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KETOCAL 3:1 CASE STUDIES

KetoCal 3:1 is a Food for Special Medical Purposes for the dietary management of drug-resistant epilepsy and other conditions where the Ketogenic Diet is indicated, and must be used under medical supervision.

This booklet is intended for Healthcare Professionals only.

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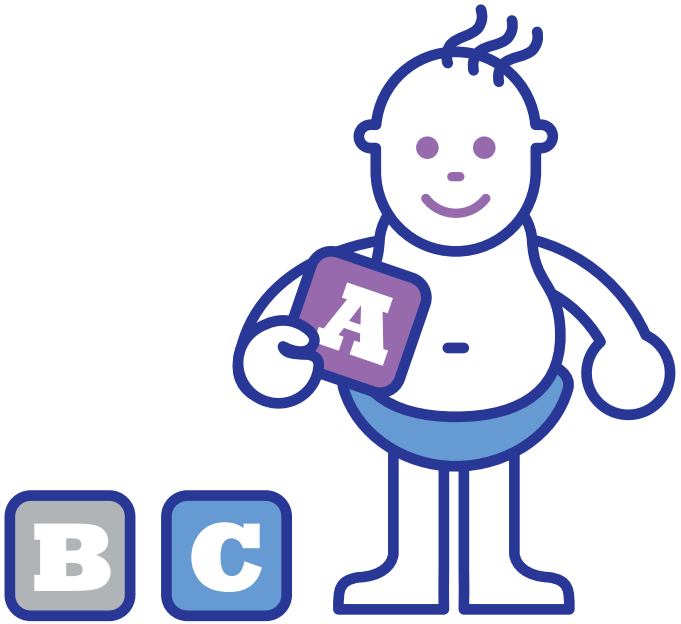
Nutricia provides products and services to help make ketogenic dietary therapy easier and more convenient.

Our products have been available for over 20 years, they are clinically proven and trusted by Healthcare Professionals and patients worldwide.

“**KetoCal 3:1** is for the dietary management of infants and children with drug resistant epilepsy or other conditions for which the ketogenic diet is indicated ”



INTRODUCTION

KetoCal 3:1 is a Food for Special Medical Purposes for use under medical supervision. KetoCal 3:1 is an unflavoured, very high fat, low carbohydrate, nutritionally complete powdered product containing a blend of oils, milk proteins, supplemental amino acids, carbohydrate, vitamins, minerals and trace elements. A 3:1 ratio of fat to carbohydrate and protein. KetoCal 3:1 is for the dietary management of infants and children with drug resistant epilepsy or other conditions for which the ketogenic diet is indicated.

Presented herein is a series of 6 case studies following a clinical trial in which patients are initiated on to ketogenic dietary therapy incorporating KetoCal 3:1 for a minimum period of 2 to 4 weeks.

SUMMARY TABLE

CASE STUDY	AUTHOR	PATIENT*	DIAGNOSES	SOCIO-ECONOMIC BACKGROUND	HISTORY	OUTCOME WITH KETOCAL 3:1
1	**HELENA CHAMPION** Paediatric Dietitian Addenbrookes Hospital	'Samuel' 3 months	Infantile spasms (IS)	Not disclosed	IS at 3 months of age. Initially treated with prednisolone and vigabatrin, to which they were resistant. Referred for assessment for KDT at age 4 months. Samuels weight was faltering and drifted from the 75th to the 50th centile, and height from the 98th to the 75th centile. Samuel was graded on to a ketogenic regimen using a mixture of KetoCal 3:1 feed and breast milk feeds	Samuel was having 3 oral meals at 2.5:1 ratio which provided 600 kcals/day (3 x 200 kcals) and two 150ml bottle feeds of KetoCal 3:1 adjusted to 2.5:1 ratio. Samuel has achieved good growth and appropriate weight gain with KetoCal 3:1 and homemade ketogenic solids. Samuel makes good ketones from his mix of ketogenic solids and KetoCal 3:1. It continues to be well tolerated and Samuel remains seizure free.
2	**VICTORIA WHITELEY** Advanced Clinical Practitioner in Ketogenic Therapies Royal Manchester Children's Hospital	'Peter' 5 years, 5 months	Neonatal epileptic encephalopathy	Mum is a single parent and Peter has a sibling who is younger, they are from a lower socioeconomic background and have managed KDT for over 3 years	Peter was born at 33 weeks and was intubated at birth and was noted to have tonic seizures within just a few hours of life. These persisted despite the introduction of phenobarbitone, pyridoxal phosphate, biotin and folinic acid. The episodes were captured on EEG. A diagnosis of neonatal epileptic encephalopathy was made. At 2 years of age Peter was referred for consideration of KDT. Within 3 weeks of KDT Peter entered ketosis where seizures improved by 90%. Peter has continued on KDT for 3 and a half years with a good response	Peter tolerates KetoCal 3:1 well. Symptoms of reflux have improved, and his constipation is stable and well managed. Peter has maintained ketosis in the therapeutic range and remains seizure free.
3	**VICTORIA WHITELEY** Advanced Clinical Practitioner in Ketogenic Therapies Royal Manchester Children's Hospital	'Sarah' 15 months	Incontinentia pigmenti, global developmental impairment, visual impairment, hypertonia, gastro-oesophagael reflux and constipation	Mum is a single parent, 20 years old without support from her family. Mum also has some learning difficulties and a history of depression and anxiety, but manages KDT well	Sarah developed seizures from approximately 5 weeks of age. Despite taking anti-seizure medications, Sarah continued to have seizures, at least 100 episodes per day including absence seizures, nystagmus with altered breathing, tonic and tonic clonic seizures	While taking KetoCal 3:1, mum feels Sarah's bowel movements have improved. Seizures have improved by over 80% on KDT and Sarah has tolerated the diet well with no exacerbation in constipation or gastro-oesophageal reflux
4	**VICTORIA WHITELEY** Advanced Clinical Practitioner in Ketogenic Therapies Royal Manchester Children's Hospital	'Leanna' 8 months	Megalencephaly-polymicrogyria-polydactyly-hydrocephalus syndrome, global developmental impairment, visual impairment, and hypotonia	Both Sarah's parents are full time students and they have 2 additional children	Diagnosed with IS at 5 months of age. Hypsarrhythmia was confirmed on EEG and started vigabatrin and prednisolone, though spasms did not improve. Due to the persistence of seizures Leanna was referred for KDT. KetoCal 3:1 was subsequently titrated over a 7-10-day period	KetoCal 3:1, Leanna's seizures reduced to once daily. The seizures are milder and seem isolated rather than clustered. Tolerance to KDT including KetoCal 3:1 has been good with no exacerbation of gastrointestinal side effects
5	**PHILIPPA THOMAS** Specialist Ketogenic Paediatric Dietitian Bristol Royal Hospital for Children.	'Harry' 11 weeks	Epileptic encephalopathy	Not disclosed	Poor seizure control while taking more than three anti-seizure medications. Seizures were short lasting (usually 5-10 seconds), sometimes up to 2 minutes, often requiring rescue medication. Seizure rate was frequent occurring more than 60 times per day. Harry was fully NG fed due to drowsiness and unable to feed sufficiently and was referred for KDT. Harry was gradually weaned onto KetoCal 3:1, which was taken via the NG tube, for two weeks. After two weeks of taking KetoCal 3:1 a higher ratio diluted feed (KetoCal 4:1 LQ) was introduced with the aim of increasing ketosis	KetoCal 3:1 was effective at starting this infant on the ketogenic diet. It was tolerated well with no significant concerns. While using KetoCal 3:1, with calorie adjustment where necessary, Harry's weight stayed stable and Harry achieved ketones mainly in the 2mmol/ls.
6	**SUSAN OVINGTON** Specialist Ketogenic Paediatric Dietitian Bristol Royal Hospital for Children.	'Chloe' 14 months	Neonatal onset spasms	Not disclosed	Chloe was admitted to her local hospital with uncontrolled spasms of up to 25 per day and tonic clonic seizures every 1-2 days for a course of steroid injections. During admission, Chloe was referred for KDT. The ketogenic diet was graded in by firstly replacing her cow's milk bottles with KetoCal 3:1. Chloe's meals were then replaced with ketogenic meals until she was on a final ketogenic ratio of 3:1 (this included 2 x 240ml bottles of KetoCal 3:1 and 3 meals per day). Introduction of the KD reduced seizure burden by approximately 75% to an average of 6 spasms per day and no tonic clonic seizures and ketone levels remained consistent.	With KetoCal 3:1 continues to contribute to the attainment of dietetic goals and is taken well with 100% compliance. Trapped wind, particularly burping, has been an ongoing symptom which has been reported to disrupt Chloe's sleep.

*The patient's real names have not been used

CASE STUDY 1:

A 3 MONTH OLD BOY PRESENTED WITH THE ONSET OF INFANTILE SPASMS (IS)

Provided By: Helena Champion
Paediatric Dietitian, Addenbrookes Hospital, Cambridge

BACKGROUND

Samuel is an Infant who presented with the onset of Infantile Spasms (IS) at 3 months of age. These were initially treated with prednisolone and vigabatrin, to which they were resistant. Samuel was subsequently referred for assessment for Ketogenic Dietary Therapy (KDT) at age 4 months. Four weeks later, once Samuel had weaned off steroids, he was admitted to hospital in the spring of 2019 for commencement of KDT.

On admission, Samuel was solely breast fed and was receiving 8 feeding episodes per day, some of which lasted for 45 minutes. Despite this, his weight was faltering. Samuel's weight had drifted from the 75th to the 50th centile, and height from the 98th to the 75th centile. On discussion, mum was reluctant to fully stop breast feeding, but was happy to consider a feeding plan that consisted of bottle feeding with KetoCal at 3:1 ratio which were complemented by small breast feeds. Samuel was subsequently graded on to a ketogenic regimen as mentioned using a mixture of KetoCal 3:1 feed and breast milk feeds (see details below in ketogenic diet section).

During Samuel's admission, a speech and language therapy (SALT) review advised his swallow was insecure and a nasogastric (NG) tube was subsequently placed. Samuel took his ketogenic feeds via the NG tube and mum could let Samuel to suckle at the breast post NG feeding for 5 minutes. The SALT team also encouraged early weaning to ketogenic solids.

KETOGENIC DIET

During admission, Samuel was graded onto a ketogenic regimen. Samuel's energy requirement was calculated at 96kcals per kg of expected weight which translated to 150mls/kg of standard concentration infant formula/breast milk and was achieved over 5 days.

- 50% of feed requirement as KetoCal 3:1 followed by a breast feed equated to an estimated 1:1 ratio
- 75% of feed requirement as KetoCal 3:1 followed by a breast feed equated to an estimated 1.7:1 ratio
- 90% of feed requirement as KetoCal 3:1 followed by a 5 minute breast feed equated to an estimated 2.2:1 ratio where ketones of 2 mmol/l were achieved.

Samuel left hospital 3 weeks after hospital admission on a mixture of KetoCal feeds (with supplementary breast feeding) and first stage solids at a 2.5:1 ratio. Samuel tolerated KetoCal 3:1 well, mum noting that he had flatulence and burped after each KetoCal 3:1 feed. He was prescribed a stool softener which allowed his bowel habit to be acceptable: 6 on the Bristol stool scale. Additional water was provided via his NG tube for hydration. Samuel's ketones improved and settled to be consistently between 4-5 mmol/l. At the time

of using KetoCal 3:1 most recently Samuel was having 3 oral meals at 2.5:1 ratio which provided 600 kcals/day (3 x 200 kcals) and two 150ml bottle feeds of KetoCal 3:1 adjusted to 2.5:1 ratio.

OUTCOME

On leaving hospital, Samuel's IS resolved from 10-14 clusters of spasms/day to 3 clusters/day. After 10 months on KDT Samuel was seizure free.

At the time of using KetoCal 3:1 most recently, Samuel's length returned to the 98th centile, and his weight approached the 75th centile. At times, Samuel does experience some bloating, but mum associates this with the introduction of some new ketogenic solids. Samuel's mum finds the consistency of the KetoCal 3;1 acceptable and is happy with its appearance. Overall, Samuel has achieved good growth and appropriate weight gain with KetoCal 3:1 and homemade ketogenic solids.

SUMMARY
Samuel continues with his KDT regimen. Samuel makes good ketones from his mix of ketogenic solids and KetoCal 3:1 formula. It continues to be well tolerated and pleasingly, he supports all his nutrition orally and remains seizure free.

CASE STUDY 2:
A CHILD WITH NEONATAL EPILEPTIC ENCEPHALOPATHY

Provided By: Victoria Whiteley
Advanced Clinical Practitioner in Ketogenic Therapies, Royal Manchester Children's Hospital

BACKGROUND

Peter is 5 years and 5 months and commenced on the ketogenic diet at 2 years of age. Peter was born at 33 weeks and was intubated at birth and was noted to have tonic seizures within just a few hours of life which persisted despite the introduction of phenobarbitone, pyridoxal phosphate, biotin and folinic acid. The episodes were captured on electroencephalogram (EEG) and confirmed as seizures with brief episodes (20 seconds to 1 minute) occurring a few times per day. A diagnosis of neonatal epileptic encephalopathy and a gene panel was sent to identify the cause.

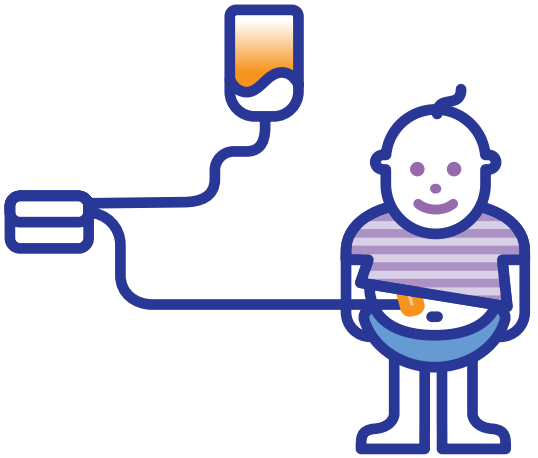
At 8 weeks of age, phenytoin was introduced in addition to the phenobarbitone and although some improvement was seen in the length of seizures, Peter continued to experience multiple tonic seizures per day.

At 2 years of age Peter was referred for consideration of Ketogenic Dietary Therapy (KDT). Over the previous 18 months Peter had tried a further 3 medications; Topiramate, vigabatrin and sodium valproate but tonic seizures continued, with a frequency of 5-10 seizures daily. Peter had developmental delay and his swallow had deteriorated resulting in weight loss and the introduction of nasogastric (NG) tube feeding. Peter also had dystonia and gastro-oesophageal reflux.

Historically, Peter was taking a standard follow on formula via a NG tube providing 100ml/kg, providing 626kcal and 12.9g protein daily. At the time of referral, Peter was 9.2kg (0.4th centile) and 82.2cm in length (9th centile). Peter's growth history showed a gradual weight loss over the last 6 months, moving from just above the 9th centile to the 0.4th. Peter was having gravity boluses 130ml x7 per day but he was experience regular vomiting with feeds, 2–3 times per day. Peter then transitioned to a classical 2:1 ketogenic diet using KetoCal 3:1 and Polycal (details below) made up at a 1kcal per ml dilution with a feed plan of 125ml x 6 per day with additional water flushes to meet requirements. To help with feeding, pump assisted boluses were introduced and lansoprazole 15mg daily was introduced to managed gastro-oesophageal reflux.

FEED	AMOUNT	NUTRITION PROVIDED
KetoCal 3:1	100g	**Energy:** 754kcal **Fat:** 68.6g **Protein:** 15.4g **Carbohydrate:** 18.7g
Polycal	12g	

Within 3 weeks of KDT introduction Peter entered ketosis, with blood ketone levels of 3mmol/l – 5mmol/l. Seizures improved by 90% with break through seizures during illness or loss of ketosis. Due to seizure improvement phenobarbitone and vigabatrin



were weaned. Four months after commencing KDT a gastrostomy was inserted, and feeds were adjusted to 150ml x 5 per day with minimal vomiting and reflux symptoms. Peter has continued on KDT for 3 and a half years with a good response. Peter now has a diagnosis of KCNQ2 related neonatal epileptic encephalopathy and his seizures are well managed with a classical 2:1 ketogenic diet and carbamazepine, with seizures only seen with intercurrent illness.

KETOGENIC DIET

Since 2020, Peter's feed (details below) is given via his gastrostomy and provides 854kcal per day in 525ml. This equates to 58% of Estimated Average Requirements (EAR) and the energy intake has been calculated by observing Peter's weight gain, growth, and tolerance to feeds.

FEED	AMOUNT	NUTRITION PROVIDED
KetoCal 3:1	114g	**Energy:** 854kcal **Fat:** 77.5g **Protein:** 17.4g **Carbohydrate:** 21.6g
Polycal	13.6g	

OUTCOME

With the above regimen, constipation remained but mum felt that his reflux has improved with KetoCal 3:1 and Peter has been able to tolerate the feed well while taking the full prescribed volume. Peter's ketones are checked twice daily 3 days per week and remain consistent at 3.1-4.4 mmol/l. Peter had one recent episode of vomiting while using KetoCal 3:1, but this was secondary to increased oral secretions and excessive suctioning by a carer. As per Peter's dietetic goal, weight increased by 300g and length remained unchanged (108cm) during a 4-week period. Peter did not experience any seizures during the same time period.

SUMMARY
Peter tolerates the KetoCal 3:1 formula well. His symptoms of reflux have improved, and his constipation is stable and well managed. He has maintained ketosis in the therapeutic range and remained seizure free.

CASE STUDY 3:

A 15 MONTH OLD GIRL DEVELOPED SEIZURES FROM APPROXIMATELY 5 WEEKS OF AGE

Provided By: Victoria Whiteley
Advanced Clinical Practitioner in Ketogenic Therapies, Royal Manchester Children's Hospital

BACKGROUND

Sarah is 15 months old and has a background of incontinentia pigmenti, global developmental impairment, visual impairment, hypertonia, gastro-oesophagael reflux and constipation. She has a gastrostomy in situ due to an unsafe swallow.

Sarah developed seizures from approximately 5 weeks of age. When she first presented, she was described to become stiff, red in the face and hold her breath, but at first these were not recognised as seizures. At 3 months of age, the episodes had evolved to include some shaking and jerking of her arms and modified hypsarrhythmia was noted on her electroencephalogram (EEG). Sarah was commenced on vigabatrin, but this had little impact so nitrazepam was added.

Despite taking anti-seizure medications, Sarah continued to have seizures, at least 100 episodes per day including absence seizures, nystagmus with altered breathing, tonic and tonic clonic seizures.

Zonisamide was trialled for a short period but this led to an increase in seizure frequency and was withdrawn after 2 weeks. Due to Sarah's seizure burden she was referred for Ketogenic Dietary Therapy (KDT) and prioritised as urgent. Sarah has been NGT fed since she was 3 weeks old and under the care of the local dietitians. Due to reflux, vomiting and poor weight gain she was tried on several different formulas. It was assumed that cow's milk protein intolerance was exacerbating her reflux and Similac Alimentum was introduced to meet her EAR. It is not clear that this was helpful and vomiting only improved with the introduction of pump feeding and anti-reflux medication (omeprazole and domperidone).

Despite the history of significant reflux, Sarah has gained weight consistently and the gain has been rapid. Sarah also has a history of constipation which is managed with lactulose, picolsulfate, daily glycerine suppositories and Movicol.

	KETOGENIC DIET RATIO	FEED(S)
Stage 1	1:1	55g Similac Alimentum + 45g KetoCal 3:1
Stage 2	1.5:1	32g Similac Alimentum + 64g KetoCal 3:1
Stage 3	2:1	17g Similac Alimentum + 74g KetoCal 3:1
Stage 4	2.5:1	85g KetoCal 3:1 + 4g Polycal powder

KETOGENIC DIET

On discussion with mum and local services, the evidence for cow's milk protein intolerance was not clear and it was agreed to challenge this with a whole protein formula while monitoring symptoms of reflux, vomiting and constipation closely. KetoCal 3:1 was subsequently titrated over a 10-14-day period over several stages (see below) to achieve an intake of 1060ml each day providing a 2.5:1 classical ratio of 617 kcal daily with 58g fat, 13.09g protein and 10g carbohydrate.

Sarah entered ketosis at stage 3 with ketone levels around 2-2.8mmol/l. Sarah moved to stage 4 after 10 days and remains at this.

OUTCOME

During titration, Sarah's weight decreased slightly but was generally stabilising as per her dietetic plan. Despite the change to a whole protein formula, Sarah tolerated KetoCal 3:1 well with no increase in reflux or vomiting. Sarah did vomit once while taking KetoCal 3:1 most recently but this was related to a tonic seizure.

While taking KetoCal 3:1, mum feels Sarah's bowel movements have improved, moving to a type 4 stool rather than type 2 and 3. The stool was also brown rather than green. With this, mum has had to use Movicol less frequently and Sarah's daily medication is due for review with the gastroenterologist.

While taking KetoCal 3:1, Sarah's seizure frequency has improved. Since she achieved ketosis mum has not seen any absence seizures and her tonic and tonic clonic seizures have reduced by over 50%. There has been no change to the frequency of nystagmus. Sarah's ketosis remains consistent with levels between 2.8-4.3 mmol/l.

SUMMARY
Sarah's Seizures have improved by over 80% on KDT and Sarah has tolerated the diet well with no exacerbation in constipation or gastro-oesophageal reflux.

CASE STUDY 4:

AN 8 MONTH OLD GIRL DIAGNOSED WITH INFANTILE SPASMS (IS) AT 5 MONTHS OF AGE

Provided By: Victoria Whiteley
Advanced Clinical Practitioner in Ketogenic Therapies, Royal Manchester Children's Hospital

BACKGROUND

Leanna is 8 months old and has a background of megalencephaly-polymicrogyria-polydactyly-hydrocephalus syndrome, global developmental impairment, visual impairment, and hypotonia.

Leanna was diagnosed with Infantile Spasms (IS) at 5 months of age. Hypsarrhythmia was confirmed on electroencephalogram (EEG) and she was commenced on vigabatrin and prednisolone. Despite the anti-seizure medication, spasms did not improve and levetiracetam was added as the prednisolone was weaned. Due to the persistence of the seizures Leanna was referred for Ketogenic Dietary Therapy (KDT).

In addition to the spasms, occurring 5-6 times per day in clusters lasting 3-4 minutes, Leanna was also noted to have nystagmus with associated changes on EEG occurring many times throughout the day. Leanna was breastfed from birth until 5 months of age and then moved on to bottle feeds of standard infant formula. When the steroid medications were introduced, Leanne fed regularly, taking a minimum of 1100ml of formula daily. On referral to the ketogenic diet team Leanna's weight was 11.3kg (99.6th centile) and length was 69.2cm (50th – 75th centile) and was taking 180ml x6 bottles daily (1080ml) of standard infant formula providing 713 kcal daily. Leanna has a history of constipation and uses lactulose if she has not opened her bowels for more than 2 days and often has type 1 stools.

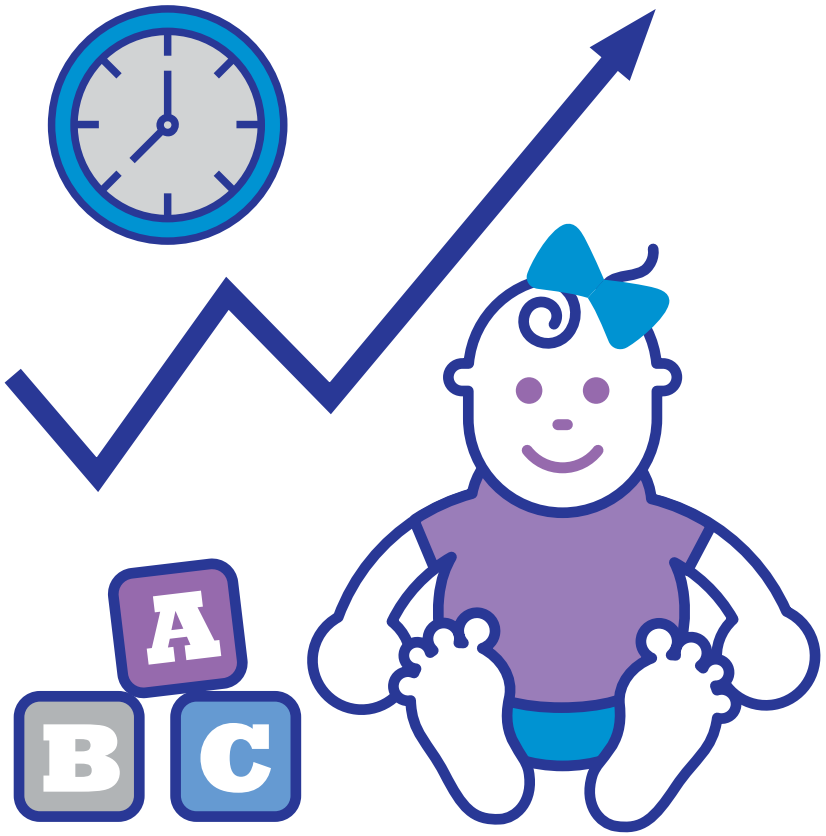
KETOGENIC DIET

KetoCal 3:1 was subsequently titrated over a 7-10-day period over several stages (see below) to achieve an intake of 1080ml each day providing a 3:1 classical ratio of 692kcal daily with 66.5g fat, 14.9g protein and 6.9g carbohydrate. Leanna achieved ketosis at stage 4 with ketone levels around 2.4-4.3mmol/l.

OUTCOME

Leanna was able to take the full volume of feeds as prescribed but occasionally had an additional bottle. Leanna experienced some constipation but is currently not using lactulose and is opening her bowels daily. When alert and happy to take, Leanna introduced 30-50g of avocado that was taken orally daily for 3-4 days per week. With KetoCal 3:1, Leanna's seizures reduced to once daily. The seizures are milder and seem isolated rather than clustered. If Leanna does experience cluster seizures, these are now much shorter, and her recovery is improved.

SUMMARY
Overall, Leanna's tolerance to KDT including KetoCal 3:1 has been good with no exacerbation of gastrointestinal side effects noted.



	KETOGENIC DIET RATIO	FEED(S)
Stage 1	1:1	390ml Aptamil 2 + 60g KetoCal 3:1
Stage 2	1.5:1	228ml Aptamil 2 + 78g KetoCal 3:1
Stage 3	2:1	120ml Aptamil 2 + 90g KetoCal 3:1
Stage 4	2.5:1	95g KetoCal 3:1 + 5g Polycal
Stage 5	3:1	97g KetoCal 3:1

CASE STUDY 5:

A 14 MONTH OLD GIRL DIAGNOSED WITH EPILEPTIC ENCEPHALOPATHY AT 5 MONTHS OF AGE

Provided By: Philippa Thomas
Specialist Ketogenic Paediatric Dietitian, Bristol Royal Hospital for Children

BACKGROUND

Chloe was a 14-month-old girl with neonatal onset spasms diagnosed with drug-resistant epilepsy. Several anti-seizure medications (ASMs), including levetiracetam, clobazam and vigabatrin, had been tried and had been largely unsuccessful in reducing Chloe's seizure burden. Chloe was admitted to her local hospital with uncontrolled spasms of up to 25 per day and tonic clonic seizures every 1-2 days for a course of steroid injections.

During admission, Chloe was referred to the ketogenic diet service at Bristol Royal Hospital for Children for a trial of the ketogenic diet (KD) and, after pre-diet testing and preparation, she started on KD one week later.

Chloe's weight on referral was 14.1kg (>99.6th centile) and her length was 75cm (25th – 50th centile). A weight history showed rapid weight gain over the last 6-9 months related to side effects of ASMs. Chloe was known to her local community Dietetic team for weight management support and at the time of referral her weight was reported to be stable. No concerns related to nutritional intake or feed tolerance were reported.

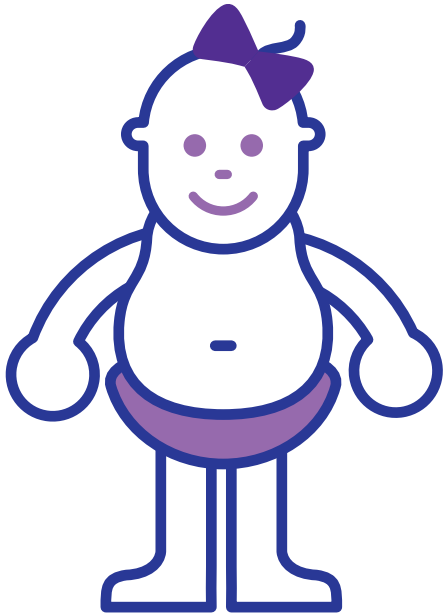
With the introduction of the KD, dietetic goals were to maintain an optimum level of ketosis for seizure control, to promote adequate growth and to ensure nutritional adequacy of KD.

The KD was graded in by firstly replacing her cow's milk bottles with KetoCal 3:1 which she tolerated and took well. Chloe's meals were then replaced with ketogenic meals until she was on a final ketogenic ratio of 3:1 with a dietary prescription of 780kcal, 76g fat, 8g carbohydrate and 17g protein. This included 2 x 240ml bottles of KetoCal 3:1 and 3 meals per day.

OUTCOME

Symptoms of bloating and burping were reported after replacing cow's milk with KetoCal 3:1 and constipation was reported within the first week of being on full KD. After 3 days of no bowel movement, glycerin suppositories were used with good effect and this treatment was required 3 times within the first week of KD. Ongoing treatment for constipation included 1 sachet paediatric Movicol daily was commenced prior to discharge from hospital and continues to be managed in this way. Once on full KD, Chloe was discharged from hospital with ketones ranging from 1.5-2.5mmol/l in the mornings and 2.5-4.0mmol/l in the evenings and was on a weaning dose of steroids alongside her normal ASMs of carbamazepine and clobazam.

Chloe has continued to take KetoCal 3:1 well with 100% compliance. Trapped wind, particularly burping, has been an ongoing symptom which has been reported to disrupt



Chloe's sleep. This has been alleviated mildly by the introduction of probiotics but then helped further by diluting KetoCal 3:1.

At times, Chloe has had intercurrent diarrhoeal illness and dilution of the KetoCal 3:1 was recommended to help alleviate symptoms and maintain hydration. Mum found Chloe's bloating was helped markedly by this, resulting in improved sleep.

Introduction of the KD reduced seizure burden by approximately 75% to an average of 6 spasms per day and no tonic clonic seizures and ketone levels remained consistent (2.5-3.5mmol/l in the evening) though fluctuations were seen with intercurrent illness where ketones dropped and seizures increased.

SUMMARY
KetoCal 3:1 continues to contribute to the attainment of dietetic goals by being a suitable ketogenic ratio, being comparable to standard infant formula and full-fat cow's milk in terms of calories and providing greater flexibility due to powder preparation and by being adequately fortified with vitamins and minerals to provide an appropriate nutritional profile.

CASE STUDY 6:
AN 11-WEEK-OLD BOY DIAGNOSED WITH NEONATAL ONSET SPASMS

Provided By: Susan Ovington
Specialist Ketogenic Paediatric Dietitian, Bristol Royal Hospital for Children

BACKGROUND
Harry was an 11-week-old boy diagnosed with epileptic encephalopathy (cause to be determined) in 2020. Harry presented to Bristol Royal Children's Hospital with poor seizure control while taking more than three anti-seizure medications. Seizures were short lasting (usually 5-10 seconds), sometimes up to 2mins, often requiring rescue medication. Seizure rate was frequent and were happening at >60 per day.

Harry had been feeding well (oral, on demand) previously. Recently, however, Harry was fully NG fed due to drowsiness and unable to feed sufficiently. Despite this, there were no growth concerns. Harry was referred to the Ketogenic Dietitians for consideration of Ketogenic Dietary Therapy (KDT). Following pre-dietary testing and preparation Harry was started on the ketogenic diet two weeks later.

KETOGENIC DIET
Harry was gradually weaned onto KetoCal 3:1, which was taken via the NG tube, for two weeks. After two weeks of taking KetoCal 3:1 a higher ratio diluted feed (KetoCal 4:1 LQ) was introduced with the aim of increasing ketosis.

OUTCOME
While using KetoCal 3:1, Harry achieved ketones mainly in the 2mmol/ls. At this stage Harry was still relying on rescue medication on all/most days.

Laxatives were reviewed due to loose bowels reported 7 days after taking KetoCal 3:1. There was no other significant medical input during this period and compliance and acceptability to this formula was excellent. During the two weeks of taking KetoCal 3:1, and with calorie adjustment where necessary, Harry's weight stayed relatively stable.

SUMMARY
KetoCal 3:1 was effective at starting this infant on the ketogenic diet. It was generally tolerated well with no significant concerns. In this case, Harry was taken off KetoCal 3:1 as he required a higher ratio formula for ketosis. Harry subsequently maintains ketosis at a higher ratio diet using diluted KetoCal 4:1 LQ preparation. Harry has seen a vast reduction in seizures due to KDT and seizures are now well controlled (1-2 per day). Further reduction in seizures were observed after the introduction of sodium valproate (Feb. 2021).

NOTES

> "Harry has seen a vast reduction in seizures due to KDT and seizures are now well controlled (1-2 per day)"

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www.nutricia.ie or call

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