

C-peptide testing in “Type 1” Diabetes

Modern precision medicine using an old biochemical marker

Dr Catriona Clarke

**Principal Biochemist, Department of Clinical Biochemistry and Haematology
Western General Hospital
Edinburgh**

A large, decorative blue wave graphic that spans the bottom of the slide, starting from the left edge and curving across the width of the page.

Type 1 versus Type 2 Diabetes: the conventional perception

	Type 1 Diabetes	Type 2 Diabetes
Prevalence (UK)	rare	Common
Peak age of onset	12 years	60 years
Obesity	Uncommon	Common
Aetiology	Autoimmune β -cell destruction	Insulin resistance
Presence of GAD and/or IA2 Antibodies	Yes	No
Diabetic ketoacidosis	Yes	No
Treatment	Insulin	Diet \pm oral hypoglycaemic agents \pm insulin

Type 1 versus Type 2 Diabetes: the reality

	Type 1 Diabetes	Type 2 Diabetes	Monogenic diabetes
Age of onset	Typically childhood but can present at any age	Typically in older adults but increasingly in younger adults and in children	Several forms. Rare and may be misdiagnosed as Type 1 or Type 2. Alternative treatments may be beneficial
Obesity	Obesity is increasingly common in children	Common	
Presence of GAD and/or IA2 Antibodies	Usually but not always: false negatives do occur	Positive antibodies can occur in the non-Type 1 Diabetic population	
Diabetic ketoacidosis	Common	Sometimes	

S's story....

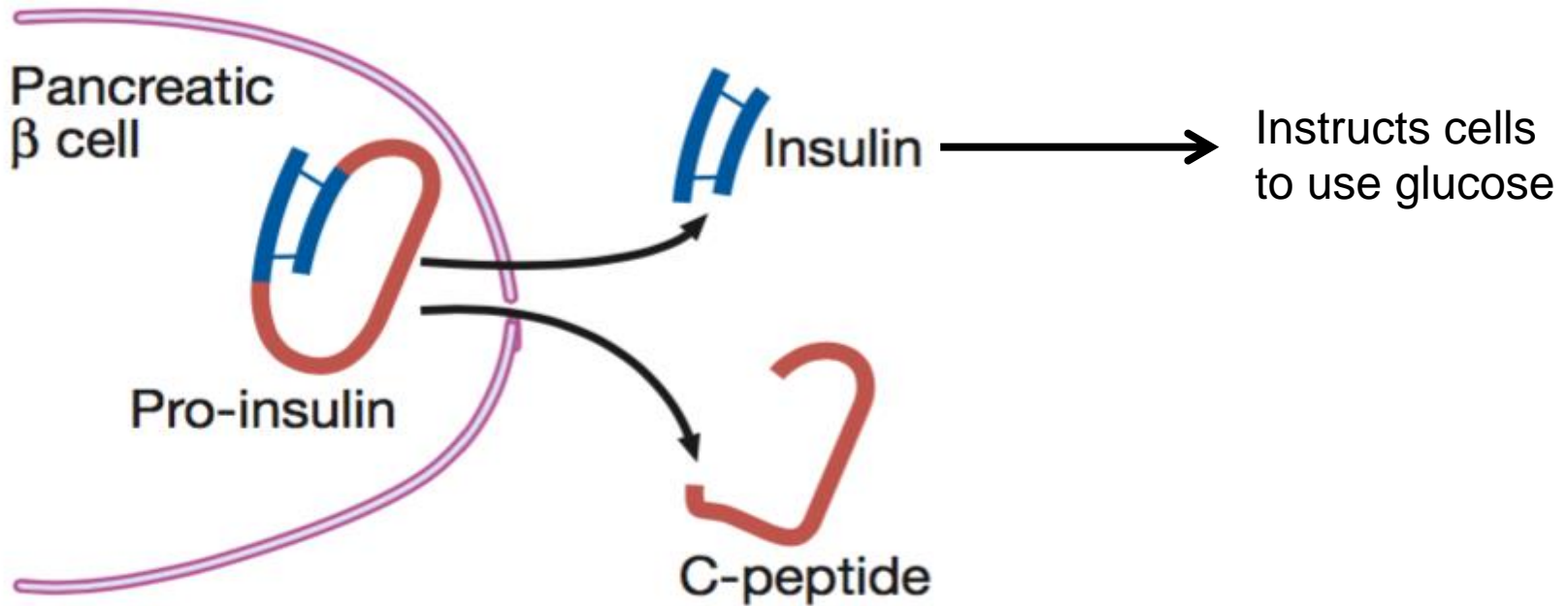
Aged 8, S was diagnosed with Type 1 Diabetes

In 2016 her father was identified as having a monogenic form of diabetes

She was confirmed to have the same mutation, 27 years after her initial diagnosis

Do we have other misdiagnosed patients?

C-peptide



Type 1 Diabetes: insulin low & C-peptide low

Type 2 Diabetes: insulin high & C-peptide high

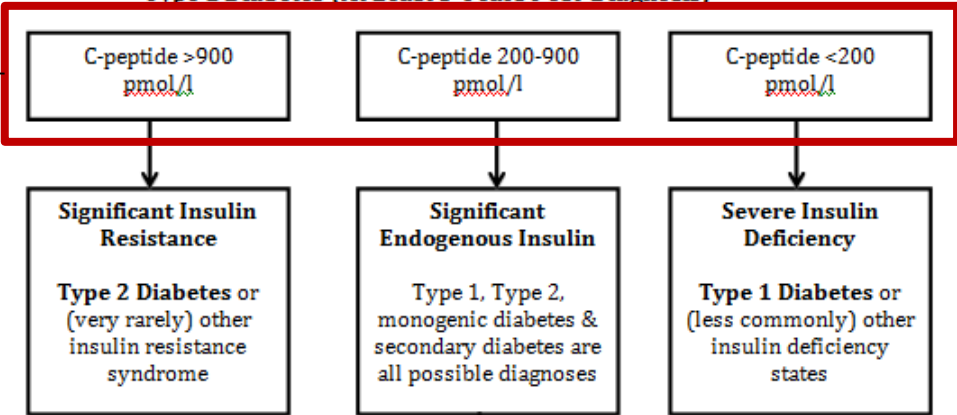
The perfect storm!

- ✓ Our clinicians want to screen for misdiagnosed patients using C-peptide
- ✓ Data from research and other hospitals supports this potential use of C-peptide
- ✓ The Laboratory wants to improve our data for C-peptide testing but is wary of the pitfalls:
keen for comprehensive clear guidance and data gathering

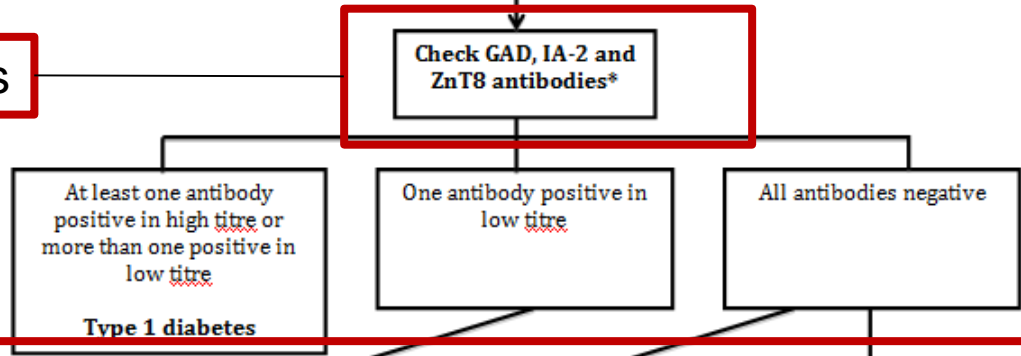
A pilot study was agreed which was then rolled out Lothian wide, supported by the NHS Lothian Laboratory Quality Improvement Team (QIT)

Algorithm for Investigating Individuals with a Clinician-Diagnosis of Type 1 Diabetes (At Least 3 Years Post-Diagnosis)

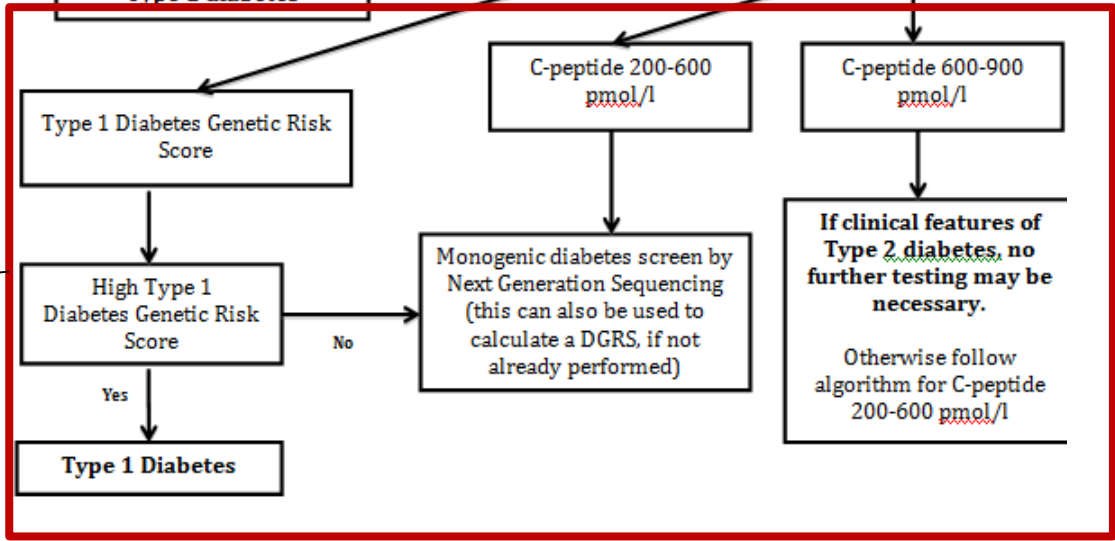
What does the C-peptide result mean?



Measure antibodies



Genetic testing may be appropriate



*If not tested at diagnosis

Outcomes so far.....



Testing commenced July 2017. ~85% of eligible patients have been tested.
~13% of patients have C-peptide levels that are high considering a diagnosis of Type 1 Diabetes and are being followed up.

21 patients have been reclassified as having Type 2 Diabetes

2 have confirmed HNF1 α monogenic diabetes

3 have confirmed HNF4 α monogenic diabetes

2 has confirmed HNF1 β monogenic diabetes

1 has confirmed NEURO-D1 monogenic diabetes

2 have confirmed mitochondrial diabetes

12 patients have stopped taking insulin. 11 are now on appropriate cotherapies.

Conclusion: all patients with a clinician diagnosis of Type 1 Diabetes (>3years) should be considered for C-peptide testing

- **The Scottish Diabetes Group are supportive of a national roll-out of C-peptide testing**
- **Scottish Clinical Biochemistry Network have taken forward a business case**
- **Awaiting sign-off by Directors of Finance and Chief Execs**
- **Edinburgh and Glasgow have agreed common reporting standards for C-peptide**

S's story...



S started on Gliclazide in November 2017

In December 2017 she switched off her insulin pump after being on insulin for 27 years

Major impact on her quality of life

Her glucose control is now within target range

Annual cost of an insulin pump: ~£2700

Annual cost of gliclazide: **£6**

Professor Mark Strachan, Endocrinology Western General Hospital
Professor John McKnight, Endocrinology Western General Hospital

Endocrinology staff, Western General Hospital
Laboratory staff, Western General Hospital

Ian Godber, Scottish Clinical Biochemistry Network

Brian Kennon, Scottish Diabetes Group
Ewan Pearson, University of Dundee

A large, light blue decorative wave graphic that spans the bottom of the slide, starting from the left edge and curving upwards towards the right.

