Nutrition Case Study

Introduction:

This case study was developed in line with BASES and SENr codes of practice (See Appendix 1.1,1.2). Informed consent was obtained (See Appendix 2), relevant personal data has been included, with identifying details removed to maintain anonymity.

The athlete was a 22-year-old national swimmer specialising in 100-200m breaststroke, recently returning to training following a year off. The aim was to ensure adequate fuelling for high weekly volumes (~27-30km) and multiple sessions a day. A key focus was on reducing the risk of recurrent low energy availability (LEA) and Relative Energy Deficiency in Sport (RED-S), conditions previously experienced by the athlete and characterised by insufficient energy to support essential physiological functions, leading to metabolic and hormonal disruptions (Cabre et al., 2022)

Demands:

Swimming places complex physiological, biomechanical and technical demands on athletes. Swimmers must overcome hydrodynamic resistance, meaning performance depends not only on physical conditioning but also on the ability to minimise drag and maintain technical precision across all four strokes (Pyne and Sharp, 2014; Domínguez et al., 2017; Silva et al., 2010). Small technical inefficiencies can markedly affect race outcomes, particularly at elite level where margins are minimal (Liu et al., 2021).

Energy system contribution varies with event distance. Sprint events (50-100 m) rely heavily on phosphocreatine (PCr) and anaerobic glycolysis, with PCr dominating the initial seconds before rapid depletion shifts demand toward glycolysis (Pinos et al., 2021; Hargreaves and Spriet, 2020). Middle-distance events (200-400 m) draw from both anaerobic and aerobic metabolism, while longer distances (800–1500 m) are predominantly aerobic (>70%) as oxidative pathways sustain prolonged output (Rodriguez and Mader, 2011; Gastin, 2001). This diversity requires swimmers to develop high anaerobic power alongside substantial aerobic capacity.

Competitions run over several days, with multiple events raced within the same day, requiring athletes to repeatedly recover and reproduce peak performance (Tijani et al., 2021). High level swimmers complete large weekly training volumes to prepare for this demand, for example

~48-60km per week in British and Australian elite programmes (Pollock et al., 2019; Meeusen et al., 2013; Mujika et al., 2002).

Female swimmers frequently experience energy deficits (Lundstrom et al., 2024). Montenegro et al. (2017) found deficits exceeding 600 kcal/day in swimmers, alongside ~3.6 kg body mass loss across the season in females, increasing risk of LEA and RED-S, both of which compromise performance and health (Stellingwerff et al., 2011; Noland et al., 2001). This highlights the need for tailored nutrition strategies (Newbury et al., 2023).

Athlete profile

Table 1: Anthropometric Measurements

	Age (years)	Body Mass (kg)	Height (cm)	Waist to Hip Ratio (cm)	Sum of 8 Skinfold Sites (mm):	Estimated Daily Energy Intake:
Measures	22	58.2	166.5	0.74	103.3	1523.7 x PAL

*Completed by swimming club physiologist, see Appendix (3)

Training load data:

Weekly training totals: **17 hours (~27-30km)**:

- **12 hours swimming** (6x2hr)
- **3 hours of mobility / land-based warm-up** (6x30min)
- **2 hours resistance training** (2x1hr)

	Monday	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**	**Sunday**
AM	Aerobic					Lactate-Tolerance	
PM	Freestyle-Threshold	Max-Kick and Individual-Medley Aerobic	Speed-Efforts		Pull and Technique		

Key competitions:

- Swim Wales Winter Championships (18th December 2025)
- Aquatics GB Swimming Championships (14th April 2026)
- Swim Wales Summer meet (29th July 2026)

Nutrition Guide:

Double Training Day:

TIMING	WHAT TO EAT/DRINK
60mins pre-training (4-5AM)	30-60g simple-carbs + fluids
During (5:30-7:30AM)	60g/hr simple-carbs + fluids
30-60mins post-training (7:30-8:30AM)	60-120g simple-carbs + 20-30g protein + fluids
Lunch (12-2PM)	Balanced meal: complex-carbs + protein + veg + healthy fats + fluids
60mins pre-training (4-5PM)	30-60g simple-carb snack + fluids
During (6-8PM)	60g/hr simple-carbs + fluids
Immediately post-training (8PM)	60-120g simple-carbs + 20-30g protein + fluids
Dinner (9-9:30PM)	Balanced meal: complex- carbs + protein + veg + healthy fats + fluids

TIME FROM TRAINING	EXAMPLE FOODS
+ 30-60mins	Jam on toast, Porridge with Honey + Fruit, Cereal + Banana, Granola + Yogurt, Cereal Bar with Fruit juice, Breakfast Drink
During	Sports Drinks, Sports Gels, Jelly Sweets, Dried Fruit, Fruit Puree
- 0-60mins	Chocolate Milk, Overnight Oats, Omelette, Toast + Eggs, Sandwich/Wrap
- 3-5hrs	Complex Carb + Protein + Veggies / Fruit
+ 1-2hrs + 30min	Fig Rolls, Rice Cakes, Malt Loaf, Jam Sandwiches, Fruit, Cereal Bar
During	Sports Drinks, Sports Gels, Jelly Sweets, Dried Fruit, Fruit Puree
- 1-2hrs + 7-9hrs	Complex Carb + Protein + Veggies / Fruit

Single Training Day:

Breakfast (7:30-8:30AM)	Complex-carbs + protein + fluids
Lunch (12-2PM)	Balanced meal + fluids
60mins pre-training (4-5PM)	30-60g simple-carb snack + fluids
During (6-8PM)	60g/hr simple-carbs + fluids
Immediately post-training (8PM)	60-120g simple-carbs + 20-30g protein + fluids
Dinner (9-9:30PM)	Balanced meal: complex-carbs + protein + veg + fluids

TIME FROM TRAINING	EXAMPLE FOODS
+ 8.5-9.5hrs	Overnight Oats, Omelette, Toast + Eggs, Baked Beans + Toast, Granola + Yogurt + Fruit, Smoothie
+ 6-4hrs	Complex Carb + Protein + Veggies / Fruit
+ 1-2hrs + 30min	Fig Rolls, Rice Cakes, Malt Loaf, Jam Sandwiches, Fruit, Cereal Bar
During	Sports Drinks, Sports Gels, Jelly Sweets, Dried Fruit, Fruit Puree
- 1-2hrs + 7-9hrs	Complex Carb + Protein + Veggies / Fruit

MICRONUTRIENTS	Include fruit, veg, dairy, wholegrains daily (Iron, vit D + C, calcium, folate, B12 = ESSENTIAL)
HYDRATION	Drink regularly, use urine colour chart (1-3), replace lost fluid post-training



Pre-, Mid-, Post-Competition:

Nutrition Recommendations

Before & During Race

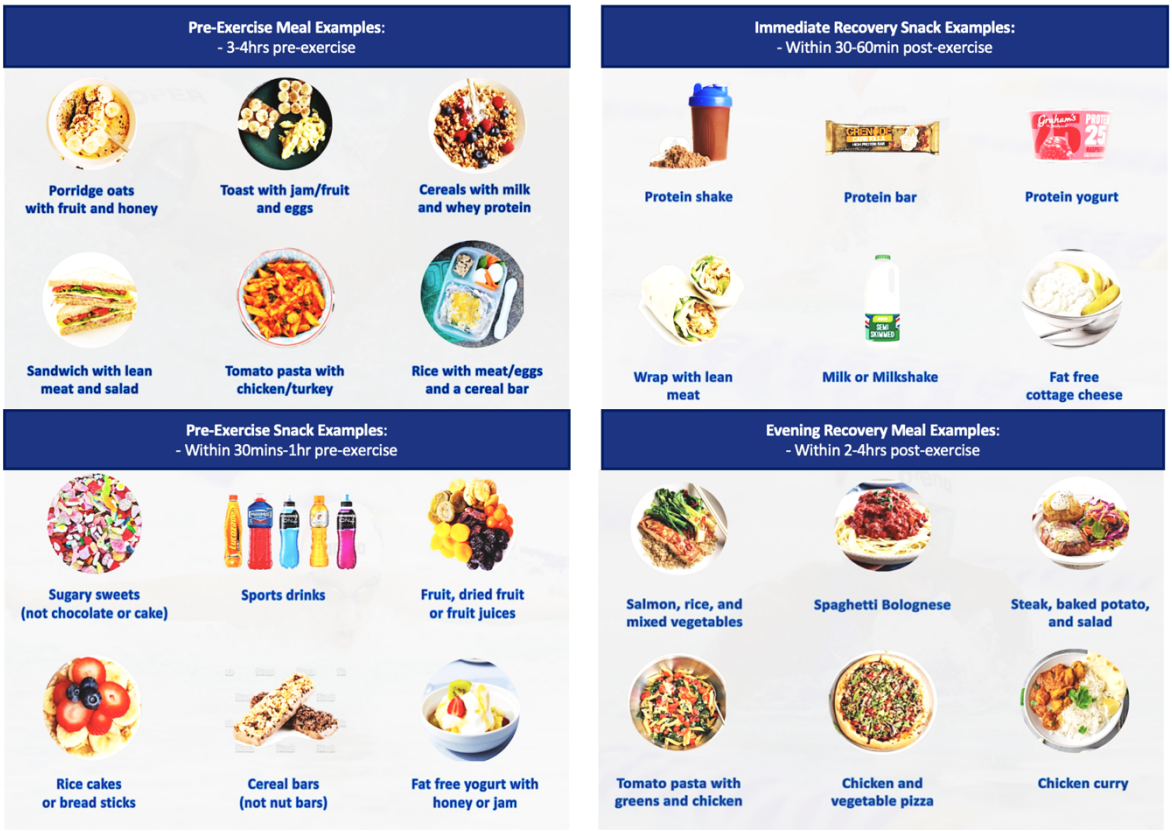
< 1 hr or 1-2 h	>2 hr
30g/kg BW Carbs	2.5- 4g/kg BW carbs + 20-30g protein
Easy to Digest, Low fibre	Mixed meals with fibre, protein
Sports Drink, fresh fruits, muesli, sports bar, cereals, dried fruits, trail mix, rice cakes and nut butter, low fat yogurt, juice,	Wholegrain cereals with milk & fruit, fruit salad with yogurt & nuts, porridge with banana and cinnamon, sandwich with salad & lean meat, sushi rolls, pasta-based dish

Post Race

Post (Immediately)	Post-Post (1-3 hrs after)
60-120 g/kg BW Carbs + 0.3g/kg protein (20-30g)	2-3g/kg BW carbs + 20-30g protein
Examples: Diary-based fruit smoothies, Ham cheese salad rolls or wraps, protein bars, yogurt with fruits	Examples: Bolognese, Stir fries, Curry, Homemade Pizza with chicken cheese and veggies, meatballs, Homemade steak burgers, lasagna

Timing	Rec. Amount	Food Suggestion
Breakfast (3-4 hr before first race)	2.5- 4.0g/kg body weight carbs Low GI + 20g of protein	Bread, pancakes, breakfast cereal, porridge, granola, muesli, fruit juice, banana are all great sources of carbohydrates. (*Make sure you are taking in the right amount)
Between morning heats (if you're competing in more than two heats in morning session)	60-70g of carbs	Cereal bars, flapjacks, sports drink, rice pudding, fruits (banana, apple, pineapple etc.), dried fruits, rice cakes, flavoured milk
Immediately after morning heat	60-120g of carbs + 20g of protein	Carbs – similar to the above Protein – yogurt, protein bar, protein drinks, protein powder, meat slices, boiled eggs, canned fish
Lunch	2.5g/kg body weight carbs + 20g of protein + some veg (1/4 plate)	Carbs – rice, pasta, noodles, couscous, quinoa, wraps, bread, potatoes etc. Protein – about a decker card size or ¼ plate
Between evening heats (if you're competing in more than two heats in morning session)	60-70g of carbs	Cereal bars, flapjacks, sports drink, rice pudding, fruits (banana, apple, pineapple etc.), dried fruits, rice cakes, flavoured milk
Immediately after evening heat	60-120g of carbs + 20g of protein	Carbs – similar to the above Protein – yogurt, protein bar, protein drinks, protein powder, meat slices, boiled eggs, canned fish
Dinner	1-1.5g/kg body weight carbs + 20g of protein + some veg (1/4 plate)	Carbs – rice, pasta, noodles, couscous, quinoa, wraps, bread, potatoes etc. Protein – about a decker card size or ¼ plate

Training + Competition Food Timeline Example



Supplements for training/competition:

Creatine – Training supplement

Naturally found in muscle meats



What does it do?

- Increases muscle creatine content
- Increases rate of ATP synthesis

How will that affect performance?

- Faster recovery between high-intensity sets (swimming and gym)
- Can lead to greater strength and power adaptations over time

How to take:

- 3-5 g per day for 6-24 weeks
- Take at any time of day
- Drink or tablet form

Possible side-effects:

- Increased muscle water content (1-2 kg weight gain)

Beta-alanine – Training supplement

Naturally found in muscle meats

What does it do?

- Increases muscle carnosine content
- Removes H^+ from the muscles at a faster rate

How will that affect performance?

- Can slightly offset fatigue in high-intensity work lasting 1-10 min
- Greater adaptations over time



How to take:

- 3-6 g per day for 6-24 weeks
- Take at any time of day
- Drink or tablet form

Possible side-effects:

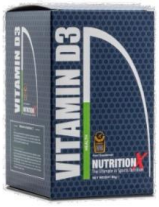
- Paresthesia (skin tingling)

Vitamin D3 – Winter supplement

Found in sunlight, oily fish, egg yolks, and fortified cereal

Why would I need it?

- Limited sunlight from October to March
- Indoor training restricts sun exposure
- Hard to get enough from diet alone
- Important for bone health, muscle function, and the immune system



How to take:

- 2000-4000 IU per day, or 14,000-28,000 IU per week
- Take at any time of day
- Calcium helps absorption
- Caffeine (tea, coffee) can reduce absorption

Sodium bicarbonate – Racing supplement

Bicarbonate of soda / baking soda

What does it do?

- Increases blood pH
- Removes H^+ from the muscles at a faster rate

How will that affect performance?

- Offsets fatigue in exercise lasting 1-10 min



How to take:

- Standard approach:
  0.2-0.3 g/kg BM
  Drink – 60-90 min before exercise
  Capsules – 120-150 min before exercise

Possible side-effects?

- Stomach ache, bloating, nausea, belching, and diarrhoea (extreme cases)
- High sodium content

Caffeine – Racing supplement

Naturally found in tea, coffee, and chocolate

What does it do?

- Stimulates central nervous system
- Reduces tiredness, perceptions of fatigue, and mood

How will that affect performance?

Improves work capacity (more tolerant of fatigue)

- Produce more muscular force (swim faster)



How to take:

- Standard approach:
  3-6 mg/kg BM, 60 min before exercise
- Personal doses and timings should be trialled in training
- Multiple forms available

Possible side-effects:

- Increased anxiety, jitters, heart palpitations, nausea, restlessness at *high doses**
- Difficulty sleeping when taken 6 h before bed

*See Appendix 4 for further athlete resources

Critical justification:

Achieving balanced macronutrient intake supports performance, health and physiological adaptations (Kerksick and Kulovitz, 2013). Adequate carbohydrate (CHO) intake maintains blood glucose and provides fuel for oxidation, sparing muscle and liver glycogen and optimising endurance capacity (Caline dos Santos et al, 2025; Naderi et al., 2023). Swimming is highly sensitive to glycogen availability, Woodbridge (1999) demonstrated a ~10% CHO reduction impaired 400-yard time-trials, while an equivalent increase enhanced performance. Current guidelines recommend CHO requirements from 3-12 $g \cdot kg^{-1}$ body mass (BM) per day, rising with increased training duration and intensity (Dominguez et al., 2017; Stellingwerff et al., 2011; Shaw et al., 2014). High-volume swimming frequently results in inadequate intake, elevating injury, illness and hormonal and metabolic disturbance risk in female athletes (Melin et al., 2014). Sufficient CHO improves intensity tolerance, delays fatigue and enhances training quality (Mata et al., 2019; Jeukendrup, 2004; Amawi et al., 2024). This athlete required 6-12 $g \cdot kg^{-1}$ BM/day to meet energy demands, supporting glycogen restoration and reducing the risk of recurrent LEA/RED-S (Angelidi et al., 2024; Grabia et al., 2024; Burke et al., 2001). Fasted training, while useful for endurance adaptations, was avoided due to exacerbating LEA/RED-S risk (Thomas et al., 2016; Garay et al., 2025; Hackney et al., 2025).

Protein supports skeletal muscle repair and adaptation (Phillips and Van Loon, 2011; Zhao et al., 2024). Swimmers require 1.4-1.9 $g \cdot kg^{-1}$ BM/day, rising to ~2-3 $g \cdot kg^{-1}$ BM on double-session days. (Matsuda et al., 2018; Witard et al., 2011; Domínguez et al., 2017).
Even distribution (~0.4 $g \cdot kg^{-1}$ BM across ≥4 occasions), enhances muscle protein synthesis, recovery, muscle mass maintenance and endocrine health (Roberts et al., 2022; Atherton and Smith, 2012; Lee et al., 2017; Witard et al., 2025). For this athlete, well-timed and adequate intake was essential to facilitate adaptations from frequent sessions and reduce muscle protein breakdown associated with LEA/RED-S (Sims et al., 2023). Post-exercise protein was prioritised for myofibrillar and mitochondrial adaptations, key for improving the strength and aerobic performance required in swimming (Moore and Stellingwerff, 2012; Bagheri et al., 2022). Although menstrual-cycle related changes in protein metabolism have been suggested, findings remain inconsistent, therefore total intake and distribution were prioritised (Elliot-Sale et al., 2021; Hausswirth and Le Meur, 2011; Williamson et al., 2023; Moore et al., 2021; Witard et al., 2025; D'Souza et al., 2023)

Fat supports metabolic regulation, injury prevention and immune function (Spriet, 2014; Gerlach et al., 2008; Meksawan et al., 2004; Pyne et al., 2014). Athletes are advised to consume 20-35% of total energy from fat (0.8-2.0 $g \cdot kg^{-1}$), adjusted to training load (Pramukovà

et al., 2011; BNF, 2021; Dominguez et al., 2017; Stellingwerff et al., 2011). Emphasis was placed on unsaturated fats while limiting saturated and trans fats due to cardiometabolic risks (Bytomski, 2017; Puglisi, 2019; Dhaka et al., 2011). Although research suggests females may rely more on fat oxidation, during the luteal phase of their menstrual cycle, evidence remains inconsistent due to methodological variation across studies (Hackney et al., 1994; Horton et al., 2002; Purdom et al., 2018; Kanaley et el., 1992; Venables et al., 2005; Ashley et al., 2000). Therefore, menstrual-phase-specific adjustments were not suggested. Given the athletes LEA/REDS history, consistent adequate fat intake was prioritised to support health and performance (Torstveit et al., 2023).

Female swimmers frequently present with micronutrient deficiencies due to high training loads, menstrual losses and suboptimal dietary intake (Gonçalves et al., 2025; Thomas et al., 2016; Collins et al., 2012; Farajian et al., 2004; McKay et al., 2023). Given that micronutrient deficiencies and supplementation require clinical assessment, this case study focussed on optimising intake through dietary sources (Jackson, 1999). Suggested investigation included iron, calcium, vitamin D, folate and vitamin B12 as deficiencies are reported among female athletes (Gastrich et al., 2020; Woolf et al., 2017; Gonçalves et al., 2025; McKay et al., 2023).

Adequate fluid intake supports thermoregulation, blood volume and oxygen delivery (Von Duvillard et al., 2004; Judge et al., 2021). Dehydration resulting in >2% BM loss impairs performance and increases risk of heat stroke or renal strain, while overhydration can cause hyponatraemia (Cheuvront and Kenefick, 2014; Nuccio et al., 2017; Sawka et al., 2007; Trangmar and Gonzalez-Alonso, 2019). Pool conditions (27-30°C, 50-60% humidity) elevate heat stress risk by reducing sweat evaporation (Rajagopalan and Jamei, 2015; Racinais et al., 2015; Briars et al., 2017). Athletes should start exercising euhydrated with 5-7 $ml \cdot kg^{-1}$ BM ~4hours pre-training and follow practical guidelines of ~250ml pre-exercise, ~250ml every 15 minutes and ~600ml post exercise (Aquatics GB, 2025; Domínguez et al., 2017; James et al., 2019). However, hydration needs vary due to individual differences in sweat rate, body composition and training load, necessitating an individualised hydration plan (Suprapongchai et al., 2021). Plasma osmolality, though valid, is impractical, requiring controlled laboratory conditions (Najem et al., 2024; Barley et al., 2020). ‘Drinking to thirst’ is unreliable, as thirst occurs after ~1-2% BM loss, where performance decrements are already evident (Armstrong et al., 2016; Greenleaf et al., 1992; Moran et al., 1998). The athlete was advised to monitor pre/post-training BM to estimate sweat losses and use urine colour chats for simple daily feedback on hydration status (Lopez et al., 2022; Baker, 2017; Maughan et al., 2007; Gisolfi,

1997; Barley et al., 2020; Belasco et al., 2020; Feng et al., 2022). Overall, forming a practical strategy to minimise dehydration and overhydration.

Effective fuelling timing is essential in swimming where training sessions and races occur close together, limiting recovery. Consuming 2.5-4.0 $g \cdot kg^{-1}$ BM of low-glycaemic index (GI) carbohydrate 3-4hours pre-exercise maximises glycogen availability (Hamzah, 2011; Wee et al., 2005; Williams and Serratosa, 2006). Early-morning start times frequently prevent consumption of a full meal in this timeframe, with Peluso et al. (2021) demonstrating that only 18-20% of swimmers meet carbohydrate targets pre-morning training (Sargent et al., 2012; Trindade et al., 2017). In these cases, smaller, easily digestible options (smoothies, breakfast drinks) can still elevate blood glucose and support performance (Stratton et al., 2025; Naharudin et al., 2020). An additional ~30g of high-GI carbohydrate 1hour pre-exercise enhances glucose availability and anaerobic glycolysis, delaying fatigue (Baker et al., 2015; Ivy, 1999). Carbohydrate loading was not recommended as benefits are limited to events >90 minutes and may provoke unnecessary gastrointestinal discomfort (O'Brien et al., 2021; Forgac, 1979; Sedlock, 2008).

Mid-session or between-race fuelling follows similar principles; 60-70 $g \cdot h^{-1}$ glucose helps maintain intensity and restore glycogen (Jeukendrup, 2004; Cermak and Van Loon, 2013; Cao et al., 2025). Rapid-absorption sources (sports drinks, gels) are preferred due to their low gastrointestinal load (Augustin et al., 2015).

Post-exercise fuelling aims to accelerate glycogen restoration and muscle repair (Bangsbo et al., 1992; Hassapidou, 2011; Reilley, 1997; Saltin, 1973). Consuming 60-120 g of high-GI carbohydrate within 30-60 minutes enhances glycogen resynthesis (Bytomski, 2017; Burke et al., 1993; Perry and Gallen, 2017). Co-ingesting ~0.3 $g \cdot kg^{-1}$ BM of protein enhances muscle protein synthesis (Phillips and Van Loon, 2017; Burke et al., 2011; Areta et al., 2013). Following this, a balanced meal containing carbohydrates, lean protein and unsaturated fats supports sustained recovery and stabilises blood glucose (Wang et al., 2024; Naderi et al., 2025; Buttriss, 2016). For athletes with reduced appetite, 0.4 $g \cdot kg^{-1}$ BM carbohydrate every 30-minutes for 4-6 hours remains an effective alternative strategy (Ranchordas et al., 2017).

Ergogenic aids were considered to support performance, recovery and training quality. Caffeine is widely used in swimming, enhancing alertness, muscle contractibility, perceived exertion and endurance capacity (Yohanes, 2024; Grgic et al., 2019; Graham, 2001). Swimming-specific research shows improvements in repeated sprints, dive and turn speed,

post-exercise lactate and time-trial outcomes (Goods et al., 2017; Lara et al., 2015; Salgueiro et al., 2022). However, females are under-represented in caffeine research (~10-20% participants), meaning recommendations are largely extrapolated from male data (Acar et al., 2024; Souza et al., 2016). Although 3-6 $mg \cdot kg^{-1}$ BM, 30-60 minutes pre-exercise is typically effective, this athlete previously experienced sleep disruption, therefore the lower end ($3mg \cdot kg^{-1}$) was recommended (Domínguez et al., 2017; Burke, 2008; Spriet, 2014; Guest et al., 2021). Using caffeine strategically for races, rather than daily training, was advised to minimise tolerance development (Antonio et al., 2024; Pickering et al., 2019).

Sodium bicarbonate (0.3 $g \cdot kg^{-1}$ BM, ~90 minutes pre-exercise) enhances extracellular buffering, delays acidosis and can improve 50-200m swimming performance (Zajac et al., 2009; Lindh et al., 2008; Mero et al., 2013). As it commonly causes gastrointestinal symptoms, such as nausea and bloating, the athlete was advised to trial in training before any race-day use (Grgic et al., 2021).

Creatine monohydrate enhances intramuscular phosphocreatine and maximises ATP synthesis, improving sprint performance and increasing strength adaptations (Wax et al., 2021; Syrotuik and Bell, 2004). Although single-bout swim results are mixed, creatine improves repeated-sprint and resistance-training quality, supporting this athlete's programme (Hopwood et al., 2006; Theodoru et al., 2005; Theodoru et al., 2010).
An effective dose for swimmers is 3g/day (Domínguez et al., 2017).

Beta-alanine increases intramuscular carnosine, improving intracellular buffering and delaying fatigue during high intensity bouts (Bellinger, 2014; Georgiou et al., 2024). Evidence suggests added antioxidant support from supplementation, particularly relevant during the early follicular phase of menstruation where oxidative stress is heightened (Smith-Ryan et al., 2022; McNulty et al., 2020; Smith et al., 2012). Doses of 4-6g/day are effective, with 6.4g/day producing greatest 100-200m swimming improvements (Smith-Ryan et al., 2022; De Salles Painelli et al., 2013). A 4-6 week loading phase followed by a 12–16-week cessation is a common recommendation (Hoffman et al., 2018; Baguet et al., 2009; Yamaguchi et al., 2021). Paraesthesia is common; splitting doses (4-6 x 0.8-1.6g) reduces discomfort (Ong et al., 2025; Domínguez et al., 2017).

Vitamin D was acknowledged due to indoor training and risks of lower-bone density in swimmers compared to land-based-athletes (Gómez-Bruton et al., 2013). 4000

$IU \cdot day^{-1}$ vitamin D_3 is an appropriate amount to sustain levels, but the athlete was already supplementing following confirmed deficiency (Newbury et al., 2025).

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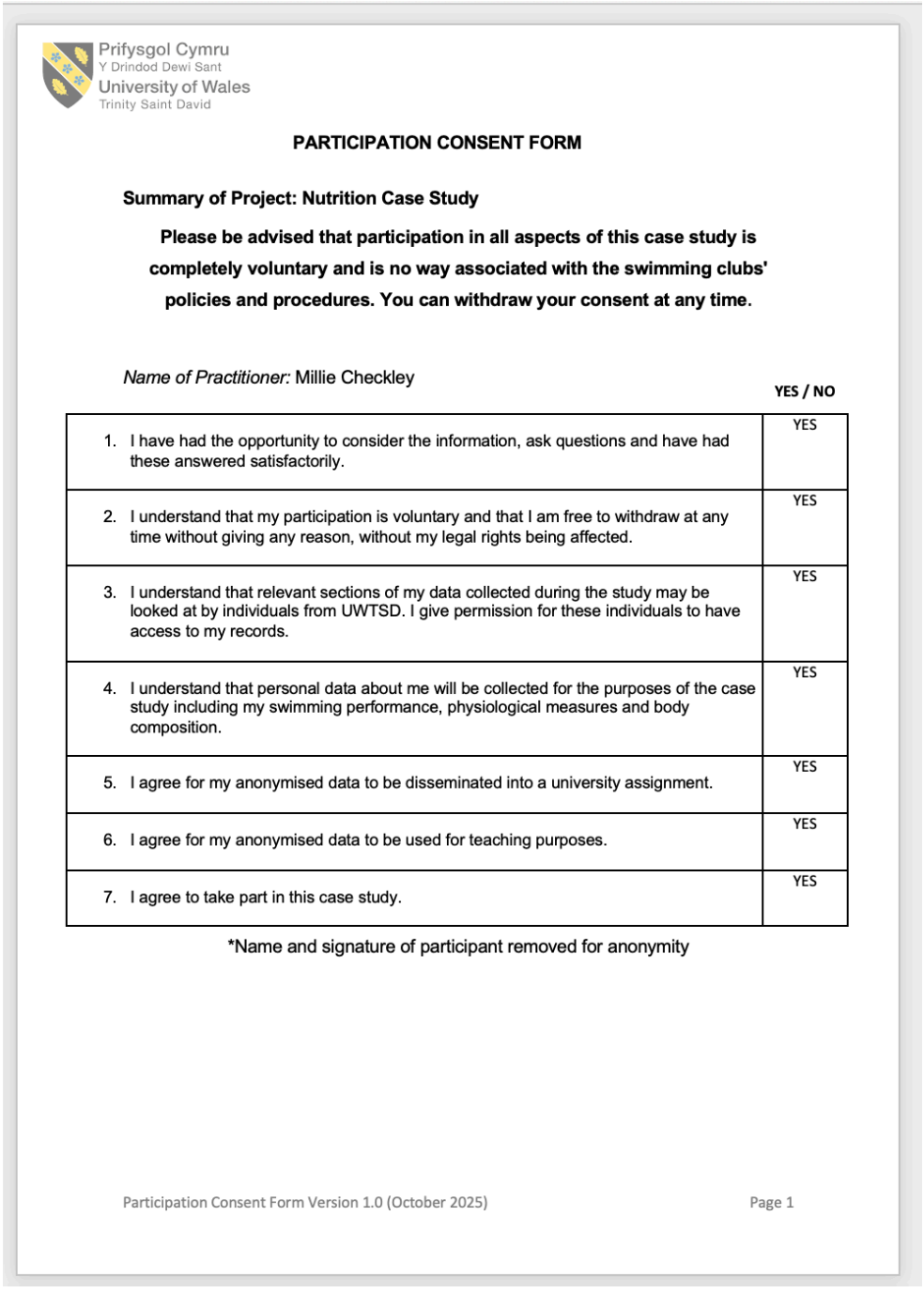
Appendices:

1) Codes of Conduct:

1.1 BASES Code of Conduct: https://www.cases.org.uk/imgs/code_of_conduct202.pdf

1.2 SENr Code of Professional Conduct: https://www.bda.uk.com/static/439bf98d-53ee-4518-9970dbc51fbbcb6c/SENR-Code-of-Professional-Conduct-2021-final.pdf

2) Informed Consent



Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

PARTICIPATION CONSENT FORM

Summary of Project: Nutrition Case Study

Please be advised that participation in all aspects of this case study is completely voluntary and is no way associated with the swimming clubs' policies and procedures. You can withdraw your consent at any time.

Name of Practitioner: Millie Checkley

	YES / NO
1. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.	YES
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my legal rights being affected.	YES
3. I understand that relevant sections of my data collected during the study may be looked at by individuals from UWTSD. I give permission for these individuals to have access to my records.	YES
4. I understand that personal data about me will be collected for the purposes of the case study including my swimming performance, physiological measures and body composition.	YES
5. I agree for my anonymised data to be disseminated into a university assignment.	YES
6. I agree for my anonymised data to be used for teaching purposes.	YES
7. I agree to take part in this case study.	YES

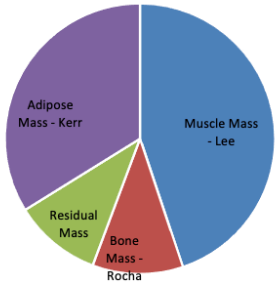
*Name and signature of participant removed for anonymity

Participation Consent Form Version 1.0 (October 2025) Page 1

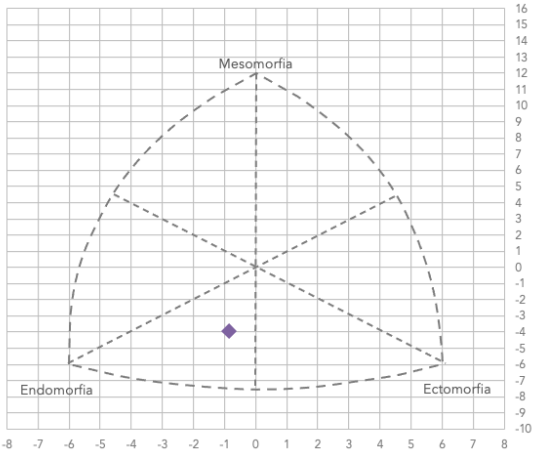
3) Skinfold Data

	Measure	1	2	3	3rd measure?		Mean or Median
1	Body Mass ®	58.2	58.2		0.00%	No	58.2
2	Stretch Stature ®	166.5	166.5		0.00%	No	166.5
3	Sitting Height ®	73.9	74.0		0.14%	No	74.0
4	Arm Span ®	165.2	165.5		0.18%	No	165.4
5	Triceps SF ®	13.8	13.4		-2.94%	No	13.6
6	Subscapular SF ®	10.4	11.0	10.6	5.61%	Yes	10.6
7	Biceps SF ®	7.0	7.1		1.42%	No	7.1
8	Iliac Crest SF ®	9.1	8.8		-3.35%	No	9.0
9	Supraspinale SF ®	11.4	11.4		0.00%	No	11.4
10	Abdominal SF ®	18.2	18.5		1.63%	No	18.4
11	Thigh SF ®	24.3	23.9		-1.66%	No	24.1
12	Calf SF ®	9.3	9.1		-2.17%	No	9.2
13	Arm Relaxed Girth ®	30.1	30.1		0.00%	No	30.1
14	Arm Flexed and Tensed Girth ®	31.7	31.9		0.63%	No	31.8
15	Waist Girth ®	72.4	72.6		0.28%	No	72.5
16	Hips Girth ®	97.9	97.6		-0.31%	No	97.8
17	Thigh Middle Girth ®	51.1	50.9		-0.39%	No	51.0
18	Calf Girth ®	31.2	31.2		0.00%	No	31.2
19	Humerus Breadth ®	5.0	5.0		0.00%	No	5.0
20	Bi-Styloid Breadth ®	4.1	4.2	4.1	2.41%	Yes	4.1
21	Femur Breadth ®	6.2	6.3	6.2	1.60%	Yes	6.2

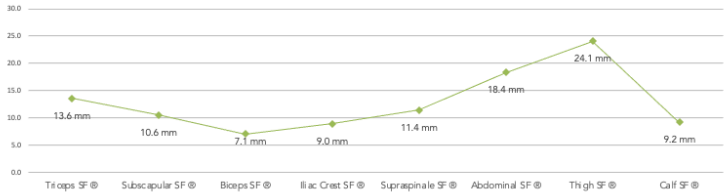
4 Compartment Body Composition		
	Percentage	Real Mass
Muscle Mass - Lee	44.85%	26.10 kg
Bone Mass - Rocha	10.85%	6.32 kg
Residual Mass	10.47%	6.10 kg
Adipose Mass - Kerr	33.83%	19.69 kg
Fat Mass - Faulkner	14.04%	8.17 kg
Fat Mass - Carter	11.75%	6.84 kg



Somatotype (Heath-Carter)	
Endomorphy	3.7
Mesomorphy	1.3
Ectomorphy	2.9



Body Mass Index (BMI)	21.0 kg/m2
Waist/Hip Ratio	0.74
Waist/Stature Ratio	0.44
Sum of 8 skinfolds	103.3 mm
Sum of 6 skinfolds	87.3 mm



4) Athlete resources

20G PROTEIN FOODS

Portion Guide

(Deck of cards) For all meats & poultry

(Checkbook) For all fish

*There are some exceptions

Meat & Poultry


Chicken & Turkey Breast


Steak (Beef, Pork, Lamb)


Minced Meat (Beef, Pork, Lamb etc.)


Loin Chop (Beef, Pork, Lamb)


Chicken thighs, drumsticks

Seafoods


White fish (Cod, Haddock etc.)


Oily fish (Salmon, mackerel etc.)


10 x king prawns / 25 x shrimps


1 small can (100g)

Eggs & Diary Products


3 large eggs


500ml milk (2 glasses)


200g of Greek Yogurt (1/2 pot)


200g of Cottage Cheese (2/3 pot)


60g of any cheese

Plant Protein


1/2 block (~116g) Tofu, firm


1 large can baked beans (~420g)


206g lentils (~1 cup)


100g nuts (~3/4 cup)

HIGH PROTEIN SNACKS

Whey & Greek Yogurt



1/4 Pot of Greek yogurt (~125g)
1/2 scoop Whey Protein Powder
Mix and consume

Greek Yogurt & Fruit



1/2 Pot of Greek yogurt (~250g)
Berries - 100g (1 cup)

Cottage Cheese on Oatcakes



Oatcakes - 4
Cottage Cheese - 100g (1/3 pot)

Houmous & Chicken/Veg



Houmous- 50g (1/4 pot)
Chicken slices - 75g (5 average slices
Carrot - 1 whole
Celery - 1 x stalk

Meat Roll-Ups



Ham slices - 4
Soft cheese - 40g (~2 tbsp)
Asparagus -40g (~5 spears

Beef Jerky/Biltong


1 pack (30g)

Boiled Eggs


2-3 eggs

Oat & Whey Bar



1 bar

50G CARBOHYDRATE FOODS

Portion Guide


1 baseball = 1 cup


1 tennis ball = 1/2 cup

Grains


3/4 cup (~75g) Pasta


1/2 cup (~90g) Rice


1 cup (~57g) Noodles


1/2 cup (~90g)Quinoa


1/2 cup (~90g) Couscous

Breads


3 med slices (~121g) Bread


2 small (~90g) Bagels


2 average (~120g) Tortilla


2 English Muffin ('~132g)


3/4 9 inch (120g) Pizza Base

Cereals & Dairy


1 cup (80g) Oatmeal


2 cups (50g) Breakfast cereal

3/4 cup (75g) Granola

2 cups (500ml) Chocolate milk

2 cups (500g) Flavoured Yogurt

Fruit, Starchy Vegetables & Legumes

2 large (~240g) bananas

2 small 4-5 cm (~272g) potatoes

2 cans (~300g) sweet corns

1 large can (~420g) baked beans

1 & 1/2 cans (~345g) chickpeas

1/2 cup (~96g) Lentils

ENERGY BOOSTERS
(30G CARBS, BEFORE & AFTER TRAINING)

Fruit

1 large banana (150g)

1 large apple (~230g)

1 mango (~230g)

2 cups pineapple (chunks, ~330g)

Bread

2 x 6 inch pancakes (~154g)

1 small fruit bun (~50g)

1 med fruit muffin (~75g)

2 slices fruit bread (~75g)

2 small fruit scone (~76g)

2 x Crumpets (78g)

1 slice (60g) banana cake

1 bap (~57g) Bread roll

Cereal

2 oat bars (42g)

5 rice cakes (~45g)

1 oat biscuits (~40g)

1 & 1/2 cup (40g) Breakfast cereal

Dairy & Others

1 cup (250ml) Chocolate milk

1 small pot (125g) yogurt + 1 cup of strawberries (150g)

2 tbsp (42g) Honey

2 heaped tbsp (36g) Jam

OMEGA 3


Mackerel (1 can, 125g) 3.9g F


Salmon (1 fillet, 100g) 3g F


Sardines (1 can, 120g) 2.2g F


Herring (1 small fillet, 85g) 1.5g F


Trout (1/2 fillet, 115g) 2g F


Tuna (1 can, 130g) 0.4g F


Soybean Oil (1 tsp, 4.2g) 0.31g F


Flaxseed Oil (1 tsp, 4.2g) 2.2g F


Canola Oil (1 tsp, 4.2g) 0.8g F


Walnut Oil (1 tsp, 4g) 0.46g F


Rapeseed Oil (1 tsp, 4.2g) 0.4g F


Fish Oil (1 capsule) 0.5-1g F


Chia seeds (1 tbsp, 10g) 1.9g F


Flaxseeds (1 tbsp, 13g) 3.1g F


Hemp seeds (1 tbsp, 13g) 1.1g F


Walnuts (3x, 12g) 0.9g F


Brazil Nuts (6x, 30g) 0.05g F


Pistachio (20x, 14g) 0.04g F


Omega 3-enriched Eggs (1 egg, 50g) 0.5g F


Milk (1 glass, 250g) 0.05g F


Chicken breast (1 fillet, 130g) 0.05g F


Seeded Bread (2 slices, 88g) 0.38g F


Omega 3 spread (1 tbsp, 15g) Varied

OMEGA 6


Chips (1 med, 120g) 0.53g F


Crisps (1 bag, 45g) 1.1g F


Fried Chicken (1 drumstick, 90g) 1.8g F


Pizza (1/4 slice, 80g) 1g F


Cake (1portion, 56g) 1.4g F


Chicken Nuggets (1 pc, 16g) 0.54g F


Sunflower Oil (1 tsp, 4.2g) 2.7g F


Safflower Oil (1 tsp, 4.2g) 3.1g F


Corn Oil (1 tsp, 4.2g) 2.1g F


Soybean Oil (1 tsp, 4.2g) 2.2g F


Sesame oil (1 tsp, 4.2g) 1.8g F


Cottonseed Oil (1 tsp., 4.2g) 2.2g F


Sunflower seeds (1 tbsp, 10g) 2.8g F


Sesame seeds (1 tbsp, 11g) 2.8g F


Hemp seeds (1 tbsp, 9g) 2.6g F


Walnuts (3x, 12g) 4.7g F


Brazil Nuts (6x, 30g) 7.6g F

Pistachio (10x, 7g) 1.2g F

Turkey (1 slice, 90g) 0.26g F

Pork Slice (1 med, 90g) 0.55g F

Chicken breast (1 fillet, 90g) 0.36g F

Beef Steak (5oz, 108g) 0.55g F

Ham slices (2x, 40g) 0.18g F

Salami (9x, 35g) 1.4g F

*Aim to get it from unprocessed sources

Calcium

Help to build strong bones & teeth, regulate muscle contractions including heart beats

Milk (1 cup, 250ml) 300 mg

Salmon (1x portion, 100g) 24.2 mg

Tuna (1 can drained, 130g) 13 mg

Sardines (1 can, 85g) 375 mg

Mackerel (1 med, 80g) 13.6 mg

Herring (1 small, 85g) 67 mg

Trout (1/2 fillet, 113g) 21.9 mg

Pilchards (1x, 55g) 138 mg

Sprat (1x, 80g) 78 mg

Kippers (1x small, 85g) 28.9 mg

Fortified Soy Yogurt (1 pot, 125g) 120 mg

Soy Milk (1 cup, 250ml) 300 mg

Yogurt (1x pot, 125g) 250 mg

Tofu (1/4 block, 116g) 406 mg

Egg (1x, 57g) 26.2 mg

Kale (1x cup, 18g) 23.4 mg

Cheddar (1 slice, 20g) 148 mg

Mozzarella (1 ball, 40g) 0.12 mg

Feta Cheese (5x cubes, 30g) 108 mg

Ricotta Cheese (1 tbsp, 30g) 319 mg

Chickpea (1 can, 230g) 99 mg

Kidney beans (1 can, 240g) 170 mg

Baked beans (1/2 can, 210g) 88 mg

Spinach (1 cup. 20g) 23.8 mg

*Rec intake: age 11-14 (1000 mg/d [M] & 800 mg/d [F]); age 15-18 (1000 mg/d [M] & 800 mg/d [F])

Vitamin B12

Required for proper red blood cell formation, neurological function, and DNA synthesis

Haddock (1 med fillet, 120g) 2.9 mcg

Tuna (1 can drained, 130g) 4.4 mcg

Salmon (1 fillet, 100g) 4.2 mcg

Mussels (6x, 84g) 8.9 mcg

Ham (2 slices, 40g) 0.4 mcg

Cheddar cheese (1 slice, 20g) 0.48 mcg

Beef Steak (1x 5 oz, 108g) 2.2 mcg

Cottage Cheese (1/2 cup, 115g) 0.69 mcg

Mozzarella (1 small ball, 40g) 0.68 mcg

Shrimp (12x, 36g) 1.1 mcg

Sardines (3x, 75g) 11.3 mcg

Mackerel (1x med fillet, 80g) 7.3 mcg

Herring (1x small, 85g) 12.8 mcg

Nutritional Yeast (1 tsp, 3.3g) 0.41 mcg

Ricotta Cheese (1 tbsp. 30g) 0.34 mcg

Trout (1/2 filet, 115g) 3.6 mcg

Pork Loin (1 med slice, 130g) 1.3 mcg

Lamb Loin (1 med, 90g) 2.7 mcg

Boiled Egg (1xmed, 50g) 1 mcg

Milk (1 cup, 250ml) 2.3 mcg

Yogurt (1 pot, 125g) 0.25 mcg

Lamb Liver (1/4, 85g) 46 mcg

Fortified Cereal (1 large bowl, 50g) 0.95 mcg

Oyster (6x, 60g) 10.2 mcg

*Rec intake: age 11-14 (1.2 mcg/d [M] & 1.2 mcg/d [F]); age 15-18 (1.5 mcg/d [M] & 1.5 mcg/d [F])

Vitamin D

Cod Liver Oil (1 capsule, 1g) 1.1 mcg

Salmon (1x portion, 100g) 9.2 mcg

Tuna (1 can drained, 130g) 1.4 mcg

Sardines (1 can, 85g) 3.1 mcg

Mackerel (1 can, 125g) 6.8 mcg

Trout (1/2 fillet, 113g) 9.4 mcg

Pilchards (1x, 55g) 7.7 mcg

Sprat (1x, 80g) 10.4 mcg

Kippers (1x small, 85g) 8.6 mcg

Fortified Yogurt (1 pot, 125g) 0.75 mcg

Fortified Fruit Juice (1x cup, 250g) 1 mcg

Liver (1x portion, 85g) 0.43 mcg

Egg (1x, 57g) 1.8 mcg

Fortified cereal (1 big bowl, 50g) 2.4 mcg

Cheddar (1 slice, 20g) 0.06 mcg

Feta Cheese (5x cubes, 30g) 0.15 mcg

Ricotta Cheese (1 tbsp, 30g) 0.15 mcg

Beef Steak (5oz, 108g) 0.65 mcg

Lamb Loin (1x med, 90g) 0.54 mcg

Pork Loin (1x med, 130g) 0.81 mcg

*RDA is 400 I.U or 10 mcg

Vitamin C

Red Pepper (1/2, 80g) 101 mg

Orange (1x small, 120g) 62mg

Grapefruit (1/2 small, 125g) 29mg

Kiwi (1xmed, 6-g) 74mg

Green pepper (1/2, 80g) 96mg

Broccoli (1 spear, 45g) 20 mg

Strawberries (5x med, 65g) 37 mg

Brussel Sprout (1x, 21g) 12.6mg

Tomato (1x, 130g) 28.6mg

Cantaloupe (1x slice, 130g) 33.8mg

Cabbage (3 tbsp, 80g) 36mg

Cauliflower (1 floret, 20g) 6 mg

Spinach (1x cup, 20g) 5.8 mg

Kale (1x cup, 18g) 19.8 mg

Sweet Potatoes (1xsmall, 98g) 22.5mg

Blackcurrant (25 pcs, 10g) 20mg

Lemon (Juice from ½, 20g) 7.2 mg

Papaya (1 slice, 140g) 84 mg

Apple (1xmed, 174g) 10.4 mg

Peaches (1xmed, 100g) 34.1mg

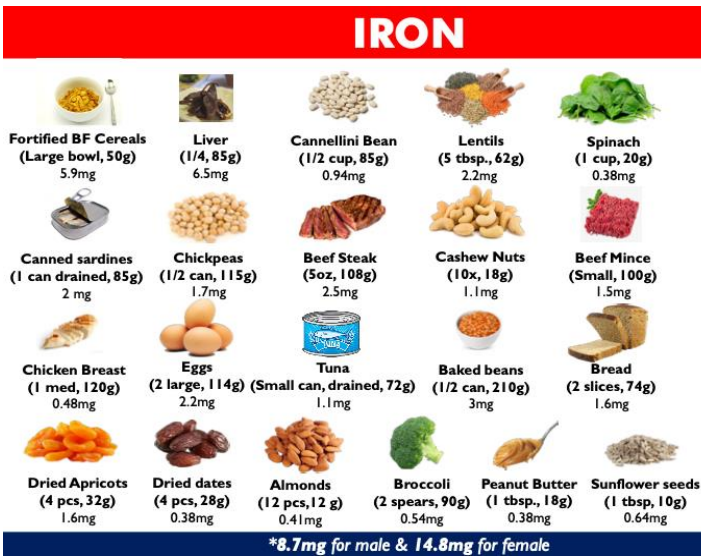
Lime (1 tbsp, 15g) 5.7 mg

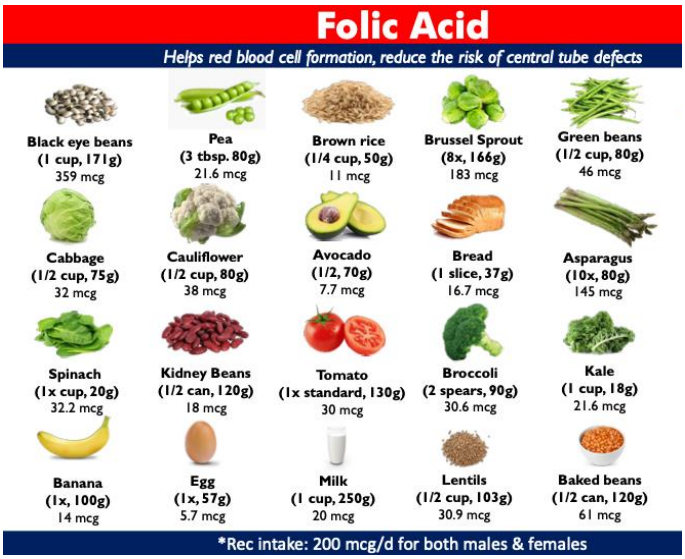
Mango (115g, ½ fruit) 43 mg

Pineapple (1xslice, 175g) 21 mg

Grapes (Small bunch, 100g) 3 mg

*Rec intake: age 11-14 (35 mg/d [M] & 35 mg/d [F]); age 15-18 (35 mg/d [M] & 35mg/d [F])





Carbohydrates Requirements

Intensity of training/Type	Daily Carbs Needs
Training twice a day	**8-12g/kg body weight** (upper end = 2 hard sessions, lower end = 2 easy sessions)
Training once a day	**6-10g/kg body weight** (upper end – hard training, lower end – light training)
Rest days	**3-5g/kg body weight** (Upper end- physically active (e.g. >10000 steps), lower end – sedentary)
The day before competition	**6-8g/kg body weight** (Upper end – long distance or multiple events the next day, Lower end – single event)

Protein Requirements

Intensity of training/Type	Daily Protein Needs
Training twice a day	2-3 g/kg BW
Training once a day	1.4-1.9 g/kg BW
Rest days	1.4-1.9 g/kg BW

Fat Requirements

Intensity of training/Type	Daily Fat Needs
Training twice a day	1.5-2 g/kg BW
Training once a day	1-1.5 g/kg BW
Rest Days / Taper	0.8-1.2 g/kg BW

Fluid Intake Example		
	Timing	Hydration
Pre-training	3-4hrs	5-7ml/kg BW (400-600ml)
Immediately pre-training	<30 mins	125-250ml
During training	Every 15 mins	125-200ml
Post-training	Immediately	600ml

*Alongside using urine colour chart to check hydration levels

Fluid Intake Example		
	Timing	Hydration
Pre-race	3-4hrs	5-7ml/kg BW (400-600ml)
Immediately pre-race	<30 mins	125-250ml
Post-race	Immediately	600ml

*Alongside using urine colour chart throughout the day