



A practical guide to establishing gastrointestinal tolerance of **medium chain triglyceride (MCT)** and **betaquik<sup>®</sup>** in the **ketogenic diet**



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Supporting education in the  
dietary management of rare diseases

## Disclaimer

### This practical guide:

- Is intended as a general aid for the use of MCT in the ketogenic diet (KD) in children aged over 1 year, adolescents and adults diagnosed with epilepsy or an inherited neurometabolic disorder, for example, Glut-1 Deficiency Syndrome (Glut-1 DS) or Pyruvate Dehydrogenase Deficiency (PDHD), where its use is indicated and evidence based.
- Is primarily focused on the dietetic application of the KD not the clinical management associated with its use.
- Does not relate to the challenge of the KD and CKD implementation in infants i.e. those under 12 months of age. Further guidance from more specialist resources should be sought for this group.
- Is only to be used by qualified healthcare professionals.
- Is not for use by patients or their parents or caregivers.
- Is for general information only and must not be used as a substitute for professional medical advice or treatment.

The information, although accurate and based on current best practice in the UK at the time of publication, is subject to change as use of the KD evolves.

It is the sole responsibility of the Multi-Disciplinary Clinical Team (MDT), i.e. a dedicated '**keto-team**', to ensure patients managed on the KD are suitable to undergo this form of dietary therapy and they undertake and implement all the assessments, procedures, investigations and monitoring required in accordance with locally agreed procedures specific to the intervention.

The term '**keto-team**' is a generic description for those healthcare professionals (for example, dietitians, clinicians, nurses) involved in the implementation, follow-up and care of patients on a KD.

We advise this guide is read in conjunction with your local and national protocols and general recommendations for the use of MCT and the KD in the dietary management of epilepsy and neurometabolic disease.

The **betaquik**<sup>®</sup> product information although correct at the date of publication, is subject to change. To ensure accuracy, please refer to product labels. For allergens contained within products included in this guide, please refer to individual product labels.

### Written by:

Bridget Lambert MSc, RD, Clinical Science Dietitian, and Vitaflo Dietitians, Vitaflo<sup>®</sup> (International) Ltd

### In collaboration with:

Elizabeth Neal MSc PhD RD, Specialist Ketogenic Dietitian - Matthews Friends Clinics and Honorary Research Associate, UCL-Institute of Child Health, London, UK.

## Abbreviations

<b>CKD</b>	Classical ketogenic diet	<b>MCFA</b>	Medium chain fatty acid
<b>GI</b>	Gastrointestinal	<b>MCT</b>	Medium chain triglyceride
<b>KD</b>	Ketogenic diet	<b>MCTKD</b>	Medium chain triglyceride ketogenic diet
<b>LCT</b>	Long chain triglyceride	<b>MKD</b>	Modified ketogenic diet
<b>LGIT</b>	Low glycaemic index treatment	<b>Modified KD's</b>	i.e. the MAD, LGIT and MKD
<b>MAD</b>	Modified Atkins diet		



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### Introduction to **betaquik**

#### **Betaquik is:**

- A food for special medical purpose intended for use under medical supervision.
- A ready to use, liquid emulsion of medium chain triglycerides (MCT). With sweetener.
- For use in the KD or in the dietary management of conditions requiring a source of MCT.
- Suitable from 3 years of age.
- For enteral use only.
- Not for use as a sole source of nutrition.
- Best consumed with food to promote gastrointestinal tolerance of MCT.



The recommended daily intake and administration of **betaquik** is to be determined by a clinician or dietitian and is dependent on the age, body weight and medical condition of the patient, and the version of the KD they are following.

For information on the ketogenic diet, Vitaflo products for the use in ketogenic diet and recipes, visit the Vitaflo websites:

[www.vitafloweb.com](http://www.vitafloweb.com)

[www.myketogenicdiet.com](http://www.myketogenicdiet.com)

[www.myketogenicdiet.co.uk](http://www.myketogenicdiet.co.uk)

[www.myketogenicdiet.co.uk/de](http://www.myketogenicdiet.co.uk/de)

[www.myketogenicdiet.co.uk/ie](http://www.myketogenicdiet.co.uk/ie)

[www.myketogenicdiet.co.uk/nl](http://www.myketogenicdiet.co.uk/nl)

Throughout this document, reference is made to other Vitaflo resources for the KD, which can be accessed on VIA.

[www.nestlehealthscience.com/Vitaflo/VIA](http://www.nestlehealthscience.com/Vitaflo/VIA)

## 1.0 Why can MCT cause GI intolerance?

MCT has many attributes that make it beneficial in the KD. These are described in the Vitaflo resource 'A practical guide to the use of medium chain triglyceride (MCT) in the ketogenic diet (KD)'. Initial use of MCT as an oil, emulsion or powder, especially in large quantities all at once, can be associated with adverse side effects (Table 1). These can occur regardless of the format of MCT, and whether it is consumed solely on its own or in combination with foods. Side-effects are related to assimilation of MCT by the body and can be a limiting factor for use and acceptability.

**However, any symptoms that do occur resolve in the majority of individuals. GI tolerance to MCT is usually established, given time and persistence with taking it. Support and encouragement to continue with MCT is vital.**

**Table 1:** Reported gastrointestinal (GI) symptoms related to ingestion of MCT<sup>1-4</sup>.

Location of side effects in GI tract after taking MCT	Description of symptoms	Reason
<p><b>Upper</b></p> 	<p>A distinctive mouth and throat sensation when swallowed, often described as a 'scratchy' or burning feeling.</p> <p>Coughing.</p>	<p>More rapid and extensive hydrolysis of MCT occurs compared to long chain triglyceride (LCT) in the upper part of the GI tract.</p> <p>On release from the triglyceride molecule, individual medium chain fatty acids (MCFA) can irritate the lining of the mouth, throat, and oesophagus<sup>1</sup>.</p>
<p><b>Middle and lower</b></p> 	<p>Nausea</p> <p>Vomiting</p> <p>Abdominal pain, cramping</p> <p>Bloating or a feeling of fullness</p> <p>Flatulence</p> <p>Diarrhoea</p>	<p>MCT can accelerate both stomach emptying and small bowel transit time by stimulating the release of hormones that control its motility.</p> <p>This may influence the nervous system present in the gut, affecting peristalsis and/or be registered by the brain as abdominal pain.</p>

## 2.0 Practical guidance for the introduction of MCT to establish GI tolerance

When advising an individual on the introduction of MCT into their KD, two main aspects to consider are:

- **The time-period of introduction** - this may need to be adjusted to suit the personal level of GI tolerance and product acceptance by the individual.
- **The quantity of MCT** (and hence the volume/weight of **betaquik**) required will be patient specific, e.g. it will depend on their individual dietary needs and the version of KD they are following. Therefore, the amount they take should always be calculated on an individual basis, e.g. when using MCT in the LCT based versions of the KD, i.e. Classical (CKD) and modified KD's, energy intake and LCT content may need adjusting.

This information is intended to compliment further practical guidance and case scenarios to illustrate the use of MCT in each version of the KD in the Vitaflo resource 'A practical guide for the use of **betaquik** in the KD'.

**Chart 1** highlights practical ways that may help establish gastrointestinal tolerance of MCT in all versions of the KD, and provides suggestions for using **betaquik** as a source of MCT.

**Chart 1:** Practical guidance for establishing gastrointestinal tolerance of MCT and **betaquik** in all versions of the KD.

### Introduction of MCT

Tailor the introduction of MCT to the patient's reported levels of tolerance and product acceptability.

Doing this slowly over a period of several days helps establish gastrointestinal tolerance to MCT and can aid acceptance of **betaquik**.



- However MCT is used, it must be introduced in a systematic, gradual manner up to the target amount.
- The amount of MCT to give and increase by each day will vary depending on the individual and the final, target volume/weight required.
- Achieving tolerance can take longer for some people than others - persistence may be required!
- It may take between 3-10 days, or up to two weeks for the full amount of MCT to be introduced and tolerated.

In general, MCT is best tolerated when:

- The total amount is divided up into smaller quantities, taken at regular intervals throughout the day.
- Consumed with food e.g. as part of a meal or snack, or incorporated as an ingredient into a recipe.

### Tips for the management of intolerance

If GI symptoms occur, worsen or persist, consider:

- Reducing the amount of MCT back to the previous step.
- Extending the introduction period by stopping at the current intake of MCT for a few days, then restarting, and slowly increasing again.
- Recalculating the transition to target amounts so changes are made more gradually and cautiously, e.g. by increasing every 2-3 days instead of daily, and/or by smaller, measured increments.
- Remaining at an amount of MCT that is tolerated, rather than trying to reach the target, especially if beneficial.

Persevere with progression as side effects usually ease and resolve with time!

### Management and monitoring tips

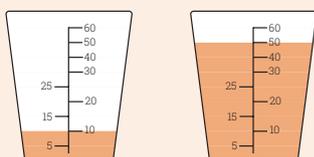
- Monitor the quantity of MCT included as a component of the ketogenic diet carefully; amounts higher or lower than the target quantity may be efficacious on an individual patient basis.
- To promote a steady ketosis throughout the day MCT is best taken regularly.
- MCT taken at bedtime can enhance ketosis overnight.
- To avoid an excessive ketosis, monitor ketones regularly when introducing MCT, as per local '**keto-team**' guidelines.

### Using **betaquik** as a source of MCT in the KD

For measuring quantities of **betaquik** simply and quickly, use a graduated cup (one is provided in a **betaquik** starter pack).

Alternatively, weigh **betaquik** in a container on digital gram scales.

10ml (10g) **betaquik** provides 2g MCT.



### Simple ways of introducing and taking **betaquik**

- Small amounts of **betaquik** can be easily measured out from the bottle. It can be consumed as a drink or 'shot' as it is, or with permitted flavourings added. Serve **betaquik** warmed, chilled or pre-frozen in a mould as an ice lolly.
- **Betaquik** can be mixed with unsweetened soya or nut milk, with or without suitable flavourings added. Mix with measured amounts of cow's milk in versions of the KD with sufficient carbohydrate allowance, e.g. MCTKD.

- Once the target amount has been reached, **betaquik** can continue to be taken in this format, or incorporated into recipes for meals and snacks with other permitted foods.

For recipes and ideas for using **betaquik** visit:

[www.myketogenicdiet.com](http://www.myketogenicdiet.com)

[www.myketogenicdiet.co.uk](http://www.myketogenicdiet.co.uk)

[www.myketogenicdiet.co.uk/de](http://www.myketogenicdiet.co.uk/de)

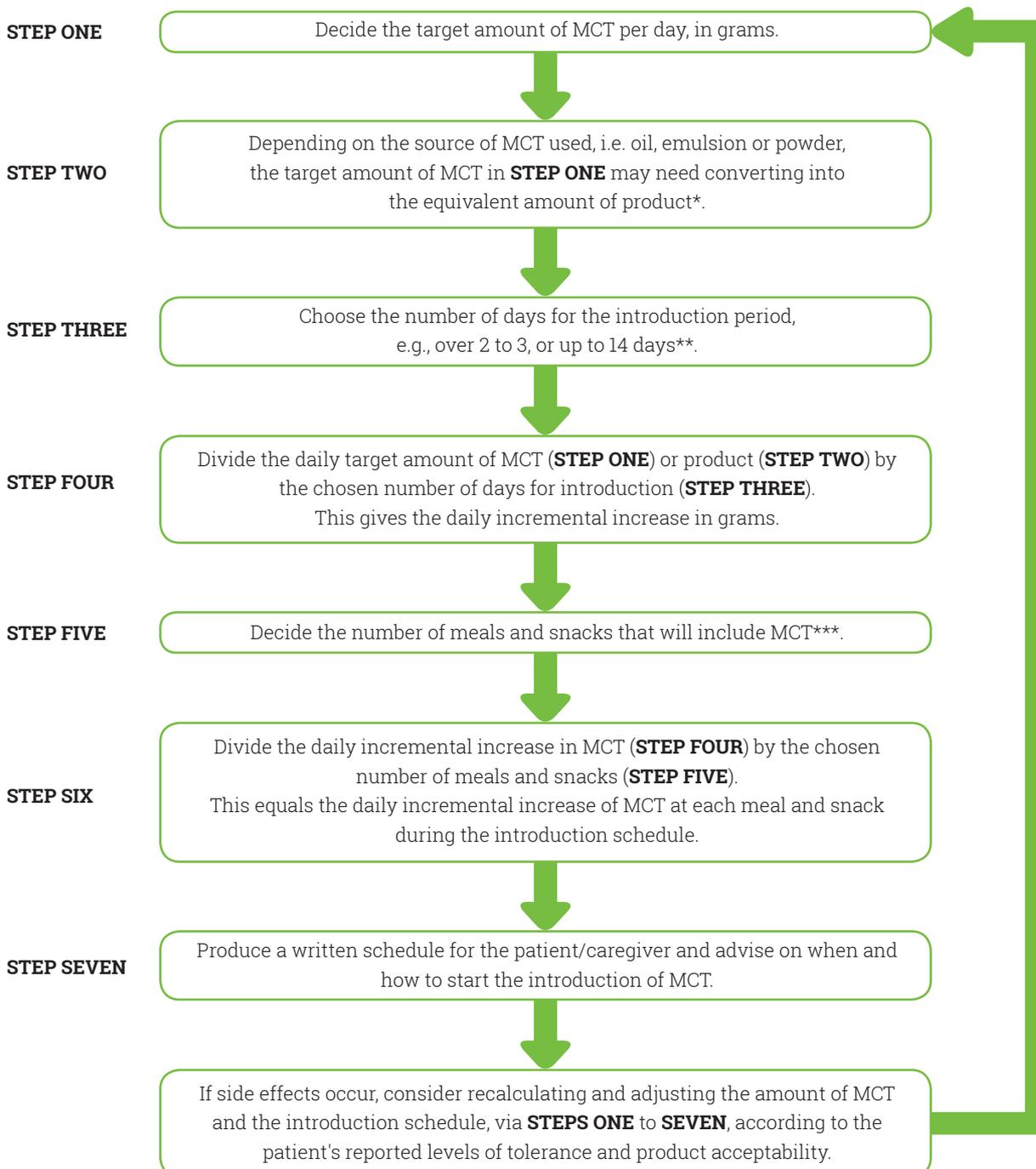
[www.myketogenicdiet.co.uk/ie](http://www.myketogenicdiet.co.uk/ie)

[www.myketogenicdiet.co.uk/nl](http://www.myketogenicdiet.co.uk/nl)

## 2.0 Practical guidance for the introduction of MCT to establish GI tolerance (continued)

**Chart 2** shows how a daily introduction schedule for MCT can be calculated in **SEVEN STEPS**. This can be tailored to meet the individual needs of the patient and also enable adjustments to be made if symptoms of GI intolerance occur.

**Chart 2:** How to calculate an introduction schedule for MCT in **SEVEN STEPS**



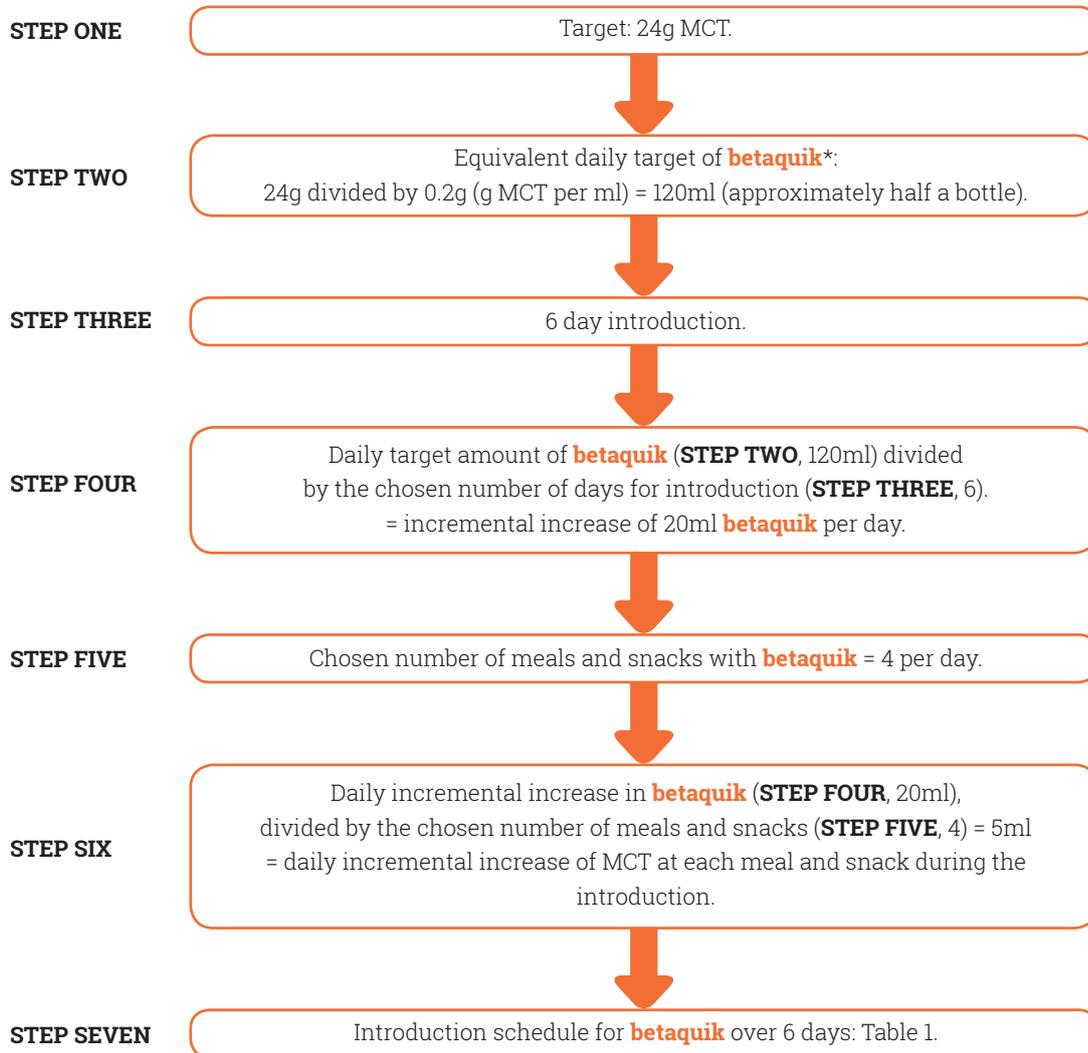
\* e.g. 1ml MCT oil = 1g MCT 1ml **betaquik** = 0.2g MCT

\*\* Initially, length may be determined by the target amount of MCT, i.e. shorter duration for smaller quantities, longer for larger ones. If side effects occur, the time period may need increasing.

\*\*\* In the KD, MCT is taken with food at regular intervals and in equal amounts over the day and at bedtime, e.g. at least 3 - 4 times daily or at every meal or snack<sup>5,6</sup>.

**Example A:** Six day introduction of 120ml **betaquik** (providing 24g MCT; approximately  $\frac{1}{2}$  a bottle) in a modified KD.

**Chart 3:** Calculation of introduction schedule for 120ml **betaquik** over 6 days.



\* 1ml **betaquik** = 0.2g MCT

**Table 1:** 6-day introduction schedule for 120ml **betaquik** (approximately half a bottle) providing 24g MCT, in a modified KD.

Betaquik ml (MCT g)						
Meal or snack	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Breakfast	5 (1)	10 (2)	15 (3)	20 (4)	25 (5)	30 (6)
Lunch	5 (1)	10 (2)	15 (3)	20 (4)	25 (5)	30 (6)
Evening Meal	5 (1)	10 (2)	15 (3)	20 (4)	25 (5)	30 (6)
Bedtime	5 (1)	10 (2)	15 (3)	20 (4)	25 (5)	30 (6)
Daily Total	20 (4)	40 (8)	60 (12)	80 (16)	100 (20)	120 (24)*

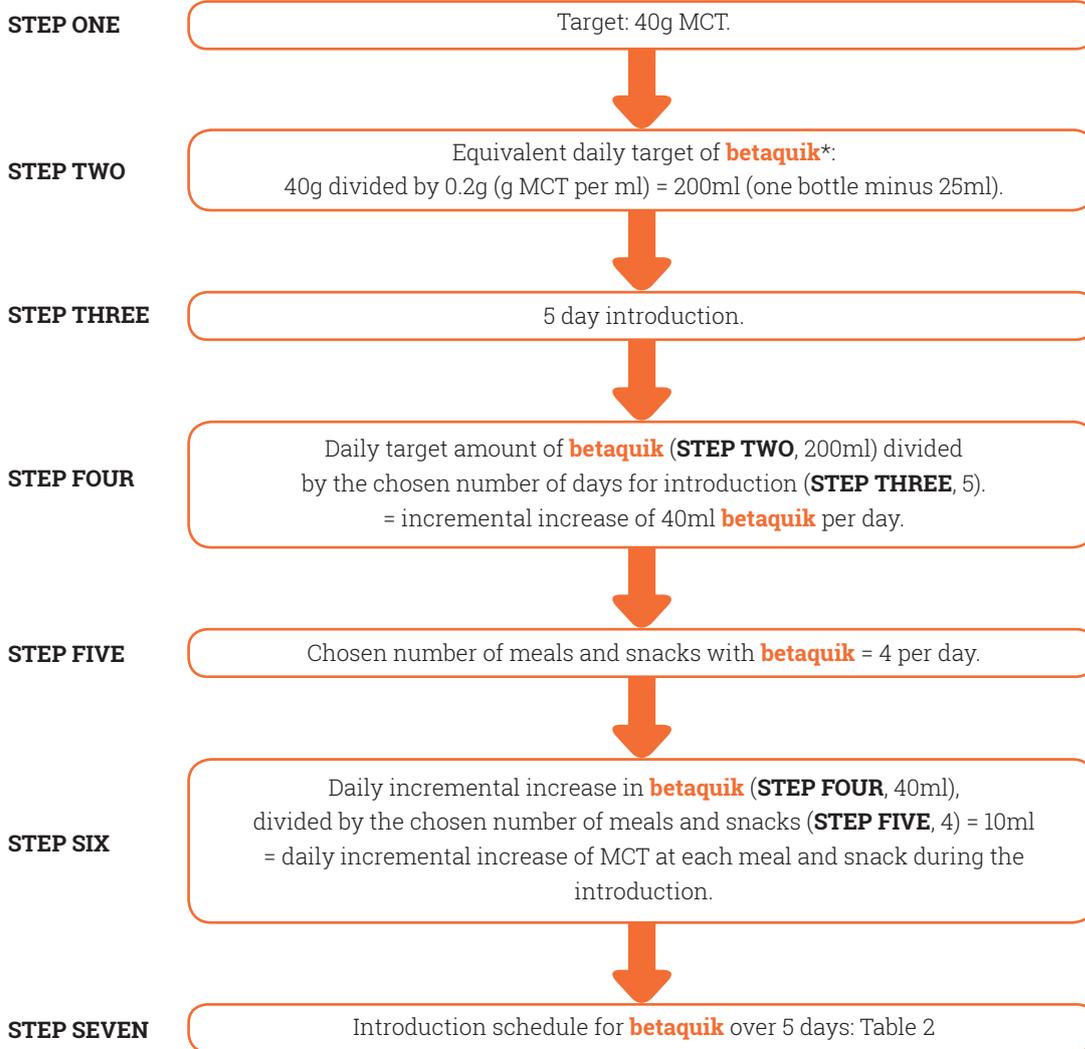
\* **Note:** This provides 227kcal (24g MCT and 1.2g LCT). Energy content of MCT is 9kcal per g as per labelling legislation<sup>7</sup>.

**Note:** To avoid an excessive energy intake, the amount of MCT used may need to be exchanged for an equivalent amount of LCT. Further details are provided in the VitaFlo resource "A practical guide for the use of **betaquik** in the ketogenic diet".

## 2.0 Practical guidance for the introduction of MCT to establish GI tolerance (continued)

**Example B:** Five day introduction of 200ml **betaquik** providing 40g MCT, in a modified KD with an additional option to increase to 225ml **betaquik** providing 45g MCT (one bottle).

**Chart 4:** Calculation of an introduction schedule for 200ml **betaquik** over 5 days.



\* 1ml **betaquik** = 0.2g MCT

**Table 2:** 5-day introduction schedule for 200ml **betaquik** providing 40g MCT, in a modified KD with an additional option to increase to 225ml **betaquik** providing 45g MCT (one bottle).

<b>Betaquik ml (MCT g)</b>						
<b>Meal or snack</b>	<b>Day 1</b>	<b>Day 2</b>	<b>Day 3</b>	<b>Day 4</b>	<b>Day 5</b>	<b>Day 6*</b>
<b>Breakfast</b>	<b>10 (2)</b>	<b>20 (4)</b>	<b>30 (6)</b>	<b>40 (8)</b>	<b>50 (10)</b>	<b>60 (12)</b>
<b>Lunch</b>	<b>10 (2)</b>	<b>20 (4)</b>	<b>30 (6)</b>	<b>40 (8)</b>	<b>50 (10)</b>	<b>55 (11)</b>
<b>Evening Meal</b>	<b>10 (2)</b>	<b>20 (4)</b>	<b>30 (6)</b>	<b>40 (8)</b>	<b>50 (10)</b>	<b>55 (11)</b>
<b>Bedtime</b>	<b>10 (2)</b>	<b>20 (4)</b>	<b>30 (6)</b>	<b>40 (8)</b>	<b>50 (10)</b>	<b>55 (11)</b>
<b>Daily Total</b>	<b>40 (8)</b>	<b>80 (16)</b>	<b>120 (24)</b>	<b>160 (32)</b>	<b>200 (40)</b>	<b>225 (45)**</b>

**\*Note:** Optional addition of 25mls **betaquik** on day 6, so that the daily total is one bottle of **betaquik** (225ml providing 45g MCT).

**\*\* Note:** This provides 426kcal (45g MCT and 2.3g LCT). Energy content of MCT is 9kcal per g as per labelling legislation<sup>7</sup>. Daily energy intake may need adjusting to accommodate this.

Guidance on the use of **betaquik** in the all versions of the KD (CKD, MCTKD and modified KD's) are provided in the Vitaflo resource 'A practical guide for the use of **betaquik** in the ketogenic diet'.

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**A Nestlé Health Science Company**

Vitaflo International Ltd,  
Suite 1.11, South Harrington Building,  
182 Sefton Street, Brunswick Business Park,  
Liverpool L3 4BQ, UK

**+44 (0)151 709 9020**

**[www.vitaflo-VIA.com](http://www.vitaflo-VIA.com)**

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