NUTRITION MANUAL FOR AGE GROUP ROWERS

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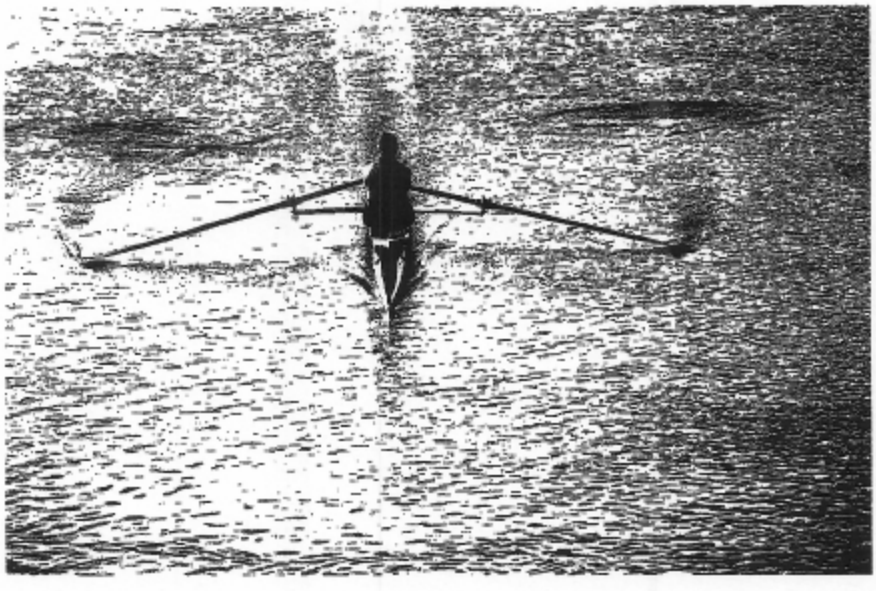

General Nutrition for Rowers

Eating for endurance

- Rowers experience a demanding training schedule of prolonged sessions of moderate to high intensity exercise. This comes with a high energy and carbohydrate bill. Re-fuelling between training sessions is a key challenge of the training diet. Inadequate carbohydrate intake will lead to depletion of muscle fuel stores, causing fatigue and ineffective training
- Low body fat levels are valuable in sports in which the athlete moves their own body mass over long distances or against gravity, since it lightens the "dead weight". Some athletes are excessive in their strategies to become light and lean. The key is to find a body fat level that is consistent with good health and good performances in the long term. Severe restriction of energy intake and dietary variety can lead to fatigue, nutritional deficiencies, hormonal imbalances and disordered eating – not to mention the loss of the enjoyment of food and social eating occasions.
- Although the focus may be on fuel foods, endurance athletes also have increased needs for protein, and various vitamins and minerals.
- Endurance athletes are often at risk of poor iron status, resulting from the combination of a low intake of readily absorbed iron and increased iron losses. Iron deficiency is another cause of fatigue and poor recovery between training sessions.
- Healthy bones need an environment of exercise, adequate calcium intake and hormonal balance. Menstrual dysfunction in female athletes is known to impair bone health - the immediate problem may be stress fractures, but the serious long-term problem is an increased risk or earlier onset of osteoporosis. All athletes need to consume high calcium foods, and females should seek immediate help with menstrual irregularities
- Lengthy workouts mean high sweat losses, especially during hot weather. Without a fluid intake plan, it is easy to become chronically dehydrated

eating to win:

1. The main fatigue factors during prolonged events are dehydration and depletion of carbohydrate fuel stores. Strategies for eating before, during and after the event will be important in reducing the impact of these factors and helping the athlete perform at their best
2. When competition involves multi-stages or a series of heats and finals, recovery between sessions will be an important factor in determining the ultimate winner

nutrition strategies

1. Meals should be based on carbohydrate-rich foods – refer to recipes in the recipe section for suggestions.
2. The philosophy of our recipes is to mix and match nutritious fuel foods, with protein sources, and fruits and vegetables. Variety and balance ensure that the athlete achieves all their nutrient needs, as well as enjoying a great range of tastes and food styles.

3. Athletes with very high energy and fuel needs will need the larger portion sizes of our recipes at meals, as well as snacks and action-packed fluids between meals. A cooked or prepared dessert can add to meals, or make a supper before bed.
4. Key strategies for athletes working on a lighter and leaner shape include low-fat eating, and paying attention to serve sizes. The smaller portion size of our recipes may be sufficient – with plenty of salad and vegetables to fill up the plate. Fruit, yoghurt or a hot chocolate provide a light way to finish off meals with a specially prepared dessert as an occasional treat. Well-placed snacks may help to prevent hunger, which leads to overeating at the next meal.
5. Fluid and fuel needs will be a key issue in competition nutrition, and in prolonged events there is opportunity to refuel and rehydrate "on the run". Sports drinks provide an ideal balance of fluid and carbohydrate to look after both needs simultaneously, and to taste good to the exercising athlete. The athlete should work out a fluid intake plan, using the opportunities provided in their event to replace as much of their sweat losses as is possible and practical. In very long events like cycling races and triathlons, the athlete may also use sports bars, gels or other carbohydrate foods to add variety and extra fuel intake. These strategies should be practised in training, to promote better performance in training sessions, and allow successful tactics to be fine-tuned.
6. It is important to recover quickly after training sessions or multi-stage competition events and prepare for optimal performance in the next workout. Since substantial refuelling can only occur after carbohydrate is eaten, it makes sense to have a fuel-rich snack or meal soon after the session. While some athletes can eat a high-carbohydrate meal within 30 minutes of the end of the workout, other athletes are challenged by being a long distance from home or food outlets, or by suffering from fatigue and poor appetite. A snack providing 50-100 g of carbohydrate will start the refuelling process until the athlete is ready to eat their next meal. There are many creative ideas for "light" and portable snacks providing carbohydrate goals, as well as other nutrients that may be important in repair and adaptation.
7. Even with good drinking practices during a workout, most endurance athletes will be in fluid deficit at the end of the session. It is not enough to rely on thirst to promote rehydration. Monitoring body weight before and after the session will provide a guide to fluid losses. Generally the athlete should drink enough fluid to replace 150% of the post-event fluid deficit (e.g. drink 3 Litres of fluid to replace a 2 Litre or 2 kg weight loss). After all, sweat loss and urine losses will continue in the hours after the event before fluid balance is finally achieved. Since sweat contains sodium and other electrolytes, athletes who incur large sweat losses in a single session will need to actively replace sodium during recovery. The everyday diet generally contains more than enough sodium for this task. However, between two training sessions or competition stages, the athlete may need to check that they have consumed sodium-containing choices such as sports drink, bread, breakfast cereal, or savoury foods that are already salted.

50 g carbohydrate snacks

600-800 mL sports drink
500 mL soft drink or fruit juice
2 carbohydrate gels
Large bread roll with banana filling
1 round jam or honey sandwich and 250 ml sports drink
80 g chocolate bar or jelly beans
2 cereal bars + piece of fruit
*60 g (1-2 cups) breakfast cereal + 200 g carton fruit flavoured yoghurt
*250-350 ml liquid meal supplement or fruit smoothie
* 1 round ham or cheese sandwich + 250 ml fruit juice
*60 g sports bar + 250 ml sports drink
* rice cream + piece of fruit

** these choices are also good sources of protein and some micronutrients*

Eating to improve muscle mass

- When increases in muscle size and strength are required, most athletes focus on protein needs. In fact, apart from genetic potential and the right training program, the next essential ingredient is adequate energy intake, which includes special needs for protein, carbohydrate and micronutrients.
- Some athletes also need to consider weight and body fat goals – especially lifters who compete in weight divisions, and body builders who are judged according to their lean and "ripped" appearance.
- Training sessions are best undertaken when the athlete is well-hydrated and well-fuelled. Often, athletes forget about these nutritional needs, and fail to bring a drink bottle to training. Fuelling with a sports drink can help to keep the athlete lifting or training with good technique right to the end of the session.
- Post-training recovery is an important goal for athletes. A snack providing a combination of carbohydrate and protein, with fluid to rehydrate is the perfect approach. Some recent evidence suggests that it even be better to have this recovery snack just *before* the weight training session.
- The sports world is filled with supplements that promote better recovery, faster muscle gains from training, increased fat loss and enhanced performance. These claims are attractive to all athletes, but seem particularly connected to the world of strength training and body building. Since the supplement industry is loosely regulated, it is easy for manufacturers to make false or exaggerated claims about products

nutrition strategies

1. Athletes wanting to increase muscle mass require meal plans based on carbohydrate-rich foods to fuel training, and plenty of protein, vitamins and minerals to build the results. The recipes in this book have been developed to achieve good carbohydrate and protein combinations.

2. Athletes who need additional energy to make gains in body size and muscle strength will need the larger portion sizes of our recipes at meals, as well as snacks and action-packed fluids between meals. A cooked or prepared dessert can add to meals, or make a supper before bed
3. Key strategies for athletes working on a lighter and leaner shape include low-fat eating, and paying attention to serve sizes.
4. A few supplements and sports foods provide good value and real enhancements to the to the athlete's training and competition program. However, for independent and up-to-date advice about what really works and how to make best use of it, consult a sports dietitian

Ideas for high-energy snacks – nutritious carbohydrate- and protein-rich choices

Fruit smoothies or liquid meal supplements
Sandwiches or toasted sandwiches
Fruit salad and fruit flavoured yoghurt
Sports bars plus fruit juice or sports drink
Creamed rice
Muffins, scones or fruit buns with flavoured milk
Fruit and nut trail mix and fruit juice or sports drink

Eating to decrease body fat

nutrition strategies

1. The recipes in this book are based on carbohydrate-rich, moderate-fat eating. When restricting energy intake to stay trim, the athlete should look for recipes that are gold medal winners for calcium, iron and phytochemicals to ensure that nutrient needs are met from the small portion serves.
2. The skill athlete should keep well-fuelled with carbohydrate rich choices before competition and training sessions. During lengthy sessions, particularly in the heat, fluids should be consumed to promote hydration. When long sessions mean skipped meals, a carbohydrate-rich snack or carbohydrate-drink should be consumed to refuel.

Ideas for staying lean and trim:

Don't overdo the portion size at meals. Choose the smaller serve size of recipes in this book and fill the plate with extra vegies or salad
Have a well chosen snack during the afternoon to pre-event extreme hunger at night. . Don't snack between meals for entertainment rather than need. If you like to have something before bed, save something from your dinner rather than having extra food
Choose low fat cooking methods, as used in these recipes. Avoid adding butter, margarine, cream, oils or creamy dressings to foods
Choose lean cuts of meat, fish and poultry, and remove skin and fat before cooking

Try low fat versions of dairy food, and use cheese (even reduced fat types) as a sprinkle rather than slabs

Nutritional Strategies to Promote Training Recovery

Before Training:

- To provide 1 g carbohydrate per kilogram body weight and protein.
- To provide 5 grams of high quality protein (either essential amino acids or whey protein or soy protein are all good options).
- Vitamin C (120mg), Vitamin E (20IU), Sodium (250mg), Potassium (120mg), Magnesium (120mg).

Options include:

- For a standard 70-90kg rower this would equate to 2 cups cornflakes with milk and 3 dessertspoons of yoghurt. Tinned fruit.
- 4 pieces of toast with peanut butter (or jam/honey for light weights). Glass of juice.

During Training (turn around point):

- To provide high glycemic index carbohydrate in amounts of 30 grams per hour.

Options Include:

1. ***Red 8 Sports Hydrate (250ml=22g CHO)***
2. ***Xri8 Sports drink (rowing formula) (250ml=19g CHO)***
3. ***Carbohydrate gels such as Leppin squeezy, powergel, Gu etc. (1 gel=30g CHO)***
4. ***Jelly beans (10 beans=30g CHO)***

After rowing (before weights):

- To provide 20 grams high glycemic index carbohydrates.
- To provide 5 grams of high quality protein (such as whey protein or essential amino acids).

Options Include:

1. ***Red 8 Just Whey Recovery (1-2 tablespoons in water)***
2. ***Ripe Banana (30g carbohydrate) and 1 tablespoon Complan + 1 tablespoon skim milk powder mixed with water.***

Before afternoon training session:

- To provide low-medium glycemic index carbohydrates in amounts 1g per kg body weight. This equates to about 70-90g carbohydrates.

Options include:

1. ***Red 8 Just Whey Plus (1 tablespoon) with water + banana or cereal bar***
2. ***Red 8 Just Whey Recovery (1-2 tablespoons) with water+ handful sultanas***

After afternoon training session:

- To provide high glycemic index carbohydrates in amounts 1g per kg body weight. This equates to about 70-90g carbohydrates.
- To provide 20grams of high quality protein
- Vitamin C (120mg), Vitamin E (20IU), Sodium (250mg), Potassium (120mg), Magnesium (120mg).

Options include:

1. ***Best option is too consume post training meal as quickly as possible.***

Nutritional Issues of Concern to Rowers

Fatigue

- Investigate inadequate carbohydrate consumption
- Ascertain dietary iron intake and consider referring to medical team for iron testing.
- Investigate adequate fluid consumption at training and between sessions
- Ensure the athlete consumes food before and after training to maximize recovery from sessions.

Low immunity and frequent illness

- Investigate poor intake of vitamins and minerals.
- Investigate poor consumption of carbohydrate
- Investigate whether the athlete consumes enough total energy.
- Ensure carbohydrate consumption during training until illness subsides (or further if warranted).

Failure to build muscle

- Investigate adequate but not excessive protein intake.
- Ensure regular healthy snacking throughout the day.

Difficulty decreasing body fat

- Investigate dietary fat intake
- Investigate refined carbohydrate intake
- Investigate total food quantity

Special issues and requirements for rowers:

- Iron needs: Rowers especially women and young males can be at high risk of low iron status. Signs of low iron can include feeling more tired or weaker than usual, shortness of breath (due to decreased uptake of oxygen), dizzy/faintness. Eat iron rich foods such as red meat, kidneys, chicken, beans and nuts, green leafy vegetables and fortified cereals. Drinking vitamin C rich drinks can help iron absorbency while drinking calcium rich drinks i.e. milk will decrease the uptake of iron. Those at risk may need regular blood test checks and a visit to the dietitian to assess their current diet.
- Fluid requirements: Due to long training sessions and limited break times on the water, fluid during recovery is very important. A rower can lose up to 1-2kg bodyweight from sweat loss (depending on factors such as gender, temperature, duration and type of session). Rowers

should monitor their fluid loss by weighing themselves before and after sessions. To fully rehydrate it is recommended to consume 150% of the fluid deficit and electrolytes should be added to replace the loss during sweating and to help with the retention of water.

- Recovery nutrition: Due to high training loads with rowers and also the nature of the sports training location not being close to home it is often hard to get the recovery food in within the optimal 20-30min bracket straight after training. Take recovery foods (e.g. high GI food such as honey sandwich, muesli bar, ripe banana) in your bag to have straight after the row or even take food in the boat with you for long rows.
- Fat mass: In rowing the power to weight ratio is important. The heavier and stronger you are the more power you can generate. However the greater fat mass you have, although making you heavier, results in dead weight that must be carried in the boat. So it may be necessary especially for lightweights to monitor body fat levels through skinfolds and excess energy in the diet such as excess fat and sugar and alcohol may need to be targeted. See a sports dietitian for more information.
- Energy intake: Rowers have high energy and carbohydrate needs. Heavyweight men and some lighter women may especially struggle to consume enough food to meet requirements. Frequent snacking, eating energy dense foods, and/or extra meal supplements or protein drinks may be needed – see dietitian for individualized needs.

Food Budgeting Tips:

- Shop using a list therefore minimising the temptation to buy unnecessary items.
- Keep the shopping list in the kitchen to add items that are used up.
- The shopping list should also be used to plan the meals for the following week. This will allow rowers to use cooks books for planning and ensure all of the ingredients are in the house.
- Attempt to minimise the meals purchased away from home. Rather, eat at home and go out for coffee or tea.
- Don't shop on an empty stomach.
- Try and purchase items on special or "no name' brands.
- Crock-pots or slow cookers are a great way to cook cheaper meat cuts without fat. Meat, tinned tomatoes and vegetables can be put into a crock pot in the morning on low ready for your arrival home from your evening session!
- Don't forget to include cheap protein sources such as baked beans, lentils, pea soup, eggs and peanut butter in your diet.

Nutrition Advice when Travelling with Rowers

Travelling away from home for training and competition is standard practice for most of the rowers. Unfortunately, the disruptions and distractions of a new environment, changes in schedule and exposure to different foods can significantly affect usual eating habits. Major nutritional challenges faced by athletes while travelling include:

- achieving carbohydrate and protein requirements
- meeting daily vitamin and mineral requirements
- balancing energy intake
- maintaining adequate hydration
- food safety

It is essential that strategies are put in place to minimise the impact of travel on an rower's food intake. Whether the rower is travelling overseas or on a long local bus trip, the key to successful eating while on the move is planning and preparation.

Plan Ahead

A general plan consisting of where, when and what the rower is planning to eat on each day should be constructed around the anticipated daily schedule. It is important to keep foods and meal times as similar as possible to the usual daily routine at home.

Research the Destination

Food patterns at the destination should be investigated as thoroughly as possible before leaving home:

- Are all important foods available?
- Is the accommodation self-catering or will it be necessary to rely on restaurants or takeaways?

What are the hygiene and food safety risks?

The internet, travel agencies, embassies, competition organisers or other rowers who have travelled to the destination before can be used to gain information.

Choose Your Catering Style

Self Catering

Cooking skills, budget and access to shops will determine the meals that can be served. The availability of food at local shops, the cooking and storage facilities and available utensils need to be investigated before leaving home. Ideally, the menu should be planned in advance. This is where the NZ academy of sport nutritionist can be valuable in designing menus that can be taken with the team taking much of the guess work out of food provision.

Restaurant Eating

Rowers often stay in hotels where all meals are provided in the hotel restaurant. On other occasions, rowers may choose to cater for their own breakfasts and lunch and use a restaurant for the evening meal. Where possible, restaurants should be investigated before leaving home. The meal options, cooking styles, opening hours and hygiene of the establishment should be considered. It is useful to book restaurants ahead of time as many businesses are unable to cater for specific requests or large groups at short notice. Discussing the proposed menu with restaurant staff in advance will minimise problems at mealtime. This is particularly important when athletes have special dietary needs (e.g. vegetarian, food intolerances).

Meals that focus on carbohydrate choices such as rice, noodles and pasta are a good place to start. Add lean sources of protein such as lean meat, fish, chicken, beans or tofu and include plenty of vegetables. Avoid dishes that are deep fried or battered. Buffet style eating can be a good option as it allows athletes a range of choices. It is quicker than waiting for individual meals to arrive and is cost effective. One of the pitfalls of buffet eating is that it is easy to over indulge. This can be avoided by planning meals in advance and leaving the buffet when full. If using the same restaurant for more than a few days, vary the menu from day to day rather than within a meal to avoid boredom. If possible, avoid being solely reliant on restaurant/fast food options. They can be time consuming, expensive and a nutritional challenge.

Snacks

Snacks are an important component of eating and recovery nutrition plans for most rowers, however access to quality snacks can be difficult when travelling. It pays to take a supply of portable, non-perishable snack foods that are unlikely to be available at the destination. It may be useful to send a package of supplies ahead to decrease baggage. Remember to check with customs/quarantine regarding foods that are restricted from crossing certain borders.

Useful Food Items To Take

cereal bars
breakfast cereal
canned snack pack fruits
dried fruit
instant noodles
jam, honey, peanut butter, Vegemite
powdered sports drink
powdered liquid meal supplements
powdered milk
concentrated fruit juice
baked beans and spaghetti

Hotels usually only cater for 3 meals/day. Arrange for snacks such as yoghurt, fruit and cereal bars to be placed out at meals so that athletes can take them for snacks later in the day. Alternatively, arrange for a communal area to be stocked with snacks (i.e. the manager's room).

Travelling by Air

Meals and Snacks

Rowers are not used to forced inactivity therefore hours spent on a plane may lead to boredom. It is important that rowers avoid over eating to relieve boredom. Taking other activities on board, drinking water regularly and chewing sugar-free gum can decrease the temptation to snack excessively on long flights. Alternatively, rowers with high-energy needs may struggle to meet their needs if they rely solely on in-flight catering. This may cause the athlete to arrive at the competition destination with reduced fuel stores. Several strategies can be taken to minimise these risks to performance:

- Enquire about the in-flight menu and timing of the meal service in advance.
- On long flights, try to adopt a similar meal and sleep pattern to that anticipated at your destination. This may help to reduce the effects of jet lag.
- It is advisable to pack extra snacks in carry-on luggage. Food available for sale at airports tends to be expensive and it can be difficult to find nutritious options. It is always useful to have some supplies in case of unexpected delays.

In-Flight Fluid

The risk of becoming dehydrated on long flights is high as the pressurised cabins cause increased fluid losses from the skin and lungs. Symptoms of dehydration may include headaches or slight constipation. It is inadequate to rely on cabin service for fluid as the serve sizes of drinks is very small. Rowers should take their own supply of bottled water onto the flight to supplement the water, juice and soft drink provided in the air. Sports drinks are also a useful choice as they provide a small amount of sodium that helps promote thirst (therefore encourages a greater fluid intake), and decreases urine losses. Aim to drink approximately 1 cup per hour during the flight. Caffeine-containing fluids such as tea, coffee and cola drinks may cause increased urine production, but can still contribute to a positive fluid balance in athletes (especially in those who regularly drink caffeinated drinks). Alcohol should be avoided on flights.

Food Safety at the Destination

Gastrointestinal problems are common when travelling to foreign destinations. These can occur in both developing countries and 'safe' destinations. Adopting good personal hygiene and food safety practices will help to decrease the risk of infection and illness.

If the local water is unsafe to drink:

Drink only bottled water or drinks from sealed containers.
Avoid ice in drinks.
Clean teeth with bottled water.
Avoid salad vegetables unless washed in bottled or boiled water.
Only eat fruit if it can be peeled.

In 'high risk' areas:

Eat only from reputable hotels or well known franchises.
Avoid street stalls and markets.
Be wary of fish and shellfish.
Only consume food that is steaming hot or has been refrigerated.

At all destinations:

- Avoid sharing cups, bottles or utensils as infections and illness can be transmitted this way. If vomiting or diarrhoea does occur, it is important to replace lost fluids and electrolytes. Oral rehydration solutions and a safe water supply should be used. A bland diet consisting of dry toast, crackers, biscuits and rice may help. Avoid alcohol, fatty foods and dairy foods until the diarrhoea has ceased.

Food at the Competition Venue

Unfortunately, most sporting venues provide food choices such as deep fried snack foods, crisps and chocolate. Nutritious options are often hard to find. Rowers should carry pre and post exercise snacks and drinks to the venue to ensure that appropriate choices are readily available. Sandwiches, cereal bars, fruit, juice, liquid meal supplements and bottled or powdered sports drinks are ideal. Check that the venue has accessible water outlets and that the water is safe to drink. Carry your own bottled water if the water supply is in doubt.

Competition day eating

Depending on the regatta competition (i.e. duration over two days resulting in racing up to 3-4 races in a day, or a regatta lasting a week long racing 1-2 races per day) will depend on the type and timing of competition food needed. It is important to eat recovery foods 20-30minutes after racing such as honey sandwich (with white bread), creamed rice, muesli bar, fruit, low fat muffins, fruit bread, raisins. These foods have a high GI which means they can be digested quickly providing instant glucose for replacing the carbohydrates lost. A good carbohydrate meal should be consumed 2-3 hours before the race e.g. pasta, porridge, rice, cold potatoes, sandwiches, and for lunch depending on the timing of the races. Rowers especially lightweights may need to be careful leading up to their race if it is over a week as energy needs maybe less so intake will have to be tailored so as to stay at weight. Those who can not stomach eating before racing could take meal supplements or carbohydrate/protein shakes.
Drinking is very important as a dehydration of 2% bodyweight loss could have detrimental effects on performance. Sports fluids are good for recovery as they help to replace electrolytes lost in sweating and carbohydrate. Even adding a little sports powder into your water during the day to help you drink more may be useful.

Key competition foods:

Honey/jam sandwich
Museli bars (low-fat)
Creamed rice
Canned spaghetti/baked beans
Yoghurt
Sports drink
Fruit bread
gel
healthy baking (low-fat)
fruit – fresh or dried
iced buns
protein milkshake
rice crackers (low fat)
potato/pasta/rice salads (low-fat)
Carbohydrate shots/ energy

What should I eat during competition?

The major regattas usually run for two days to a week with rowers often have only one race per day. At the week to week regattas rowers may race in up to three or four events meaning that there is little time for rest and recovery in between. Eating during competition can be difficult, when nerves and a busy schedule can take over! Practising competition eating during training sessions will help to identify food choices that will work best. Examples below:

If less than 60 minutes between races: fluids, sports drinks, juices, glucose lollies and fruit are the best options (as they are rapidly digested from the gut) If 1-2 hours between races: pasta, rice or noodle-based dishes with low fat sauce/toppings or sandwiches with honey/jam/banana are good choices. Sports bars, cereal bars or low fat muesli bars can be handy also.

If more than 2 hours between races: a more substantial meal or meal replacement can be eaten (with plenty of fluids, of course!) Rowers need to be prepared with snacks as regatta courses can be some distance away from shops. A chiller bag packed with plenty of fluids and snacks like cereal bars, fruit and sandwiches can be a handy way of keeping food cool and safe by the water.

Antioxidants (Including vitamin C, E and flavanoids)

Supplement Overview

Physical activity causes an increase in energy requirement and therefore an increase in metabolism. Increased metabolism has a side effect of increasing the production of free radicals in the body.
The free radicals can cause damage to muscle, immune system and recovery if in excess of the rowers' ability to resist.
Some evidence suggests that antioxidant supplementation may assist the body to resist free radicals and therefore recovery from exercise.

Supplement Profile

Daily dose of 500mg vitamin C and 500IU vitamin E and 3000mg anthocyanins.
Most studies have only been short term, so benefits may only be with short term supplementation, in fact long term supplementation has been associated with lower improvements in endurance capacity and should therefore be avoided.
Suggested to be used in increased training periods or when competition travel.

Situations for use in Rowing

- Rowers commencing a period of high intensity training.
- Rowers with a poor intake of nutrients are far more likely to benefit.
- Rowers traveling to compete in areas with very little fresh fruit and vegetables may also benefit.

Concerns

Antioxidant mechanisms within the body are complex and some act in negative ways if taken in excess.
Little concern in the amounts recommended.

References:

Pilaczynska-Szczesniaj, L., Skarpanska-Steinborn, A., Deskur, E., Basta, P. & Horoszkiewicz-Hassan, M. (2005). The influnence of chokeberry juice supplementation on the reduction of oxidative stress resulting from an incremental rowing ergometer exercsie. *International Journal of Sport Nutrition and Exercise Metabolism, 14,* 48-58.

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Watson, T.A., MacDonald-Wicks, L.K.. & Garg, M.L. (2005). Oxidative stress and antioxidants in athletes undertaking regular exercise training. *International Journal of Sport Nutrition and Exercise Metabolism, 15,* 131-146.

Dernach, A.R., Sherman, W.M., Simonsen, J.C., Flowers, K.M. & Lamb. D.R. (1993). No evidence of oxidant stress during high-intensity rowing training. *American Journal of Applied Physiology, 161,* 2140-2145.

Calcium (including calcium citrate malate, calcium carbonate, calcium phosphate or calcium lactate)

Supplement Overview:

Calcium is important for optimal bone status; it is also integral for a range of body functions including neuromuscular transmission, muscular contraction and blood coagulation. Body calcium balance is tightly controlled with calcium requirements being met by dietary intake or when dietary intake is inadequate by mobilisation of bone stores. Calcium is also lost through sweating.

Supplement Profile:

600mg/ d: preferably in the form of Calcium Citrate Malate which has increased water solubility and thus bioavailability.

Situations for use in rowing:

When intake assessed as lower than 1200mg/day for athlete population and need can not reasonably be met by dietary intake; for example low energy diets for light-weight rowing, lactose intolerance or milk allergy, or an aversion to milk or dairy products.
This may include other situations when athlete has increased requirements as determined by physician.

Concerns:

Several factors are important for maintaining bone mineral density, including or hormonal status, so other areas should be addressed as per advice from physician.
Rowing is not a weight-bearing exercise – however bone health should not be compromised in rowing over other sports through loading via muscular contraction and other activities; combined with an adequate calcium intake.

Calcium intake assessment should be performed by dietitian and calcium prescribed in conjunction with dietary history and assessment.
Supplemented calcium should be separated from supplementation of iron due to co-binding of the minerals, therefore multi-vitamin formulations are not as bioavailable for calcium.

References:

Clarkson, PM & Haymes, E. (1995). Exercise and mineral status of athletes: calcium, magnesium, phosphorus, and iron. *Medicine and Science in Sports & Exercise*, 27(6):, 831-43.

Jasminka, Z & Kerstetter, J. (2000) Nutrition in Bone Health Revisited: A story beyond calcium. *Journal of the American College of Nutrition,* 19, 715-737.

Heinonen, A, et al. (1995). Bone mineral density in female athletes representing sports with different loading characteristics of the skeleton. *Bone,* 17(3), 197-203.

Nattiv A & Armsey TD Jr. (1997). Stress injury to bone in the female athlete. *Clinics in Sport Medicine,* 16(2), 197-224.

Electrolyte Replacement Supplements

Supplement Overview

Rowers may wish to utilise an electrolyte replacement supplement if competing in a light weight division and therefore require rapid rehydration following moderate to large fluid deficits or other dehydrating activity.
In addition to this, some rowers have very high sweat rates and therefore when competing in hot conditions may benefit from an electrolyte replacement supplement.
Sports drink (10-25 mmol/L sodium and 3-5 mmol/L potassium) may not address the replacement of large electrolyte losses through dehydration or excessive sweat.
In the case of post rehydration, there is sound evidence that the replacement of electrolyte losses, particularly sodium, must occur before fluid balance is fully restored. If sodium is not replaced, the drinking of plain water or salt free drinks will lower sodium levels in the blood, therefore decreasing thirst and increasing urine output.

Supplement Profile

Commercial electrolyte replacement supplements such as flavoured gastrolyte or electrolyte tablets available in most chemists are ideal.
These supplements should contain the following quantities of electrolytes:

Electrolyte	Ideal (mmol/L)	Ideal (g or mg/L)
Sodium	<145 mmol/L	<3.3g/L or 3300mg/L
Potassium	20-30 mmol/L	0.8-1.2g/L or 800-1200mg/L
Chloride	50-100 mmol/L	1.8-3.5g/L or 1800-3500 mg/L

Generally these supplements will be low in carbohydrate and rowers using these solutions following weigh in should also pay careful attention to replacing carbohydrate as well.
In this situation, electrolyte tablets may be added to a standard sports drink to replace fluid, electrolytes and carbohydrate.

Refer to "Making weight guidelines" for direction on a post weigh in strategy.

Situations for use in Rowing

- Light weight rowers post weigh in.
- Training in hot conditions to be used as a post exercise recovery.

Concerns for supplementation

Drinks containing a high electrolyte content may not taste as favourable and therefore limit the overall consumption of fluid at a crucial time. This issue should be minimal with practice prior to competition time.

References

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Glycerol

Supplement Overview

Glycerol is a 3-carbon alcohol which is the structural backbone of triacylglycerol molecules. It has been suggested that glycerol acts as a hyper hydrating agent because it is rapidly absorbed, as well as evenly distributed

among body fluid compartments. It is a natural metabolite that is well tolerated in the body and has the ability to assist the body to retain fluid. This may be beneficial for light weight athletes following weigh in to assist the body retain fluid that otherwise might be lost to urine output.

Supplement Profile

Most studies have used amounts of 1g/kg bodyweight of glycerol mixed with 25ml/kg bodyweight of fluid immediately after weigh in. However, this should be trialed with each individual rower as it results in a large volume of fluid to consume and this may not be acceptable to all rowers.
Glycerol is a thick liquid that can be purchased from most pharmacies.

Refer to "Making weight guidelines" for direction on a post weigh in strategy.

Situations for use in Rowing

- Light weight rowers post weigh in.
- Training in hot conditions to be used as a post exercise recovery.

Concerns for supplementation

Some athletes have experienced abdominal bloating, diarrhea and headaches. For this reason, this supplement should be trialed during training.

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Iron Supplement

Supplement Overview

Reduced iron content in the blood is a common issue amongst rowers and is due to an imbalance between dietary intake and requirement by the body. It is now recognised that females with a ferritin reading below 16-20ng/mL will benefit from supplementing their diet with an iron supplement. However, having said this each athlete is different and a low reading for one rower may be high for another. For this reason it is useful to monitor iron levels on a semi-regular basis to ascertain real changes for that individual.

Supplement Profile

Ferro-gradumet is the first iron supplement of choice recommended by sports physicians, as it provides a good quantity of iron.
Best taken on an empty stomach with 250-500mg vitamin C.
Chris Milne will recommend alternative sources of iron supplementation if constipation is a side effect.

Situations for use by Rowers

When determined by a sports physician to have a low ferritin level.
Factors that may contribute to a low ferritin level include:

- Chronic anti-inflammatory medication
- Low dietary intake of red meat or other high iron foods.
- Female menstrual cycle
- Increase in cross training like running

Dietary advice on high iron foods given when the rower is deemed to have low iron status will assist the transition off iron supplements.

Concerns for Supplementation

Excessive iron consumption when the need has not arisen can result in excess accumulation of iron within the body and a decreased absorption of other nutrients.