THE BARBADOS DIABETES REVERSAL STUDY
PRELIMINARY RESULTS

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Presented by:
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Prof Nigel Unwin FRCP FFPH, Principal Investigator, Chronic Disease Research Centre, UWI
DECLARATIONS

- None
OVERVIEW

- Scientific basis and origin of the study
- Aim & Objectives
- Methods
- Results
- Discussion
BACKGROUND

- Known that in many obese individuals with type 2 diabetes bariatric surgery can lead to rapid normalisation of glucose.

- Question: is the same effect possible without surgery, with diet alone?
NEWCASTLE (UK) DIABETES REVERSAL STUDY

11 with type 2 DM:
- 9 men 2 women
- Ages 35 to 65 yrs
- Type 2 diabetes < 4 years
- HBA1c 6.5 – 9.0%
- BMI 25 – 45 kg/m²
- Not on insulin

9 ‘Controls’
- Age, sex and BMI matched
- Normal glucose tolerance

Lim et al, Diabetologia, 2011
Professor Roy Taylor lead scientist
NEWCASTLE STUDY - 8 WEEK INTERVENTION

- Liquid diet – 510 Kcal per day
- 3 portions of high fibre non-starch vegetables
- Encouraged to drink 2 liters a day of water
- Maintain physical activity

Lim et al, Diabetologia, 2011
NEWCASTLE STUDY: CHANGE IN WEIGHT AND BMI

- Mean (SE) weight (Kg)
  - Baseline: 103.7 (4.5)
  - 8 weeks: 88.4 (4.3)

- Mean (SE) Body Mass Index (Kg/m$^2$)
  - Baseline: 33.6 (1.2)
  - 8 weeks: 28.7 (1.3)

Lim et al, Diabetologia, 2011
CHANGES IN GLUCOSE AND INSULIN

- Fasting insulin: pmol/l, mean (SE)
  - Baseline 151 (31)
  - Week 1 73 (10)
  - Week 4 57 (11)
  - Week 8 65 (15)

- Value in controls at baseline: 115 (27)

Lim et al, Diabetologia, 2011
BASELINE INSULIN SECRETION

Controls

Diabetic group

Lim et al, Diabetologia, 2011
CHANGE IN INSULIN SECRETION IN DIABETIC GROUP

Lim et al, Diabetologia, 2011
CHANGES IN LIVER AND PANCREATIC TRIGLYCERIDE CONTENT

Pancreas

Liver

Fat content measured by nuclear magnetic resonance spectroscopy

Lim et al, Diabetologia, 2011
DIABETES REMISSION CLINICAL TRIAL (DIRECT)

- Evaluate the very low calorie diet intervention in a primary care setting
- Assess sustainability over a minimum of 2 years
- Cluster randomised controlled trial
  - GP practice is unit of intervention
  - 30 to 35 practices with 280 participants
- Detailed metabolic assessments on around 50%
- Funded by Diabetes - UK
THE BARBADOS DIABETES REVERSAL STUDY
AIM

- To evaluate the feasibility in Barbados of implementing a very low calorie diet to reverse type 2 diabetes
OBJECTIVES

- In men and women with Type 2 diabetes in Barbados:
  - To evaluate a low calorie liquid meal replacement as a means of achieving substantial weight loss
  - Measure effect on blood glucose, beta cell function, insulin sensitivity, and HbA1c
  - Monitor the maintenance of reversal of diabetes by 6 months follow up during a structured support programme
  - Investigate the acceptability and challenges of complying with the intervention

- Use the results from this study to help design a larger, pragmatic, trial of diabetes reversal in Barbados and other parts of the Caribbean
STUDY DESIGN

‘Before and after’
25 participants

- **Inclusion criteria:**
  - 20-70 years
  - T2DM duration 0-6 years
  - BMI >27 kg/m²

- **Exclusion criteria include:**
  - Insulin use
  - Known serious illness
  - HbA1c ≥12%,
  - Pregnant/ considering pregnancy
Recruitment

- Media
- Public Sector – Ministry of Health
- Private Physicians
- Patient Membership of
  - Barbados Diabetes Foundation
  - Diabetes Association of Barbados
LOW CALORIE LIQUID DIET (WEIGHT LOSS) PHASE

- All Diabetes Medication Stopped
- < 1000 kcal/day
- 4 GLUCERNA SHAKES/day (760 kcal)
- 3 portions of non-starchy vegetables (~200 kcal)
- 3 Litres water/calorie-free beverages
- Weekly Measuring of
  - Blood Pressure
  - Weight
  - Fasting Blood Glucose using Hemocue Glucose 201 Machine
  - Waist Circumference
  - Hip Circumference
Standardized Meal Tests

- Baseline & 8 weeks
- Measurement of metabolic response over 2 hours
- Glucose, Insulin, C-Peptide, NEFA
- Baseline LIPIDS
- Glucerna Shakes were given to participants
PARTICIPANT SUPPORT

- Comprehensive Support Package
  - Written personal guide
  - Non-starchy vegetable guide
  - Expectations of participant
  - Expected side effects
- Weekly support calls
## BASELINE CHARACTERISTICS

<table>
<thead>
<tr>
<th></th>
<th><strong>Men</strong></th>
<th><strong>Women</strong></th>
<th><strong>Total</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (yrs)</strong></td>
<td>50.9 (11.7)</td>
<td>46 (9.2)</td>
<td>48.0 (10.3)</td>
</tr>
<tr>
<td><strong>BMI (Kgm(^{-2}))</strong></td>
<td>33.9 (5.5)</td>
<td>34.3 (6.6)</td>
<td>34.2 (6.0)</td>
</tr>
<tr>
<td><strong>Waist (cm)</strong></td>
<td>110.4 (14.7)</td>
<td>102.0 (15.1)</td>
<td>105.4 (15.2)</td>
</tr>
<tr>
<td><strong>Systolic BP (mmHg)</strong></td>
<td>134 (15.6)</td>
<td>126 (11.3)</td>
<td>129 (13.7)</td>
</tr>
<tr>
<td><strong>FPG (mmoll(^{-1}))</strong></td>
<td>9.2 (2.2)</td>
<td>9.3 (2.2)</td>
<td>9.2 (2.2)</td>
</tr>
<tr>
<td><strong>HbA1c %</strong></td>
<td>8.1 (2.0)</td>
<td>8.2 (1.5)</td>
<td>8.1 (1.7)</td>
</tr>
</tbody>
</table>

Table shows mean (SD) for all characteristics
Individual changes in weight

Between baseline and week 8

Mean weight loss 10.1(4.7) kg (range 1.5-20.8)
Individual changes in waist circumference

Between baseline and week 8

Mean waist circumference loss 10.9 (4.0) cm (range: 5.1-20.8)
Relationship between change in weight and waist

\[ R = 0.83, p = 0.0029 \]
\[ R = 0.55, p = 0.033 \]
Individual changes in fasting glucose

Between baseline and week 8

Mean change in FPG 2.2 mmol/l (range -1.5 to 7.9)
Fasting plasma glucose
Baseline and 8 weeks

THERE WERE 15 PERSONS WITH A FPG <7.0mmol/l AT 8 WEEKS COMPARED TO 3 BASELINE, p=0.004
### Summary of mean changes between baseline and 8 weeks

<table>
<thead>
<tr>
<th>Metric</th>
<th>Baseline</th>
<th>8 weeks</th>
<th>Change* (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI (Kgm(^{-2}))</td>
<td>34.2</td>
<td>31.1</td>
<td>3.1 (2.1 – 3.9)</td>
</tr>
<tr>
<td>Waist (cm)</td>
<td>105.4</td>
<td>94.5</td>
<td>10.9 (9.3 – 12.5)</td>
</tr>
<tr>
<td>FPG (mmoll(^{-1}))</td>
<td>9.2</td>
<td>7.0</td>
<td>2.2 (1.2 – 3.2)</td>
</tr>
<tr>
<td>HbA1c %</td>
<td>8.1</td>
<td>7.3</td>
<td>0.8 (0.3 – 1.4)</td>
</tr>
</tbody>
</table>

*Baseline minus 8 week value, all changes statistically significant at least p<0.003*
GENERAL FINDINGS

- All participants reported feeling more energetic
- Most persons felt full while on diet
- Constipation – most common side effect
- Motivation with reduced blood glucose readings
- All participants wanted to continue to lose weight
CONCLUSION

- Significant reduction in FPG and weight achieved
- Significant reduction in HbA1c without medication
- Could be maintained with support and close follow-up
FURTHER ANALYSES

- Qualitative Data – learning from the experience
- Pancreatic analyses – insulin, insulin secretion
- Weight Maintenance Phase
- Future larger research study
FURTHER READING


CORE STUDY TEAM

- Prof. Nigel Unwin
- Dr. Charles Taylor
- Dr. Madhurvanti Murphy
- Ms. Melissa Abed
- Ms. Latoya Bartholomew
- Ms. Krystal Boyea
- Mr. Andre Greenidge
- Dr. Karen Bynoe
- Prof. Roy Taylor (UK)
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THANK YOU!