TRAIN SMART, EAT SMART, RACE FASTER

It's all about stress and adaptation

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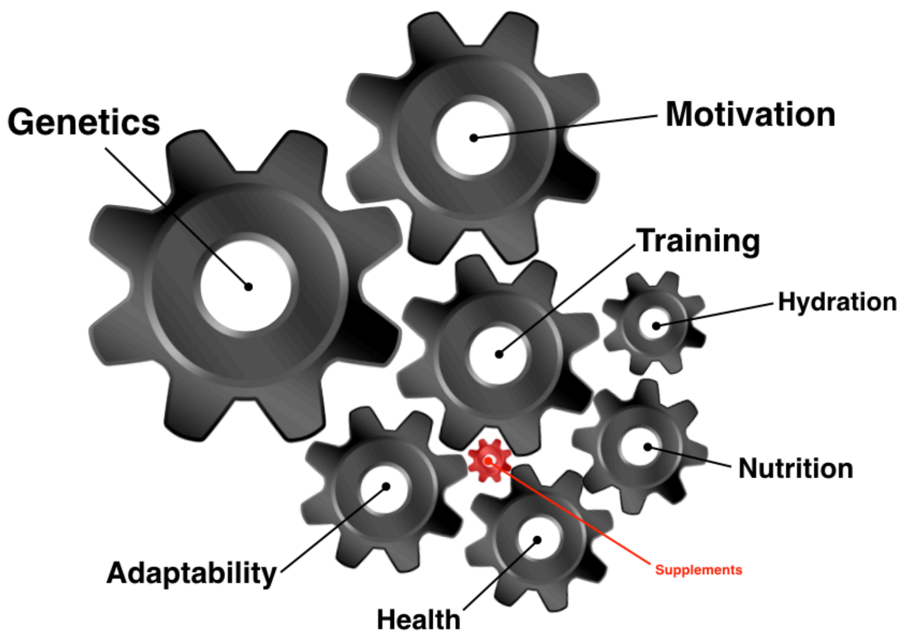

1. **Genetics -** establishes the upper limit of our capabilities.
2. **Motivation -** determines how close we might get to that upper limit.
3. **Training -** maximizes our genetic potential.
4. **Adaptability -** the speed and completeness of how we respond to training stress.
5. **Health -** mind-body wellbeing needed to optimize training and adaptation.
6. **Nutrition -** fuel and nutrients needed to get the most from our bodies, support adaptation, and speed recovery.
7. **Hydration -** to support hard training, recovery, and adaptation.
8. **Supplements -** possibly a small boost to adaptation, recovery, and performance.

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Stimulus	Facilitators	Response
Training	Rest Nutrition Hydration Endocrine Immune CNS	Go faster Go longer Go harder

→ Increased myofibrillar protein → Increased strength

→ Increased mitochondrial protein → Increased endurance

A QUICK OVERVIEW

TRAIN SMART
- During training and racing, your body is stressed and is breaking down.
- During the day, and especially during sleep, your body adapts to that stress.

STAY HYDRATED
- During training and racing, drink to minimize weight loss. Don't over-drink.
- During the day, stay hydrated to aid adaptation.

STAY FUELED
- During training and racing, consume 50-90 grams of carbs/hr to fuel muscles.
- During the day, consume carbs to replace what your body has used.

STAY SALTED
- During training and racing, consume at least 500 mg of sodium each hour.
- During the day, salt your food to taste.

EAT ENOUGH FOOD
- During training and racing, 200 kcal/h is a minimum, 400 kcal/h is maximum.
- During the day, eat enough to achieve your goals for body weight.

EAT ENOUGH PROTEIN
- During training and racing, don't worry about protein.
- During each day, spread protein intake evenly, with 20-40 grams soon after training.
- Consume 0.5 to 1.0 g protein/lb body weight each day.

WATER/FLUID

- The simple truth: drink or die. Hydration has to be priority #1 any time you sweat.
- Stay well hydrated during the day and before sleep. Good hydration is anabolic.
- Each day, drink half your body weight in ounces. Example: 180 lb = 90 oz/day.
- Even slight dehydration saps strength and endurance, especially in warm weather.
- Drink during training and competition to minimize weight loss, but don't over-drink.
- The best way to rehydrate after training is to not allow yourself to get dehydrated during training.
- Periodically weigh yourself before and after training to learn how much fluid you need.
- Rule of thumb: for workouts > 4 hours, finish weighing within -2% of starting weight. Example: if starting weight = 148 lb, then finish weight should be around 145 lb (2% of 148 = ~ 3 lb). For shorter workouts, try to finish within -1% of starting body weight.
- Favor sports drinks over water to get the carbs and electrolytes needed to fuel muscles and maintain hydration.

CARBS

- During exercise, muscle and brain run on sugar (glucose).
- Fat is also important to muscles, but even the leanest athlete has enough fat to last for days of continuous exercise.
- Consuming sugar (carbohydrate) during exercise fuels muscle and brain, helping ensure peak performance.
- When pushing hard, your muscles can use roughly 0.5 grams of carbohydrate per pound of body weight each hour of exercise. For example, a 160-lb athlete should try to ingest 80 grams (240 kcal) of carbs each hour.
- Sports drinks can provide the bulk of the carbs ingested during exercise, but other carb sources can also be used (bars, gels, etc.)
- IMPORTANT: Extra carbohydrate can't be used by muscles during exercise and can impede race nutrition by slowing gastric emptying and causing gastric discomfort.
- Daily carb intake should follow daily training demands: the harder and longer you train, the more carbs you should eat during the day.
- During *intense* training (i.e., the type of training that would be difficult to sustain for more than one hour), your muscles will use roughly 300 grams of carbohydrate (from muscle glycogen and blood glucose) each hour. Consider this the top end of carb use by the body.
- During *hard* training (e.g., a hard two-hour workout), total carb use will be approximately 150 grams per hour (300 grams in two hours).
- During *easy* training, total carb use will be about 50 grams per hour.

- These are <u>estimates</u> of carb use, but you can use them as a guide to get a sense of your daily carbohydrate needs. For example, if you have a hard two-hour training session in the morning and an easier two-hour session in the evening, total carb use will be roughly 400 grams. That's 1600 kcal of carbohydrate (400 grams x 4 kcal/gram) that you will need to ingest in order to return muscle glycogen stores to normal. Add a normal amount of fat and protein along with those carbs and total daily intake can easily be over 3000 kcal for many athletes.
- On easy training days, your calorie (energy) needs will be substantially less. If you do an easy two-hour workout just to keep loose, you might use 100 grams of carbs (400 kcal). Add to that the 1200-1600 kcal needed just to sustain resting metabolism and another 600-800 kcal worth of protein and fat, and the daily calorie total might be in the neighborhood of 1800-2400 kcal.
- Carb intake is important immediately after exercise, as is protein intake. The good news from a practical standpoint is that a little protein goes a long way in sparking glycogen restoration and muscle protein synthesis. Just 20 grams of high-quality protein (e.g., milk, meat, eggs, fish, soy, etc.) and at least 35 grams of carbohydrate will provide your fatigued muscles the nourishment they need to get on the road to recovery. Subsequent meals and snacks will complete the job.

SALT

- Sweat contains electrolytes (also referred to as minerals or ions) such as sodium, chloride, potassium, calcium, and magnesium.
- Replacing those electrolytes during training helps maintain your desire to drink and keeps your blood volume from dropping too low, two critical benefits in keeping you well hydrated.
- Big sweaters tend to lose a lot of salt during training, light sweaters do not.
- During exercise, it is not necessary to replace all the salt that is lost in sweat.
- As a rule of thumb, try to ingest around 1 gram (1,000 mg) of sodium/hour.
- The typical sports drink has 400-600 mg of sodium per quart, so additional sodium sources are needed. Adding a 1/4 tsp of table salt per 20 oz of sports drink, popping an occasional salt tab, or eating foods with sodium can fill the gap.
- Salty sweaters may need around 2 grams (2,000 mg) of sodium each hour of training and racing.

OTHER STUFF

Over-stressing is good. Over-training is not: Periodic fatigue—the failure of a muscle group or the entire body to keep up with the task—maximally stimulates the adaptations that improve performance. That's not to say that we have to train to fatigue every day to accomplish optimal adaptation. In fact, DON'T DO THAT! A training set to all-out fatigue should be reserved to one or two days per week. Training at lower efforts also promotes adaptations that improve performance. Proper training gradually and progressively over-stresses our bodies (called functional over-reaching), but if we don't back off periodically and rest for a few days, that over-stress can quickly become *nonfunctional* over-reaching or, even worse, over-training … and that can set us back six months or more. Symptoms of non-functional over-reaching and over-training include worsening performance in training and racing, prolonged crankiness, muscle aches and soreness that don't subside, poor sleep, lack of desire to train, early fatigue, unusual muscle weakness, and fatigue when climbing stairs and doing other everyday tasks that usually aren't a problem.

Recovery: Most athletes don't realize that recovery is more important than training. Training provides the stimulus for the body to adapt, but recovery allows for the responses to occur. Optimizing those responses requires the right blend of rest and nutrition, along with individualized training programs. In terms of nutrition, the priorities are these:

1. Hydration - a hydrated muscle is an anabolic muscle.
2. Carbohydrate - restoring muscle and liver glycogen is essential.
3. Protein - 30-40 grams per meal optimizes muscle protein synthesis.
4. Energy - adequate calorie intake ensures there is enough energy to go around.
5. Other nutrients - fat, vitamins, minerals, and a vast array of micronutrients allow for training adaptations to occur.

Illness: Training stresses the immune system because many of the hormonal responses that occur during and following hard training blunt certain aspects of immune-cell function. Those changes increase the risk of infections from bacteria and viruses. Interestingly, consuming carbohydrate during training and competition actually maintains the activity of some immune cells and may reduce the risk of illness. Proper diet, adequate rest, training within your capabilities, washing your hands at the appropriate times, avoiding large crowds, wearing a face mask when desired, and keeping your hands away from your face are all important in reducing the risk of illness.

Weight loss / Weight gain: Being lean means being lighter and that's a good thing for cycling and running. During your training season, weight loss may be tough to avoid and weight gain may be tough to achieve. The sheer quantity of training virtually dictates fat loss over time as energy expenditure typically exceeds energy intake at least a few days each week. To purposefully accelerate fat loss, reduce energy intake (calories) by 500 kcal/day less than what you guess your needs to be. The easiest way to accomplish that is to simply reduce portion sizes and rely on protein snacks to keep hunger at bay. To maintain or gain weight, increase portion sizes or add high-calorie nutrition shakes or smoothies to your diet.

Resting metabolic rate (RMR): Being generally aware of your RMR is a good way to understand your daily energy (calorie) needs. There are all sorts of on-line calculators and mobile apps that you can use, including http://www.rmrcalculator.net. Your RMR represents the number of calories you need during a day if you sat and read a book or watched TV all day. The moment we start moving, our daily energy needs increase. The more we move, the greater the increase. On a rest day, your energy needs will be roughly 1.2 times your RMR. On a hard training day (> 2 hours), your energy needs might be 2 times your RMR. The RMR link above calculates daily energy (calorie) needs that reflects the training you do.

More about protein: Recent research confirms that spreading protein intake throughout the day is the best way to protect and improve muscle mass and strength. Athletes need roughly 0.75 grams of protein per pound of body weight each day. Follow a pattern of breakfast/snack/lunch/snack/dinner/bedtime snack. For example, a 160-lb athlete should consume at least 120 grams of protein each day (160 x 0.75). That should be distributed as 30 grams at breakfast, 10-gram mid-morning snack, 30 grams at lunch, 10-gram mid-afternoon snack, 30 grams at dinner, and then a 10-gram bedtime snack to get the benefit of greater muscle protein synthesis during sleep. Don't get hung up on the exact grams of protein, but do try to make your protein intake consistent throughout the day.

In-race nutrition: During competition, your Top Six Nutritional Priorities are: 1) hydration, 2) hydration, 3) hydration 4) sugar, 5) salt, 6) comfort food. You should favor sports drinks, but bars, gels, salt tabs, pretzels, peanut-butter-and-jelly sandwiches; anything else that you enjoy and sits well in your stomach can also have a place in your nutrition arsenal. Shoot for no more than around 200-400 kcal/hour; try for the low end if you weigh less than 150 lb, high end if you weigh more than 200 lb.

Caffeine: Research shows that caffeine improves performance, especially compared to consuming a placebo. But when caffeine and carbohydrate are combined, the performance improvement from caffeine is considerably less. If you tolerate caffeine and have found it to be helpful during races, keep it up, but don't expect miracles. Ingesting 1-2 mg of caffeine per pound of body weight <u>before</u> a race may benefit performance in Olympic-distance triathlons. For half- and full Ironman distances, caffeine ingestion <u>during</u> the race is likely to be more effective, if only to decrease the perception of fatigue. Try 50 mg of caffeine per hour, but be sure to experiment during training to make sure you can tolerate the caffeine and are sure you feel a benefit.

Bone health: Sunshine, vitamin D, calcium, and impact exercise (weightlifting, running) combine to stimulate the development of strong bones (increased bone density). Because serious athletes sweat a lot, calcium loss in sweat can mount. For females, that calcium loss just makes it tougher to meet daily calcium requirements (1000 mg/day). Consider taking calcium supplements to help ensure adequate calcium and vitamin D intake.

Carb loading: The combination of training and a high-carb diet ensure that muscle glycogen levels remain high. Easing off training before a race will top off the tank, so there's no need to do any further dietary manipulation.

Daily diet: Athletes are rarely undernourished. The fact that athletes usually ingest more than 2,000 kcal/day virtually ensures that they are eating enough macro- and micronutrients, unless the diet is restrictive in some way. As a micronutrient insurance policy, a low-dose, low-cost, multi-vitamin and mineral supplement makes sense. Other than that, you simply can't beat a diet high in colorful fruits and vegetables to marinate your body in the vast array of micronutrients and phytochemicals formulated by Mother Nature.