The twin cycle hypothesis

Substantial weight loss in people with type 2 diabetes will:

**Liver**
- Decrease fat – improve insulin action
- And
- Normalise overnight blood sugar

**Pancreas**
- Decrease fat – normalise the insulin response to eating

And
The Counterpoint study – Type 2 diabetes, 800kcal diet

Liver

Pancreas
Reversibility of type 2 diabetes

The pathophysiological defects in the liver and pancreas are reversible – if diabetes duration <4yr

Can long duration type 2 diabetes also be reversed?
The Counterbalance Study –

Counteracting BetA cell failure by Long term Action to Normalize Calorie intake

Questions:
Can people with longer duration type 2 diabetes reverse to normal?
Is the reversal of type 2 diabetes durable if body weight remains stable?
Protocol for CounterBalance study

Very low calorie diet

Stepped return to normal eating

Weight maintenance

T2DM < 4 yr

T2DM > 8 yr

Weeks

0 1 4 8

10 + 6 months
## Counterbalance Subjects

<table>
<thead>
<tr>
<th></th>
<th>0-4y (n=15)</th>
<th>8-23y (n=14)</th>
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</thead>
<tbody>
<tr>
<td><strong>Diabetes duration</strong></td>
<td></td>
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<tr>
<td><strong>Age (yr)</strong></td>
<td>52.1 ± 2.6</td>
<td>61.6 ± 2.0</td>
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<tr>
<td><strong>Weight (kg)</strong></td>
<td>99.0 ± 3.7</td>
<td>96.9 ± 3.8</td>
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<tr>
<td><strong>BMI (kg/m²)</strong></td>
<td>34.6 (27.6-38.0)</td>
<td>33.0 (29.4-45.7)</td>
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Results: weight loss during diet

Weight loss: $14.6 \pm 0.8\%$ vs. $14.5 \pm 0.7\%$

$p=0.662$
Fasting plasma glucose during diet

Short duration

Long duration

FPG (mmol/l)

Weeks

FPG (mmol/l)

Weeks

Steven et al Diabetic Med 2015
By diabetes duration

Spearman 0.501; p=0.006

Steven et al Diabetic Med 2015