The Reality of Genetically-Specific Nutrition and Training

Despite advances in modern medicine and the rapid growth of the health and fitness section, Australians remain one of the largest demographics in the world in terms of obesity.

Why, what are we missing?

As fitness professionals, we have clients who train hard, improve their diet yet often see minimal improvements in their results.

As I have discovered, the answer may well exist in our DNA.

Personalised Nutrition and Exercise

New research is allowing us to implement a more individual nutrition and exercise protocol for our clients, based on an individuals DNA, specifically their AMY1 copy number variation (known as AMY1 CNV). The AMY1 gene has been found to accurately predict an individual’s ability to metabolise starch carbohydrates. This is a great step forward for us in terms of assisting our clients reach their exercise and nutritional goals and requirements.

We now know that:

- The AMY1 CNV has our genome’s largest influence on obesity2; and this has been
- Independently verified, to have the greatest correlation to a physiological parameter.3
- The AMY1 CNV is linearly related to amount of salivary amylase.
  - CN = 2 – salivary amylase 4 IU/L
  - CN = 9 – salivary amylase 28 IU/L

Salivary Amylase and Exercise

Following are some of the most interesting aspects around how salivary amylase and exercise are aligned.

- Exercise consistently increases mean salivary amylase activities and concentrations, particularly at an intensity of >70% VO2max for 30 -90 minutes, either running on a treadmill or peddling on a bicycle ergo-meter, in healthy individuals. Significant increases in salivary amylase were observed within 45 minutes post exercise.

- If you have a low AMY 1 COPY Number you have a significantly lower Lactic Acid Threshold therefore needs to be considered for their training regime and targets.
- Intermittent, high-intensity exercise can significantly increase salivary amylase activity. Including activity such as a 60 minute cycle exercise task, consisting of 20 1 minute periods at 100% VO2max, each separated by 2 minute recovery at 30% VO2max.

- Smoking a single cigarette can decrease salivary amylase activity by 44% in healthy individuals, irrespective of gender.

- Significantly higher salivary amylase levels have been observed for individuals reporting a positive mood and calmness.

**What the AMY 1 CNV Result Means for Lifestyle Risk and Interventions.**

<table>
<thead>
<tr>
<th>Physiological function</th>
<th>Plays a role in the digestion of carbohydrates.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variation</td>
<td>Copy Number Variation between 1 – 20.</td>
</tr>
<tr>
<td>Effect of Variation on Gene Expression</td>
<td>The higher the copy number the higher the production of amylase.</td>
</tr>
</tbody>
</table>

**Green**
- Copy numbers greater than 9
- High production of amylase
- Greater ability to digest carbohydrates
- 800% decreased risk of obesity
- Decreased diabetes risk
- Decreased insulin resistance risk
- Able to tolerate and metabolise gluten better
- Increased risk of dental decay and periodontal disease
- Lower risk of infection
- High starch foods may taste sweeter
- Higher chance of failure when attempting to quit smoking

**Orange**
- Copy numbers 5 to 9
- Moderate production of amylase
- Moderate ability to digest carbohydrates
- Increased risk of obesity
- Decreased risk of insulin resistance
- Decreased risk of diabetes
- Able to metabolised and tolerate gluten better
- Increased risk of periodontal disease and dental decay
- Increased risk of infection
- High starch food may taste less sweet

**Red**
- Copy numbers 1 to 4
- Low production of amylase
- low ability to digest carbohydrates
- **800% increased risk of obesity**
- Increased risk of insulin resistance
- Increased risk of diabetes
- Less able to metabolise and tolerate gluten
- Decreased risk of dental decay and periodontal disease
- Increased risk of infection
- High starch food may taste less sweet

**Diabetes**
- Low copy numbers have an increased risk of insulin resistance and diabetes.

**Periodontal disease and dental decay**
- High copy numbers have an increased risk of both periodontal disease and dental decay.

**Obesity**
- Copy numbers 1 to 4 have a 800% increased risk of obesity compared to higher copy numbers.

**Gluten intolerance/celiac disease**
- Low copy numbers at higher risk of being gluten intolerant or having celiac disease.

**Gut dysbiosis**
- Low copy number at higher risk of gut dysbiosis.

**Infection**
- Low copy number at higher risk of infection.

**Aim of intervention**
- If low AMY 1 number then the aim is to increase amylase production and decrease impact of low AMY 1 by reducing high starch carbohydrates in diet.
- If high AMY 1 number then the aim is to decrease risk of dental decay and periodontal disease.

**Lifestyle Interventions**
- High copy numbers should take extra care with their dental hygiene and brush their teeth after consuming carbohydrates.
- Stop smoking if low copy number.
- Exercise up to 2.5 hours before meals if low copy number. High intensity exercise for short periods of time is best.
- Chew food slowly if low copy number.

**Nutrigenomic Interventions**
- Low copy number should take 1 to 2 drops of Citric acid solution before meals.
- Low copy number can take amylase as a digestive enzyme.

**Nutrition Interventions**
- Low copy numbers (1-4) should consume a low starch carbohydrate diet which is approximately 75g for women and 100g for men, a day.
- Copy numbers 5-9 should consume a low to moderate carbohydrate diet. That’s 75 to 110g for women and 100 to 150g for men a day.
- High copy numbers (>9) can consume a greater amount of carbohydrates. Around 150g or more for women and 200g for men a day.
- Low copy numbers should eat unrefined, unprocessed, high amylose, high resistant starch, plant based carbohydrates.
- Low copy numbers should avoid gluten, grains, sugar and high amylpectin carbohydrates.
- Avoid or severely limit alcohol before high starch meals if low copy number.
- Avoid consuming amylase inhibitors such as amaranth, barley, rice, sorghum, wheat, black tea, green tea and alcohol, bilberry, lemon balm, rhodiola and rosemary, grape seed extract, green tea and quercetin, acarbose and ginger.
- Eat foods high in citric acid such as lemons, limes, oranges and grape fruits.
REFERENCES


