Ymchwil Iechyd a Gofal Cymru
Health and Care Research Wales

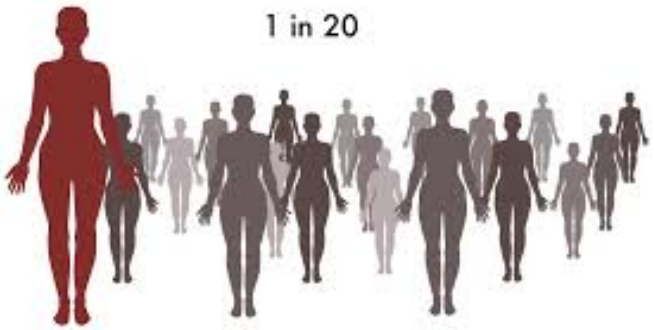
Diabetes Research Unit Cymru

Professor Steve Luzio

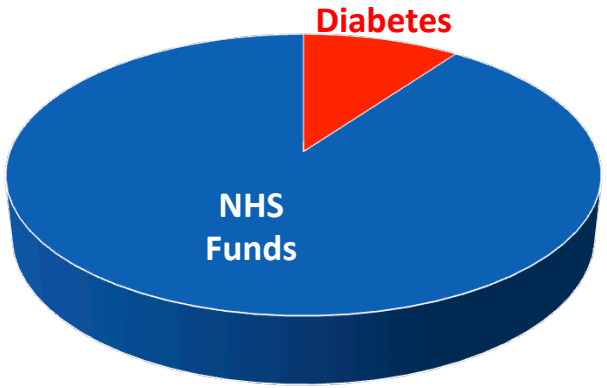
Operational Manager

Llywodraeth Cymru
Welsh Government

Diabetes – Facts and Figures



The prevalence of diabetes is now over 5% of the population and is set to rise dramatically over coming years.



Diabetes is thought to account for more than 10% of NHS spend

Audit data (2013) show that ~20% of hospital in-patients in Wales have diabetes.

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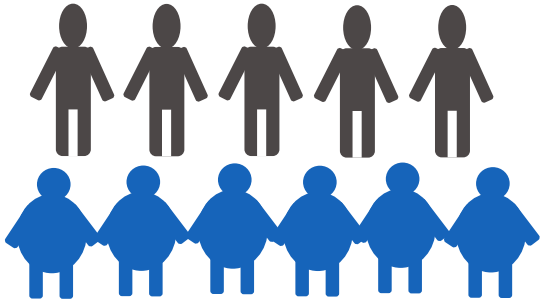
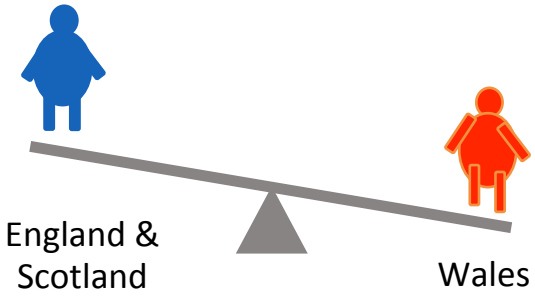
Diabetes – Facts and Figures

Over half of all adults in Wales are overweight or obese





The prevalence of childhood obesity (25%) is higher in Wales than in both England and Scotland.

Type 1 diabetes accounts for around 10% of all patients with diabetes with over 1000 children in Wales affected.

Diabetes and related metabolic conditions are therefore a leading cause of ill-health and premature mortality regionally, nationally and globally, exerting huge financial pressures on health services.

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Diabetes Research Unit Cymru

DRU Cymru has been funded to provide infrastructure support to:

- address the important social and health-care needs in diabetes
- undertake and support a comprehensive, integrated translational research programme,
- advance development and implementation of therapeutic strategies for prevention, treatment and self-management of diabetes

Unit Director is Professor Steve Bain, Swansea University

DRU Cymru is based in Swansea but works with collaborators across Wales.

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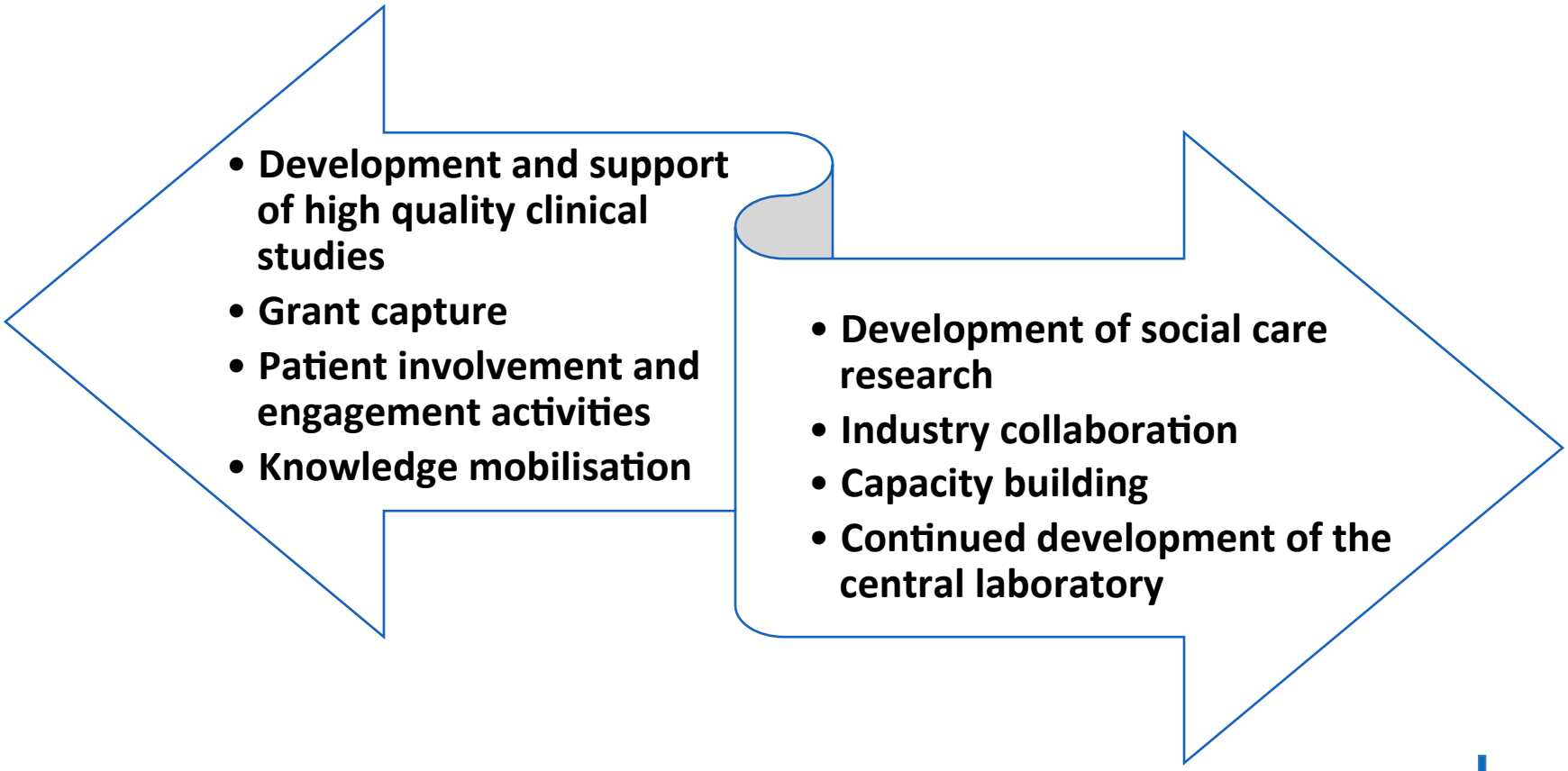
Strategic Objectives / Key Outputs



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Industry Engagement

Major Pharma/Diagnostics

- Abbot
- Astra Zeneca
- Boehringer Ingelheim
- GSK
- J&J
- Lilly
- Merck
- Novartis
- NovoNordisk
- Roche
- Sanofi
- Takeda

Small & Medium Sized Entities

- Agamatrix
- CellNovo
- Diabetology
- EKF
- Mendor
- PolyPhotonix
- Innoture
- Invitron
- RSR
- Senseonics
- SmartSensor Telemed

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Central Laboratory

CERTIFICATE OF ACCREDITATION

Good Clinical Laboratory Practice

Name and address of Laboratory Accredited

DRNW Laboratories
3rd Floor, Institute of Life Sciences
Swansea University
Singleton Park
Swansea
SA2 8PP

Date of Accreditation
6th November 2014

Category of Accreditation
Full Accreditation

GCLP Accreditation of the DRNW Laboratories is continuous from the date of the previous inspection on 10th September 2012

The above laboratory has satisfactorily implemented the requirements set out in the Good Clinical Laboratory Practice (GCLP) standard, 2011, ISBN 978-1-904610-00-7.

Date of Assessment: 1st October 2014

Re-assessment due date: October 2016

Type of work accredited: Clinical Laboratories

Accreditation number: 01708

T R Stiles, Director
GCLP Accreditation Scheme

GCLP Accreditation Scheme operated by Qualogy Ltd www.qualogy.co.uk

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Case Study 1 – Glucometers

- New ISO guidelines (ISO15197) have been introduced to establish acceptable performance
- To demonstrate compliance with this international standard at least 100 different subjects with diabetes with glucose ranging from ~3 to >25 mmol/L are required and the study is to be conducted in actual conditions of use.

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Case Study 2 – POCT HbA1c Analyser

- Measurement of HbA1c is used to monitor diabetes control and has also recently been recommended as a method of diagnosis of diabetes
- POCT is performed on site, often while the patient is still in the clinical setting and allows clinical decisions to be made in real time, without the need to wait for laboratory results.
- POCT in the measurement of HbA1c has been performed for a number of years, but not always with the level of performance required for clinical decision making.

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Case Study 3 – Insulin Pump

Evaluation of patient acceptance of an insulin infusion pump

- The study was designed to provide information about the general patient acceptance and functionality of pump training and set up of the Cellnovo System.
- A total of 30 days of patient data.
- System performance data was acceptable with ≥90% acceptance data achieved.
- User feedback was very positive and all subjects expressed a preference to continue using the CellNovo System in preference to their previous pumps.

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Case Study 3 – Insulin Pump

Data presented at the European Association for Study of Diabetes (Barcelona) and the ADDT (Vienna)

Evaluation of Patient Acceptance of the Cellnovo Insulin Infusion Pump

SD Luzio[1], SC Bain[1], J Davies[1], L Bastin[2], K Wareham[2], R McDonagh[3]
[1]Diabetes Research Group, Swansea University;
[2]Joint Clinical Research Facility, Swansea University; [3]Cellnovo

Introduction

Continuous subcutaneous insulin infusion (CSII) systems, or insulin pumps, have become increasingly popular as a means of insulin delivery for individuals with type 1 diabetes.

A new style of pump has also been introduced in Europe over the recent years, so-called 'patch pumps', in which the pump controller communicates with an infusion component that is attached to the skin directly rather than being connected by a catheter.

The Cellnovo System is a CE marked insulin delivery system, comprising of mobile connected Handset, Pumps and Cellnovo Online web-based Management System. Cellnovo Online can support the self-management of diabetes through the presentation of real time data in list and graph format. This web-based system may also be used by Healthcare Professionals (HCPs) who will be able to view data for their patients and support them remotely.

Methods

This study was a single site pilot study, designed for investigation of the acceptance of end-users' of the study device(s). The number of subjects was (n=3) was chosen for pragmatic reasons.

After a screening visit the overall duration of the study was 10 days. For the first three study days, subjects stayed at the Joint Clinical Research Facility (JCRF), Swansea University for training and use of the Cellnovo System. Following this they used the system at home for 7 days. At the end of the study visit, subjects returned to complete a questionnaire and return to their previous insulin pump.

Screening	First Phase	Second Phase	End Visit
	Training	Home Use	Study end visit
2-3 hours	3 Days	7 Days	2–3 hours
• Informed Consent • Screening procedures	• Training • Use Cellnovo System • Use Cellnovo Online and Customer Care • Re-training • Questionnaire	• Use Cellnovo System at home • Daily monitoring using Cellnovo Online • Daily followup by study staff	• Questionnaire • Return to own insulin pump

Subjects

Male and female subjects aged >18 years with Type 1 diabetes and already on insulin pump therapy (using either NovoRapid or Humalog) for at least 12 months and compliant with their therapy were recruited.

Subject	Age	Gender	Diabetes duration	Duration of Pump therapy	Insulin type
001	42y 2m	M	17y 0m	6y 10m	Humalog
002	41y 1m	M	25y 6m	5y 9m	NovoRapid
003	34y 6m	F	22y 11m	7y 0m	NovoRapid

Results

Selected Questionnaire Data

	Ave Day 3	Ave Day 10	Range		Ave Day 3	Ave Day 10	Range
The handset and pump were intuitive to use	6.7	7.0	6-7	I found the bolus calculator helpful in managing my BG level and preventing me giving myself too much insulin	6.7	7.0	6-7
The pump was comfortable to wear	6.3	6.3	6-7	I found the tailor made food library useful and easy to use/create new foods	6.0	7.0	4-7
I found the pump discreet and easy to hide from view	6.7	6.7	6-7	Use of the Handset allowed me to dispense with keeping a paper journal	7.0	7.0	7
The insertion process was easy to learn	7.0	7.0	7	I am pleased that my HPC is able to access real-time data to support management of my diabetes	7.0	7.0	7
The ability to recharge the battery was important to me	5.7	6.0	4-7	Viewing real-time data on-line helped me to manage my diabetes better	7.0	7.0	7
I found taking a blood glucose reading simple	6.0	6.0	4-7	I found the graphs helpful in managing my diabetes	6.7	7.0	6-7
The Health Assessments and Notes in the Blood Glucose application was helpful	7.0	7.0	7	I learnt more about managing my diabetes from using the devices than I did beforehand	6.7	7.0	6-7
Creating a basal profile was easy to do	6.7	7.0	6-7	Did you prefer using the Cellnovo System over your previous therapy?	Yes - 3		
The 4 insulin delivery options were supportive in managing my diabetes	7.0	7.0	7	Would you like to remain on the Cellnovo System?	Yes - 3		

Insulin Usage

Subject	Average total daily dose at start of study (U)	Average total daily dose at end of study (U)	Comments
001	108	63	Average BG now 8mmol whereas initially hypo almost all day. Insulin sensitivity was 1U reduce by 1mmol; now 1U reduce by 3mmol. Feels much better
002	65	52	Feels better
003	35	38	Rates adjusted more appropriately throughout the day and adjustment on-going.

Discussion

- All subjects successfully completed the study giving a total of 30 days of patient data.
- Insulin usage decreased or was adjusted more appropriately throughout the day.
- There were no serious adverse events or adverse events that resulted in professional medical intervention.
- User feedback was very positive and all three subjects expressed a preference to continue using the Cellnovo System in preference to their previous pumps.

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Case Study 4 – Insulin Assays

Insulin analogues - small structural modifications introduced into the insulin molecule to act more rapidly or to prolong biological activity

Insulin	Gly Ile Val Glu Gln Cys Cys Thr Ser Ile Cys Ser Leu Tyr Gln Leu Glu Asn Tyr Cys Asn Phe Val Asn Gln His Leu Cys Gly Ser His Leu Val Glu Ala Leu Tyr Leu Val Cys Gly Glu Arg Gly Phe Phe Tyr Thr Pro Lys Thr
Glulisine (Apidra)	Gly Ile Val Glu Gln Cys Cys Thr Ser Ile Cys Ser Leu Tyr Gln Leu Glu Asn Tyr Cys Asn Phe Val Lys Gln His Leu Cys Gly Ser His Leu Val Glu Ala Leu Tyr Leu Val Cys Gly Glu Arg Gly Phe Phe Tyr Thr Pro Glu Thr
Lispro (Humalog)	Gly Ile Val Glu Gln Cys Cys Thr Ser Ile Cys Ser Leu Tyr Gln Leu Glu Asn Tyr Cys Asn Phe Val Asn Gln His Leu Cys Gly Ser His Leu Val Glu Ala Leu Tyr Leu Val Cys Gly Glu Arg Gly Phe Phe Tyr Thr Lys Pro Thr
Glargine (Lantus)	Gly Ile Val Glu Gln Cys Cys Thr Ser Ile Cys Ser Leu Tyr Gln Leu Glu Asn Tyr Cys Gly Phe Val Asn Gln His Leu Cys Gly Ser His Leu Val Glu Ala Leu Tyr Leu Val Cys Gly Glu Arg Gly Phe Phe Tyr Thr Pro Lys Thr Arg Arg
Aspart (Novorapid)	Gly Ile Val Glu Gln Cys Cys Thr Ser Ile Cys Ser Leu Tyr Gln Leu Glu Asn Tyr Cys Asn Phe Val Asn Gln His Leu Cys Gly Ser His Leu Val Glu Ala Leu Tyr Leu Val Cys Gly Glu Arg Gly Phe Phe Tyr Thr Asp Lys Thr

Most of the methods currently available for the measurement of insulin in blood react to a varying degree with these analogues - not possible to distinguish between endogenously produced insulin and insulin analogue(s) injected.

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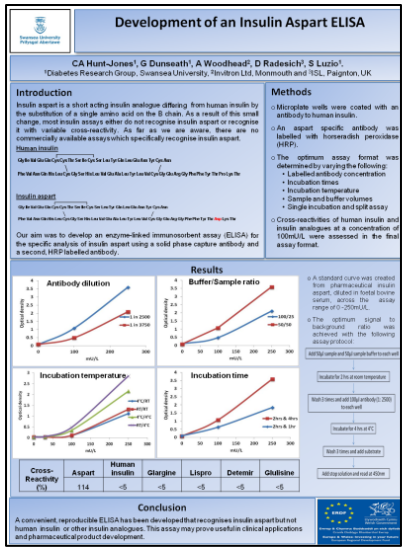
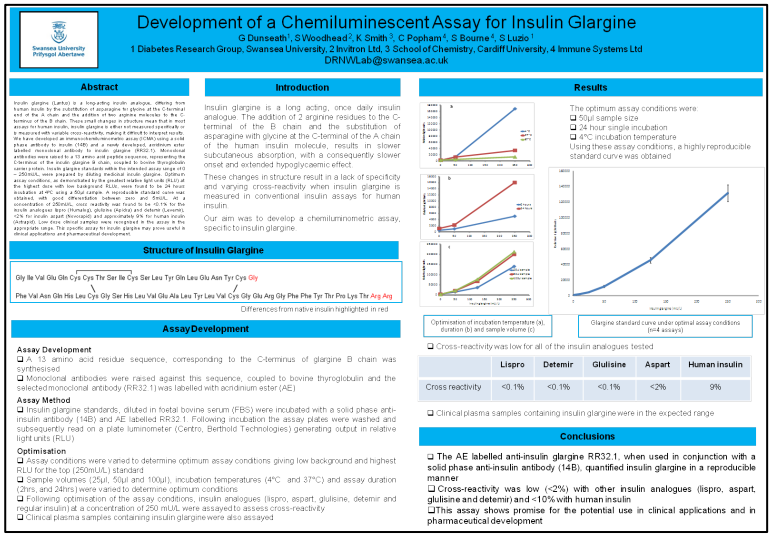
Case Study 4 – Insulin Assays

- Create a group of immunoassays to enable measurement of insulin analogues without interference from native insulin.
  - Synthesis of short peptide sequences
  - Production of monoclonal antibodies
  - Develop and validate assay methods based on these antibodies

- Working with the company we have now created a number of well defined immunoassays for some of the insulin analogues.





Presentations at UK, European and American diabetes meetings

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Summary

- **The Diabetes Research Unit Cymru** is an all Wales collaboration.

- The Unit has a good track record of performing clinical studies and working with industry (pharma, diagnostics and devices)

- The Unit would welcome further collaboration with industry on novel treatments, diagnostics and devices in the area of diabetes.

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Diabetes Research Unit Cymru

Contact Details

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http://diabeteswales.org.uk

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