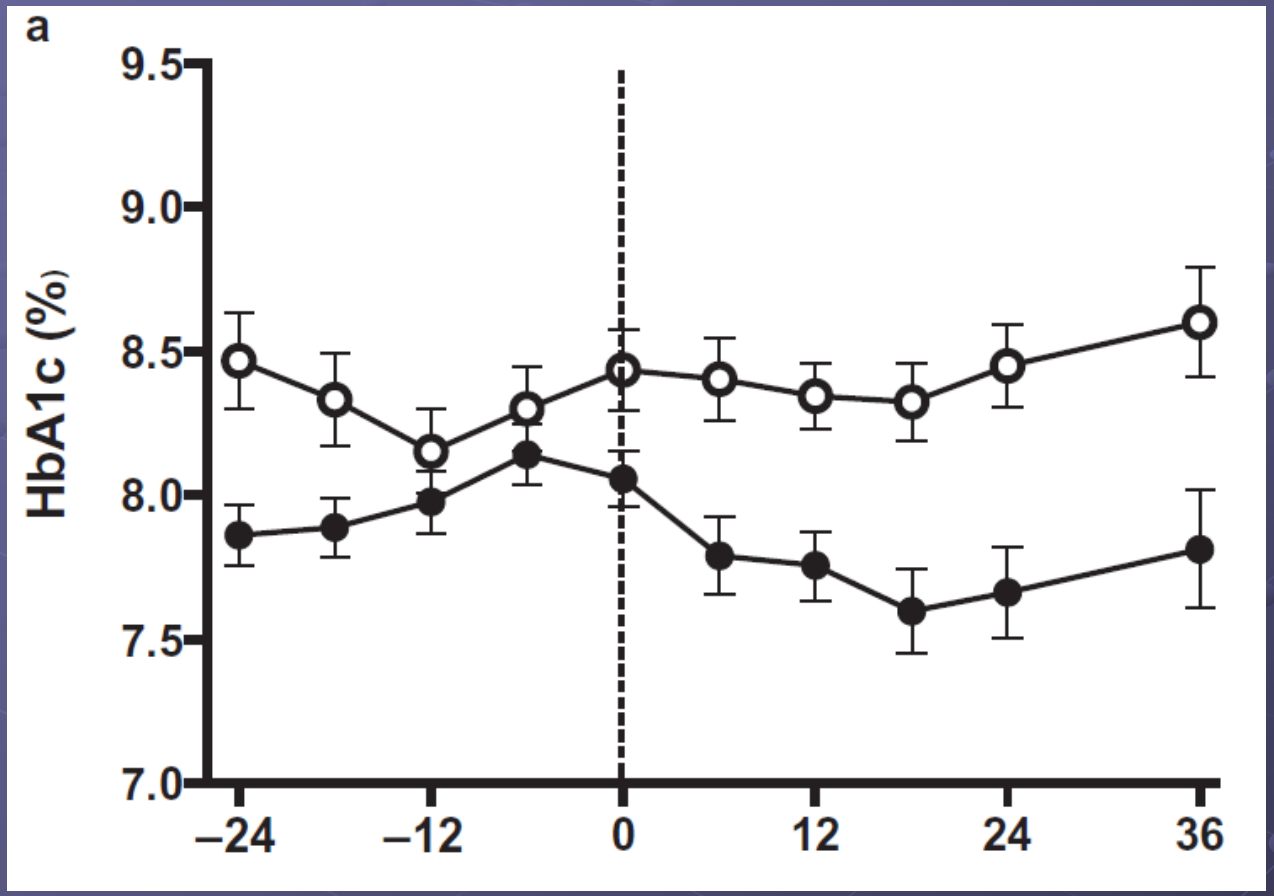


What we know about pumps

	Cochrane review [1]
Improved HbA1c	✓
Less variability in BSL	✓
Improved post prandial BSL	✓
Improved fasting glycaemia	✓
Less events of severe hypoglycaemia	✓
Improvement in quality of life	✓
Less insulin	✓
No weight gain	✓
No increase in DKA	

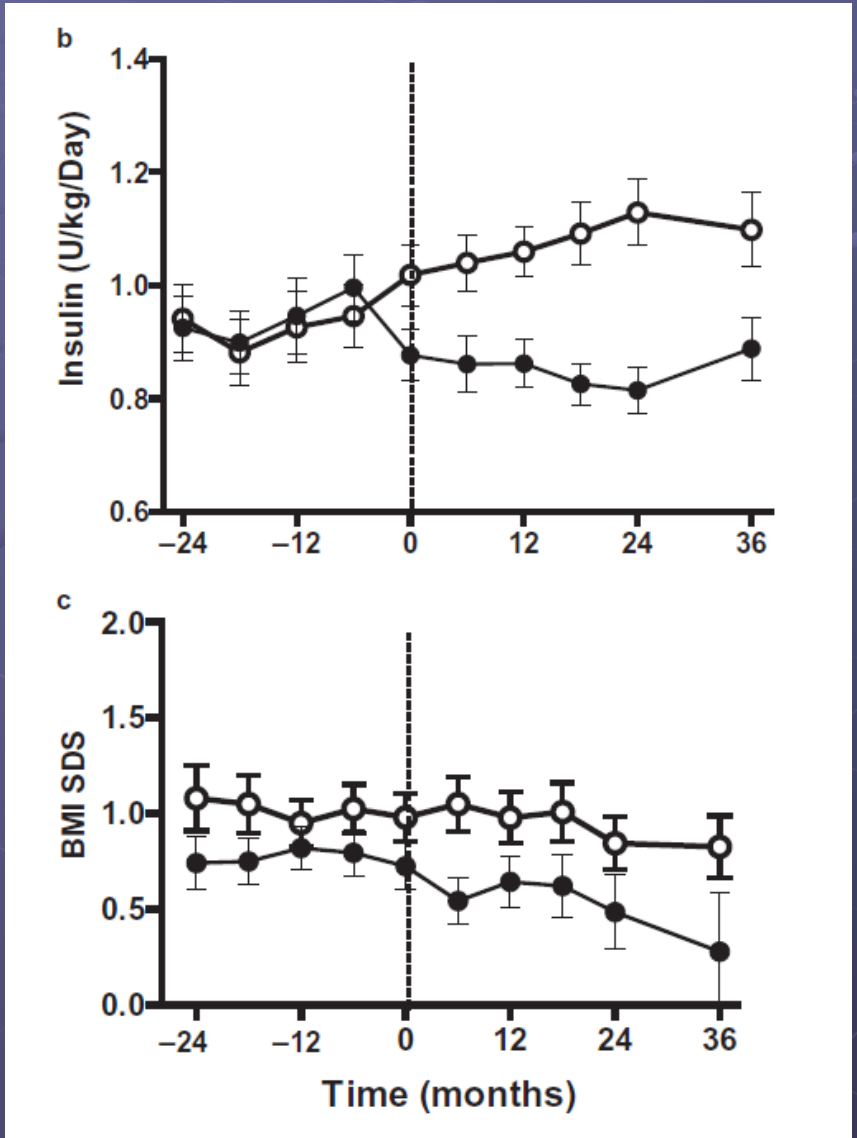
1. Misso, M., K. Egberts, et al. (2010). "Continuous subcutaneous insulin infusion (CSII) versus multiple insulin injections for type 1 diabetes mellitus." Cochrane Database of Systematic Reviews **20(1): CD005103**

Insulin pump Auckland data



De Bock 2012
75 children were treated with insulin-pump therapy for more than 12 months.

Insulin pump Auckland data



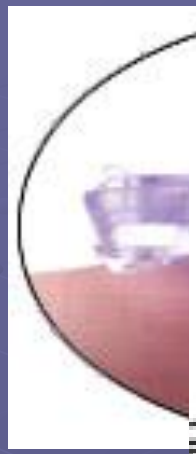
De Bock 2012
75 children were treated with insulin-pump therapy for more than 12 months.

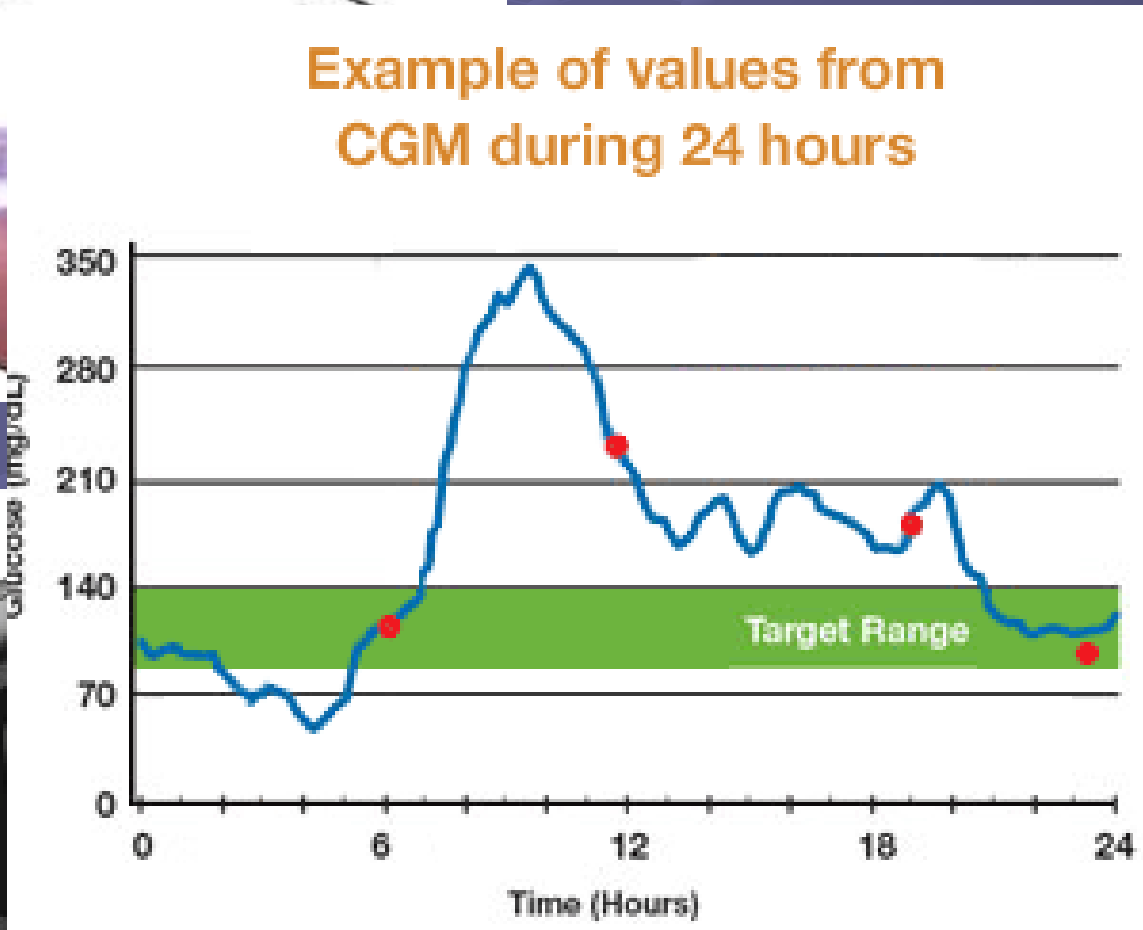
Pharmac funded pump

- Indications funded
  - Recurrent Hypoglycemia
  - Erratic levels and improvement in HbA1c.
- Initial application valid for
  - 3 months for pump
  - 9 months for consumables
- Review at 9 months
  - Renewed for 2 years
  - Ongoing

Glucose sensing and new stuff

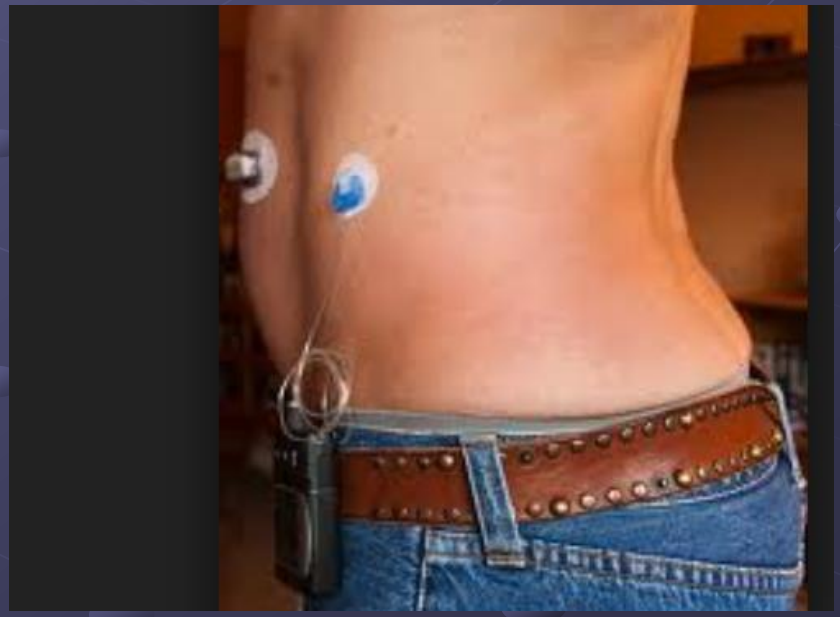
Dexcom

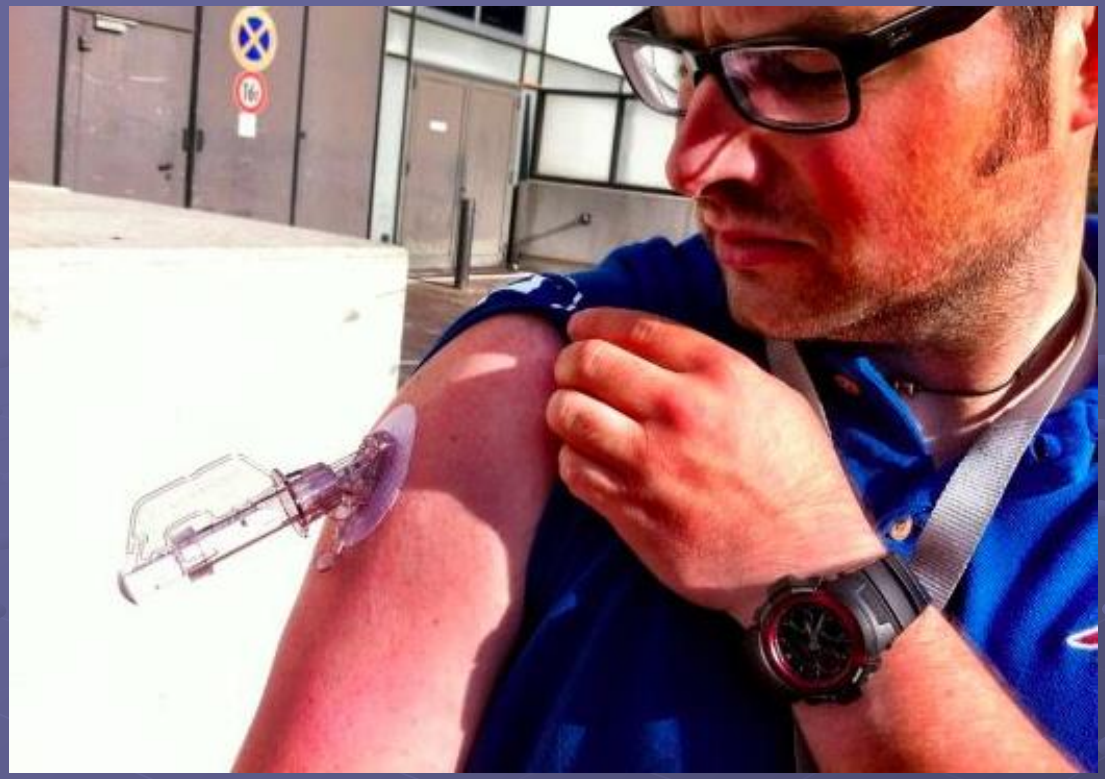



Example of values from
CGM during 24 hours
350
280
210
140
70
0
Target Range
0
6
12
18
24
Time (Hours)

min


Animas
vibe
7.5
mmol/L
1:17P
24hr
OK

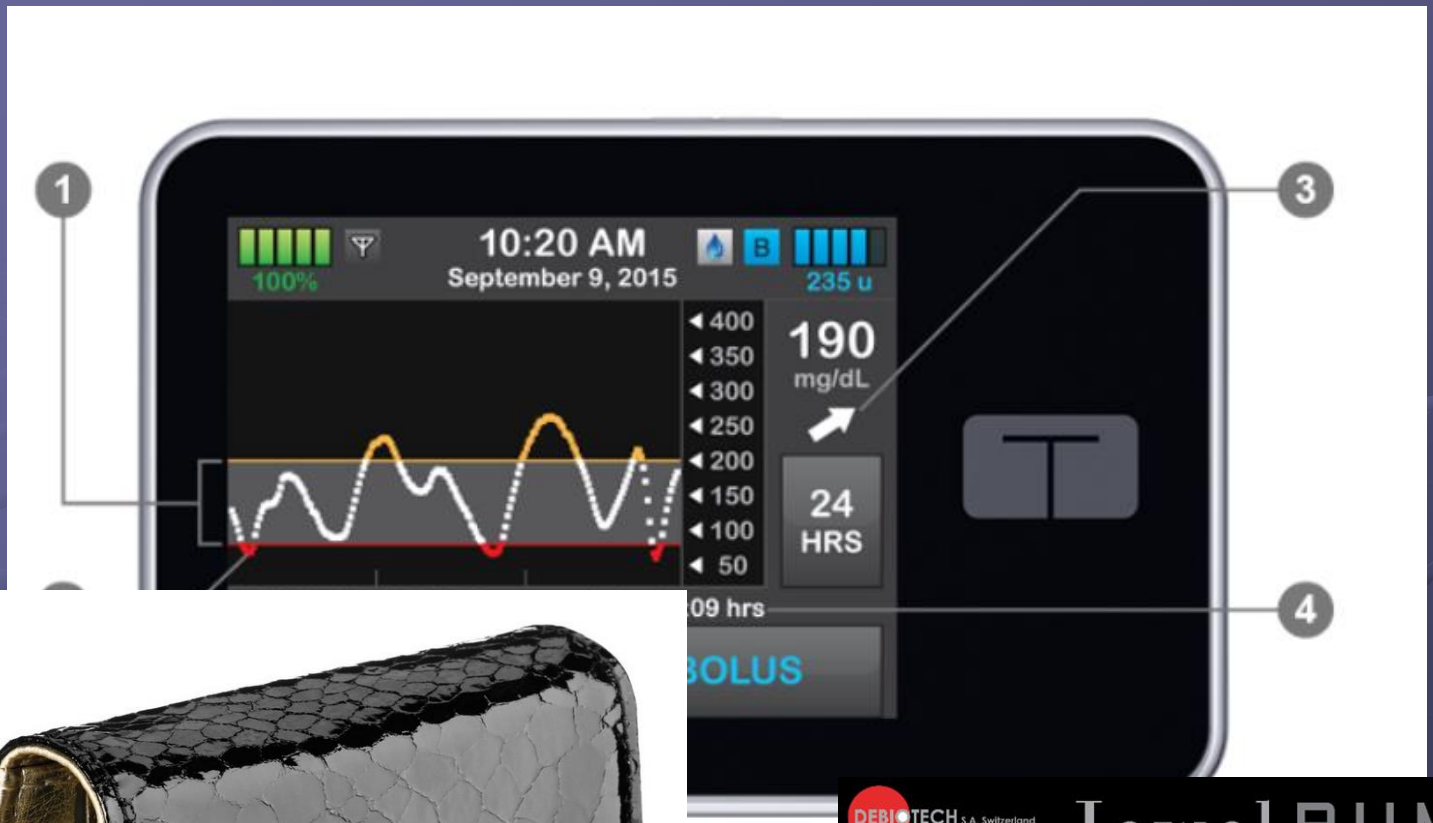





102
6 AM
7 AM
8 AM
9 AM
DEXCOM

Insulet OmniPod

Powered by the Freescale i.MX Series MPU and Wireless 8-bit MCU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September 9, 2015
100%
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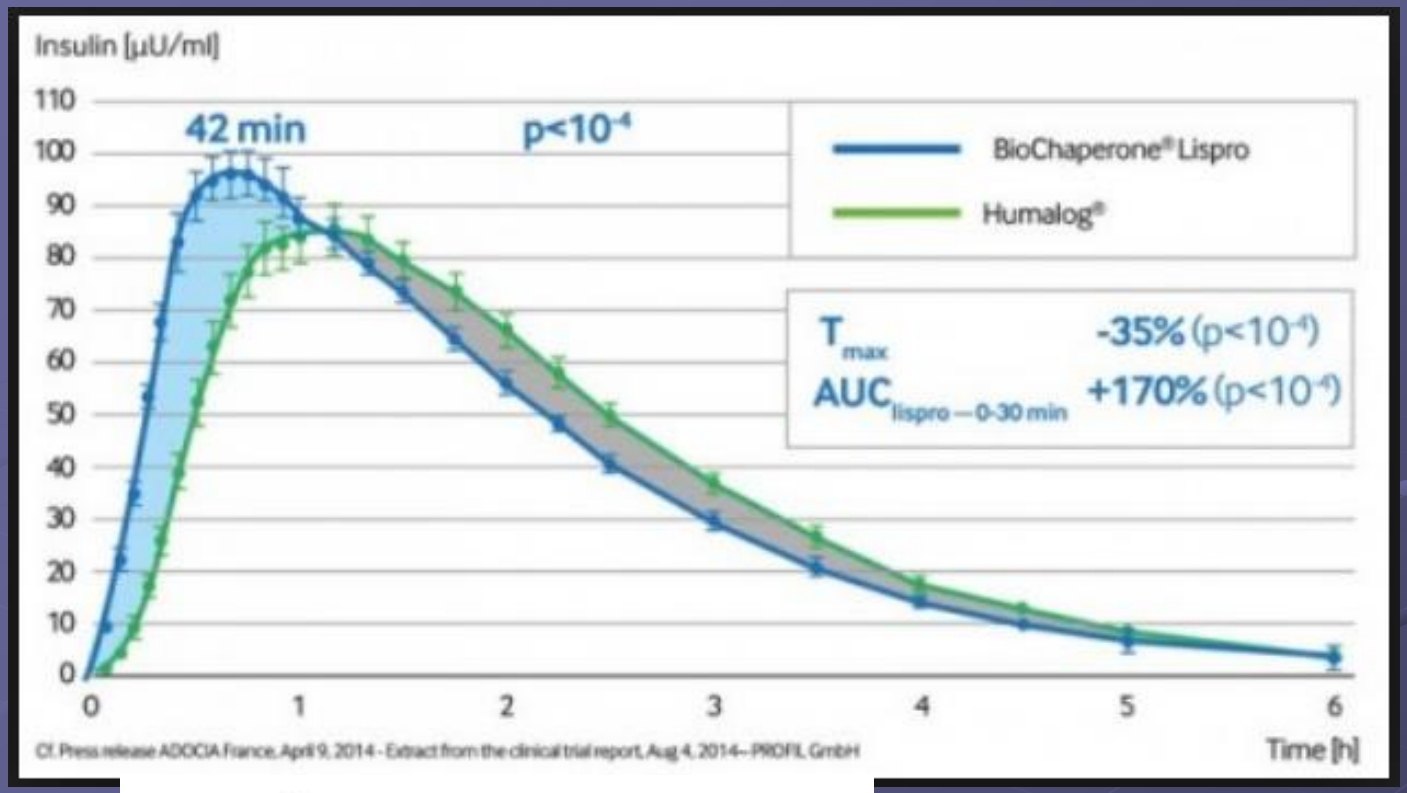
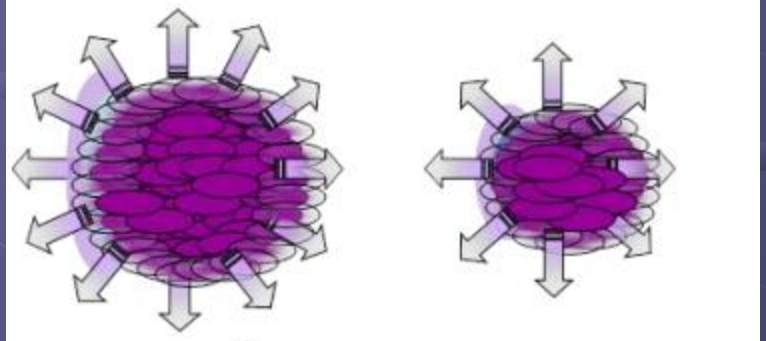
100
50
190
mg/dL
24
HRS
09 hrs
BOLUS


DEBIOTECH S.A. Switzerland
Innovative Medical Systems
JewelPUMP™
More Freedom...
Better Performances !



Faster!



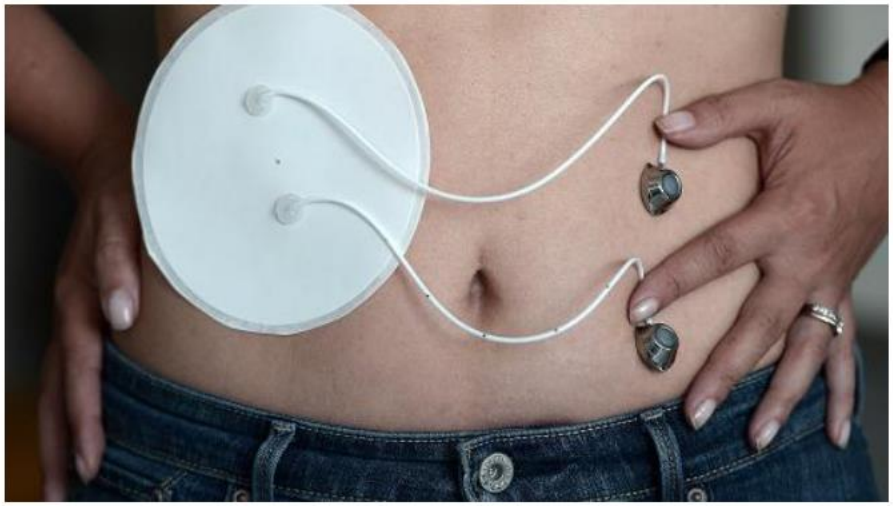
Upon injection, U300 forms a compact subcutaneous depot with a smaller surface area to produce a more gradual and prolonged release as compared to Lantus® (schematic illustration).

Or Longer !

Glucose monitoring

- “Flash” Glucose monitoring
- ? No other players at the moment

academic and commercial groups are conducting clinical trials for the latest generation of what's known as the artificial pancreas. Contrary to what the name might suggest, artificial pancreas systems involve no transfer of tissue. Rather, the term refers to a complex technology that uses computer algorithms to automatically and continuously sense a person's unique blood glucose balance and then substitute the endocrine function of a healthy pancreas.



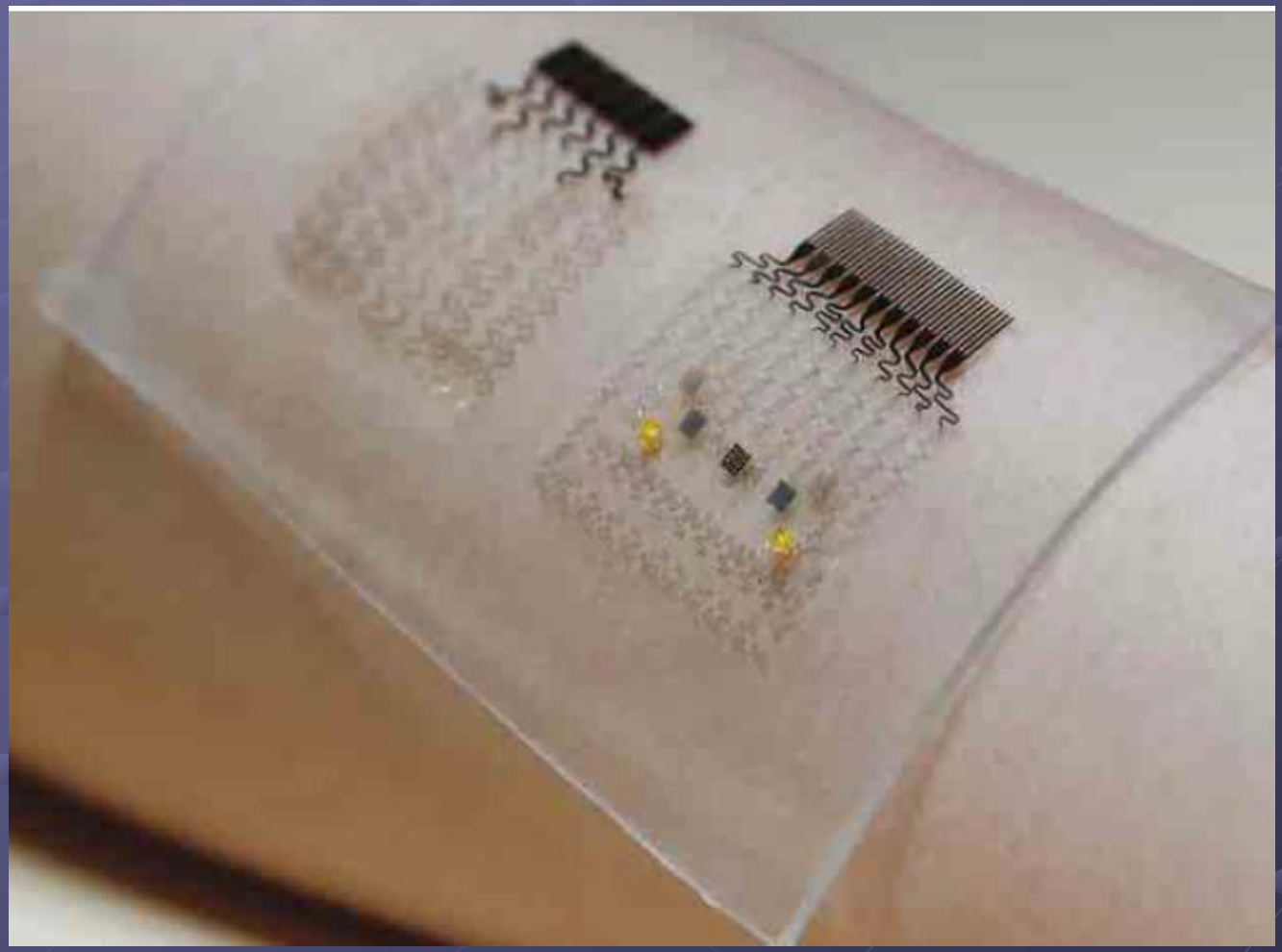
Frederucj Florin | AFP | Getty Images

A woman wears an early prototype of a bio-artificial pancreas (BAP) at the European Center for the Study of Diabetes on July 3, 2014, in Strasbourg, eastern France.

The new technology is a part of what the President's Council of Advisors on Science and Technology refer to as personalized medicine — which the organization de
to the individual characteris

Wearable Bio-sensors

JAMA online June 23, 2016



Case-12 year female

- Weight loss, polyuria, polydipsia.
- Father diabetic, European family.
  - From 24 yrs age & Rx insulin, no complications.

- Random glucose 20 mmol/l, Trace ketonuria.
- BMI SDS +1
- No acanthosis nigricans, in mid puberty
- Not hyperthyroid

- Stabilised on BD insulin 0.5 U/kg/day
- Remains with HbA1c ~7% (55mmol/mol) for next 2 years of follow-up

Case-12 year female

- What is the differential diagnosis and what (if any) investigations are required?

Investigations

Pre-Diabetes antibody screening

ICA, GAD, IA2 antibody

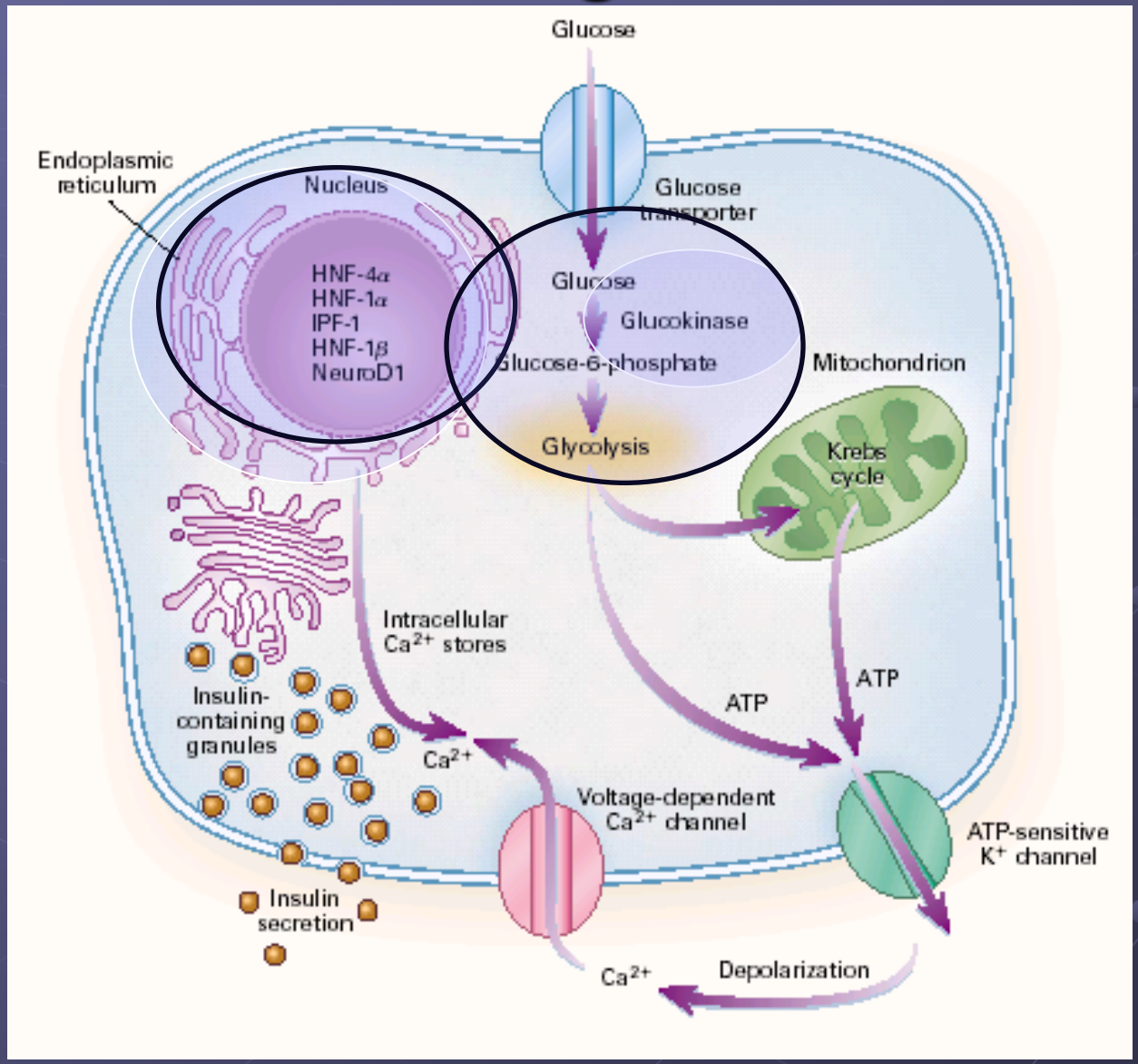
- These are all negative
- Negative for coeliac markers, thyroid autoantibodies

DNA for ?MODY

HNF1α mutation in exon 4.

Diagnosis: MODY 3.

MODY = Monogenic diabetes



Monogenic Diabetes

- GK abnormality
  - Glucose signal switch
- Transcription factor defect

- Influences expression of many other genes in several organs.
- Often results in abnormal embryonic development.
- Failure of β cell development ± ↓insulin gene transcription.
- Hattersley. J Paed Endocrinol Metab. 2000.

MODY Prevalence

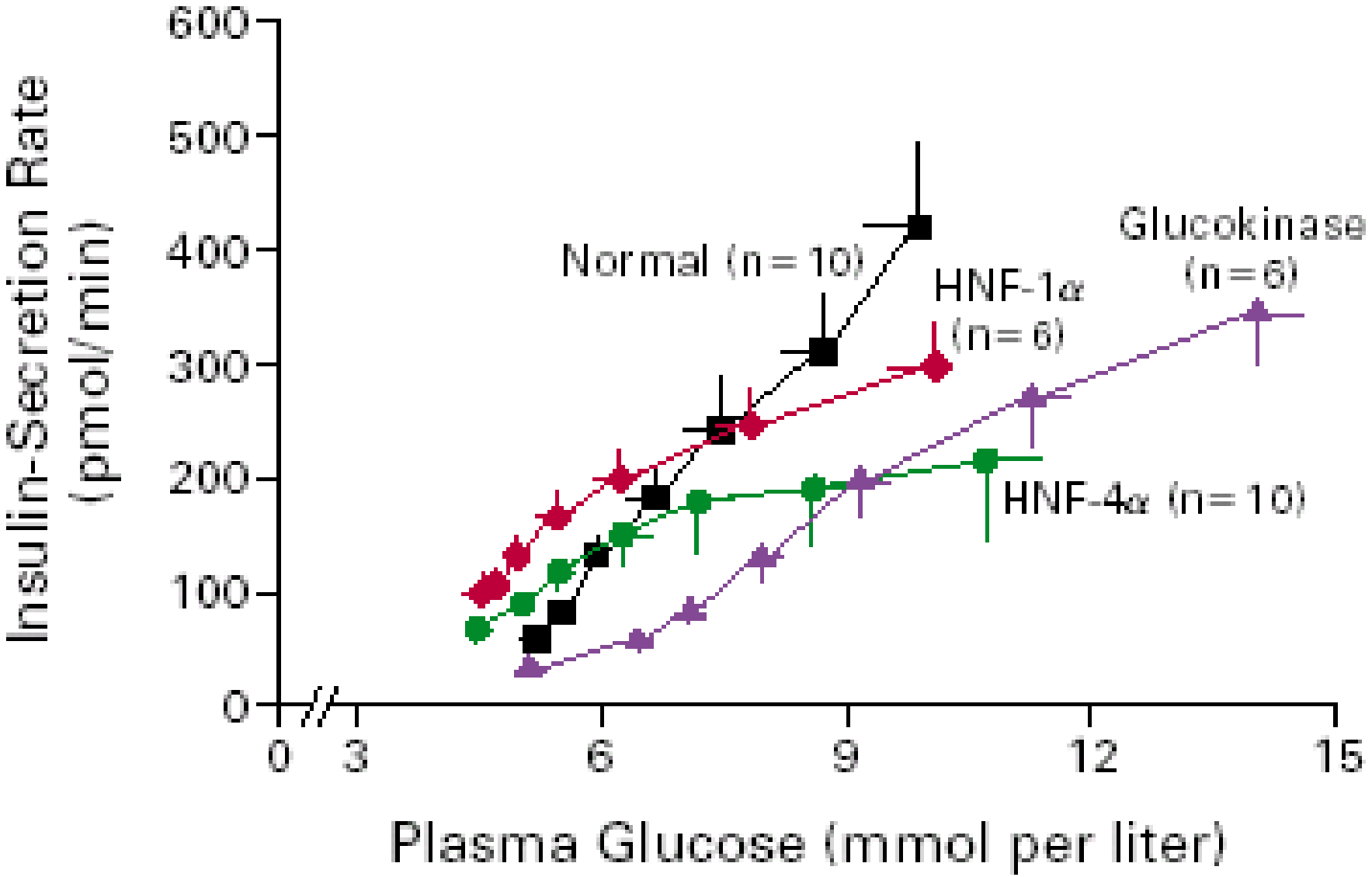
Monogenic DM, more to come.

Freq of MODY and forms varies with country, ethnicity, policy.

In the UK Paediatric Clinics MODY is >10x more prevalent than type 2 DM.

Hattersley. J Paed Endocrinol Metab. 2000; 13(Suppl 6):1411-7.

MODY Type	Gene	Clinical Features of Heterozygous State†
MODY 1	HNF-4α	Diabetes; microvascular complications (in many cases); reductions in serum concentration of triglycerides, apolipoproteins AII and CIII, and Lp(a) lipoprotein
MODY 2	Glucokinase	Impaired fasting glucose, impaired glucose tolerance, diabetes, normal proinsulin-to-insulin ratio in serum
MODY 3	HNF-1α	Diabetes, microvascular complications (in many cases), renal glycosuria, increased sensitivity to sulfonylurea drugs, increased proinsulin-to-insulin ratio in serum
MODY 4	IPF-1	Diabetes
MODY 5	HNF-1β	Diabetes; renal cysts and other abnormalities of renal development; progressive nondiabetic renal dysfunction, leading to chronic renal insufficiency and failure; internal genital abnormalities (in female carriers)
MODY 6	NeuroD1, or BETA2	Diabetes


Insulin-Secretion Rate
(pmol/min)
600
500
400
300
200
100
0
0
3
6
9
12
15
Plasma Glucose (mmol per liter)
Normal (n = 10)
HNF-1α
(n = 6)
Glucokinase
(n = 6)
HNF-4α (n = 10)

MODY 3

- ?commonest form of MODY (65%).
- Progressive β cell failure.
- Presents with symptomatic hyperglycaemia usually in 20's sometimes in adolescence.
- Secondary insulin resistance later develops.
- Those at risk of developing MODY 3 have normal insulin secretion however fail to increase insulin secretion with increased plasma glucose.
- BEWARE stress induced hyperglycaemia with FH DM.

Management

1. Aim for good glycaemic control. 14% of adults have severe retinopathy.

2. Try diet/sulphonylureas initially.

1/3 diet, 1/3 sulphonylureas, 1/3 insulin. Insulin needed with ↑age, ↑obesity.

3. Monitor HbA1c, if ≥8% start insulin.

Velho. Diabetes Care 1996; 19:915-9.

Hattersley. Diab Med 1998; 15:15-24.

Case-10 year

- A healthy obese 10 yr old boy presents with increased thirst.
- Random BGs 7.5, 8.5 mmol/l.
- Mild asthma, becotide 400 μgm/day via spacer.

- Mother had gestational DM. Now has IGT with fasting BG 6.8 mmol/l.
- Maternal g'mother also had gestational DM.
- BMI SDS +3, no acanthosis nigricans.

Case-10 year

What investigations should be performed?

Case-10 year

What investigations should be performed?

- ICA, GAD, IA2 Abs negative.
- Serum βhydroxybutyrate negative.

- HbA1c 5.9%.
- Fasting BG 7.5 mmol/l, insulin 30 mIU/l.

- OGTT 2 hour value 7.9

Case-10 year

Diagnosis?

Case-10 year

What are the possible underlying diagnoses?

Glucokinase mutation (MODY2)

Atypical/Pre type 1 DM.

NOT: Type 2 DM

Stress induced DM.

Steroid induced DM.

Case-10 year old

How should he be managed?

Case-10 year

How should he be managed?

He doesn't really have diabetes!

Needs to trim down!

"Diet".

Good glycaemic control easily achieved as insulin secretory capacity normal.

Minimal risk of complications.

↑age and ↑obesity have minimal effect.

MODY 2 and GCK

Glucokinase:

Is the β cell sensor.

Converts glu→glu-6-PO4.

Mutation has ↓glu affinity.

Resetting of fasting BG for given insulin secretion.

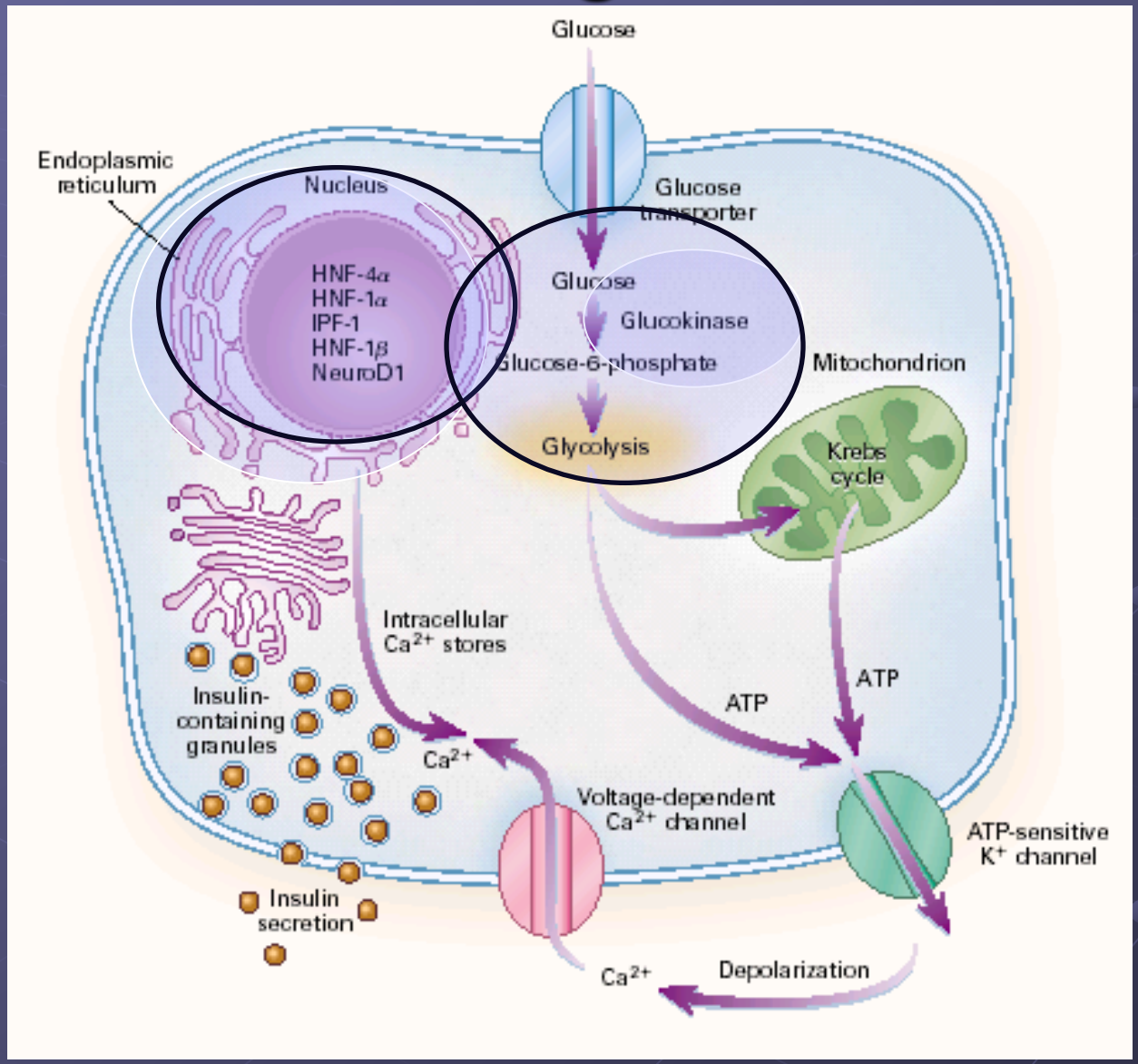
2nd commonest form of MODY (12-50%).

Usually asymptomatic and undiagnosed.

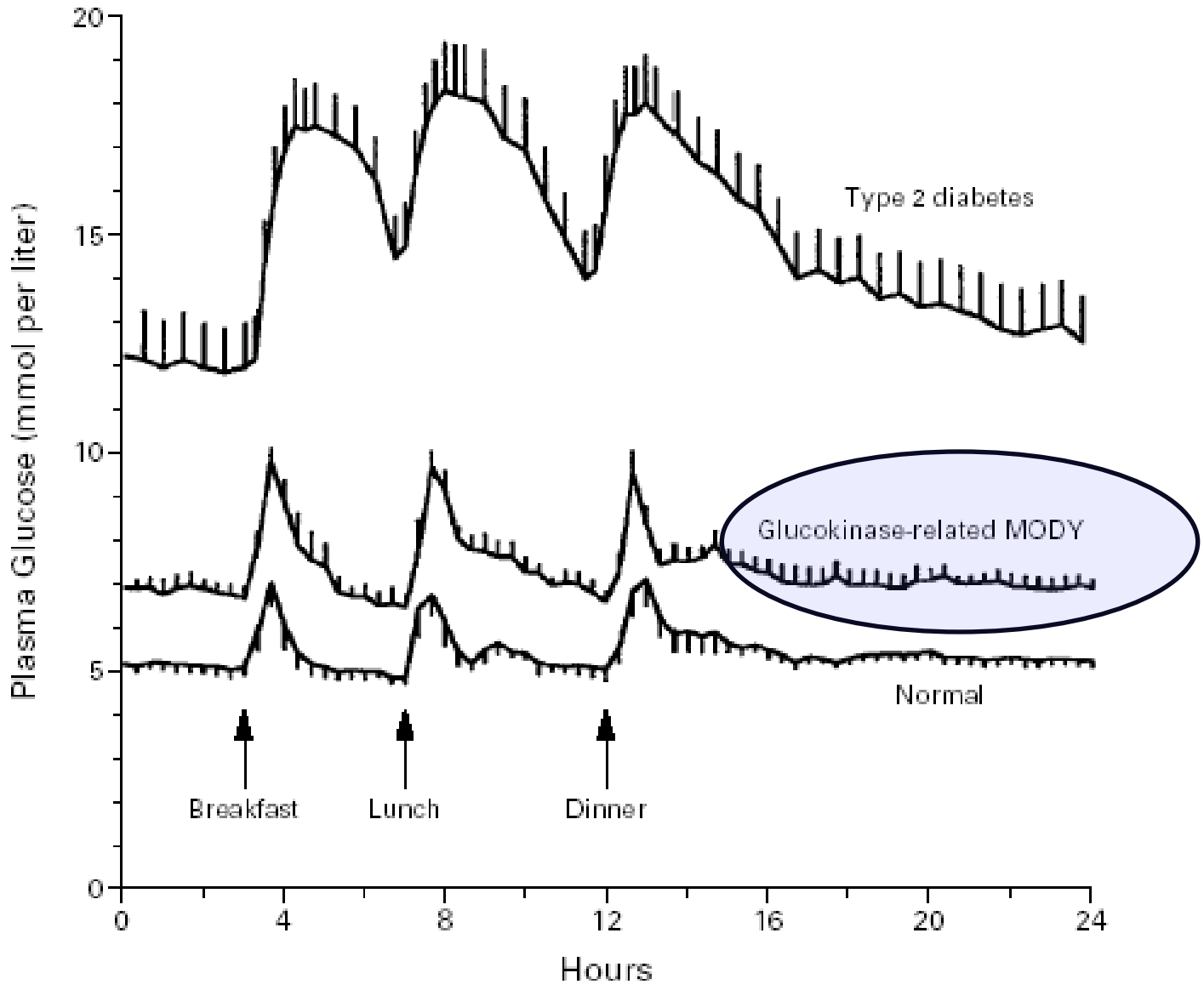
Present from birth.

? What condition results from a homozygous GK mutation

MODY = Monogenic diabetes



MODY 2 or glucokinase defect



Case-3 year old

- A short 2 yr old Pacific Island boy presents with anaemia (Hb 79 gm/l, MCV 60).
- Noted to have random BGs of 10.2, 13.3 and 9.8 mmol/l, HbA1c 8.2%.
- He has mild sensorineural hearing loss. He is an adopted child.
- His mother died of unknown causes at the age of 35 yrs.

Case-3 year old

- Diagnosed with “type-1” diabetes mellitus and treated with insulin.
- Glycaemic control was suboptimal with HbA1c values of 9.5-10.0%.
- At 4 years of age his hearing loss had become severe.
- One morning he was found drowsy with a left sided hemiparesis still evident after 8 hrs, (BG was 4.5 mmol/l at presentation).

Case-3 year old

What has happened to him?

Todd's paresis from a hypoglycaemic seizure?

Stroke?

What investigations should be undertaken?

Case-3 year old

What investigations should be undertaken?

MRI (Stroke)

- GAD and IA2 antibodies (negative)
- Serum, CSF lactate and pyruvate (↑)
- Muscle biopsy (ragged red fibres).
- WBC and muscle DNA analysis (mitochondrial tRNA A3243 mutation)

- Mother died of massive stroke.

Diagnosis: MELAS syndrome with DM

Mitochondrial mutations & DM

Uncommon cause of DM.

- Consider with DM and disease in other organs without evidence of autoimmune disease, particularly mental retardation, deafness, unexplained short stature.
- Wide spectrum of organ systems involved and severity.
- Progressive defects.

Case-Term Baby

A term 2.6 kg infant is born to a primigravid woman. Infant noted to be sleepy day2.

Random BGs (mmol/l)	D2	6.5
	D3	7.2
	D4	7.9
	D5	7.8

Father is slim and thinks he has DM and is supposed to be on a diet.

Case-Term Baby

Does the infant require further investigation?

Case-Term Baby

Does the infant require further investigation?

- ICA, GAD, IA2 for infant and father -ve.

- OGTT for father.
- 8.3 mmol/l (0), 9.1 (60), 8.9 (120).
- Screen father's siblings/parents if available with fasting BG. Father 4.1, mother 7.1, brother 6.5, sister 4.2.

- Repeat BG at 1 month, 7.4 mmol/l.

Case-Term Baby

What is the likely cause of the hyperglycaemia in this infant?

Unrecognised sepsis.

Neonatal DM.

Leprachaunism IUGR.

Monogenic Diabetes

Birth Weight & MODY2

Mother	Infant	BWt
Mutation	Normal	↑
Normal	Mutation	↓
Mutation	Mutation	Normal

Velho Diabetologia 2000; 43(8):1060-3.

Case-13 year

- A 110 kg 13 yr old Polynesian female presents with polyuria and polydipsia. Mother has type 2 DM.
- BG = 30
- Ketonuria 3+
- Weight loss 20 KG

Case-13 year

- Cervical and axillary acanthosis nigricans.
- Tanner 5 breast/pubic hair.
- Acne present.
- BP=130/85 supine.
- Renal function normal
- Investigations:
- ICA, GAD positive

Case-13 year

What sort of Diabetes does she have?

Relate to

1) Ketonuria
2) Positive antibodies
3) family history

Case-13 year

What sort of Diabetes does she have?

Relate to

1) Ketonuria
2) Positive antibodies
3) family history

She has AB related to type 1 diabetes and is obese or has “both” T1Dm and T2DM

Case-8 year

- 8 year old girl present with a marked bullous eruption on 30% of her body
- Thin++, some grey hair
- Started on high dose steroids for ?disorder
- BG repeatedly >20 and becoming more and more symptomatic
- Severe acanthosis
- No response to subQ insulin (1u/kg/day)
- Changed to IV insulin at 4u/kg/day to maintain BG <15.

Case-8 year

- Subsequently developed microscopic haematuria, rash faded on body and insulin requirement decreased to 0.5u /kg/hr and then stopped.
- Off Insulin BG ranged between 1.9 and 10.
- Fasting insulin >2,000 BG 5 mmol/l
- Haematuria persisted while on steroids

Case-8 year

- ? Unifying diagnosis
- SLE with skin and renal involvement
- Type B Insulin resistance
  - Polyclonal IgG antagonistic to the IR.

Mr "T"

- 3 am call, 14 year old boy Samoan boy
- URTI and severe headache → CED
  - CT head Normal
  - LP Normal
    - Nucleated cells 2, RBC 12,050
    - Prot 0.39, Glucose 8.3, No Growth after 3 days.
  - Blood glucose 16 mmol/l, repeat 10 mmol/l
  - No urinary ketones
- 116 Kg and has had some possible weight loss
- Acanthosis present on neck
- Mother has type 2 diabetes, grandparents in Island DM
- **Initial diagnosis please**

Mr “T”

- Overnight glucoses 10 and 19
- Head ache just about gone, been having them monthly for a year or so.
- Poor sleep as hard to fit into bed
- History
  - Reflux nephropathy with L nephrectomy, hypertension & long standing microalbuminuria
  - Albumin/Creatinine ratio 49.7
  -

  Has not been taking the lisinopril prescribed
  No glucose in urine 18 months earlier
- Mother T2Dm on insulin, no compilations known, no renal disease
- **? Any additional thoughts to your diagnosis**

Mr “T”

- **Exam:**
  - **Tall and muscular boy, moustache, quiet, not very overweight.**
  - **No acanthosis.**
  - **Height 191 Weight 116**
  - **BMI 29**

  Weight loss from 130 to 116 kg
- **Tests awaited**
  - **Fasting insulin *Awaited***
  - **Hba1c 10.1%**
  - **Lipids N, LFT N**
  - **Pre type 1 DM Abs *Awaited***
- ***Diagnosis and treatment options please.***

Mr “T”

- **Treated with insulin to normalise BG**
  - **In light of HbA1c and renal abnormalities**
  - **Await Pre-type 1 DM Abs then consider other**
- **Results**
  - **Insulin 15.0 mIU/L**
  - **Glucose 9.2 (HOMA 8.6)**
- ***Diagnosis and treatment options please.***

Mr “T”

- **Stabilised well on 1 u/kg/day insulin**
- **Results**
  - **Anti GAD antibodies > 250 U/ml H 0-10**
  - **Anti IA2 antibodies > 400 U/ml H 0-15**

  - **Type 1 DM**