

OPTIMIZING PERFORMANCE AFTER THE 'EVENT': NUTRITION, HYDRATION AND RACING TIPS

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This is the last in a series of three articles that deals with nutrition, hydration and training tips before, during and after the event. The previous two issues of Running Room Magazine have all of the nutrition and hydration pointers and tips dealing with pre- and during-event recommendations, while this last article deals exclusively with the post-event advice. Similar to the last article, the current definition of an 'event' is any run or race that takes longer than 60 minutes to complete. The steps you take in terms of nutrition, recovery and regeneration immediately after every single training session or race, are probably the most vital in terms of maintaining consistent injury and sickness *free* training without burning out. The areas every runner needs to consider post-exercise are: nutrition, or something I'll call the "glycogen replenishment window", and recovery and regeneration.

GLYCOGEN REPLENISHMENT WINDOW: POST EVENT NUTRITION

As I outlined more thoroughly in the first article of pre-event considerations in the Sept/Oct. issue of Running Room Magazine, the body's storage form of carbohydrate is called glycogen, which can be stored in either the skeletal muscle or the liver. Glycogen is great since it can provide energy at a high rate during intense exercise, such as a race or hard workout, but unfortunately our body's ability to store carbohydrate in the form of glycogen is quite limited. During intense exercise, our body can already be starting to get low in glycogen after 60 minutes of intense exercise. Some athletes will "hit the wall" after 90 minutes of hard running without taking in any extra carbohydrates in the form of a sports drinks or gels.

Obviously, after any hard run or race, your body's storage form of carbohydrate will be vastly reduced, which leads to the phenomena called the "Glycogen Replenishment Window". Immediately after exercise, your body acts like a 'sponge' and is ready to take up almost as much fuel or food as you can give it to initiate the replenishment of used up muscle and liver glycogen. This optimized state of replenishment for the body only lasts for about two hours. Therefore you have a limited "window" of opportunity for truly optimized nutrition replenishment and recovery. Figure 1 below illustrates this 'glycogen replenishment window' very well¹. Up the left-hand axis is the number of hours it takes your body to replenish your used up glycogen stores after a hard workout or race. Obviously the shorter, or the fewer amount of hours, the better in terms of getting your body reloaded for the next run or workout. Along the bottom axis are the different types of nutritional treatments. As you can see from the first left-hand bar, if you wait after a hard workout for longer than two-hours to re-feed with carbohydrate, there is a huge delay in the amount of time it takes your body to replenish its storage of glycogen- nearly 37 hours! In contrast, if a runner takes carbohydrate immediately after a workout, an athlete can replenish their glycogen in less than 24 hours (see the second bar). Therefore one will feel better and fresher for the next run or workout.

The type of nutrition an athlete needs to take after a workout has also been examined in detail lately, and there is now considerable evidence to suggest that the addition of protein, or specific amino acids (which make up proteins), may slightly help this glycogen replenishment phenomena post-workout or race. Specifically, certain amino acids (and many experts think that those amino acids are possibly arginine, leucine and phenylalanine) after exercise can slightly increase the amount of insulin your body secretes. Insulin sends a message to the body to store, or soak up, the blood sugar, thus increasing the amount of glycogen that your body is remaking. As you can see from the last two bars of Figure 1, adding protein or specific amino acids, does seem to slightly decrease the time of glycogen recovery, to slightly under 20 hours. However this research outcome is probably more applicable to world class and elite athletes that are training hard several times per day. As long as you stick with getting in primarily carbohydrates immediately after a hard workout or run *within* the first two hours, you will be pretty much maximizing your body's recovery in terms of nutrition, while only having a slight advantage by adding proteins.

The total amount and type of carbohydrate have also been examined in research. Immediately after exercise it seems that more simple sugars (or high glycaemic index carbohydrates) do a better job in

initiating glycogen replenishment compared to more complex carbohydrates (low glycaemic index)². A well-formulated sports drink, or replenishment bar, will supply much of the simple sugars. Then, switching over to more complex carbohydrates and proteins in a well-balanced meal and nutrition seems ideal. You as an athlete should shoot for about 60 grams of carbohydrate per hour, for the first few hours after a tough workout or race, and then about a total of 400-600 grams of carbohydrate over the next 24 hours. Depending on body weight, shoot for 600 grams if you're heavier (over ~200 pounds), or around 400 g if you're lighter (under ~200 pounds). Some good examples of carbohydrate are shown in Figure 2. Along with nutrition, there are some recovery tips that can also work well in keeping your body healthy and happy during tough training.

RECOVERY AND REGENERATION

The most significant area of recent developments, in terms of consistent long-term injury free training, that have been identified by most coaches and experts in the area of running, is the vital importance of recovery and regeneration coupled with post-exercise nutrition, which has already been covered. There are four main areas here: stretching, icing, chiropractic and/or massage and sleep. All of these boil down to being 'proactive', instead of 'reactive', in terms of how your body is feeling and handling the workouts and increased running.

Every runner needs to realize that the only time your body actually gets stronger is when you're resting and recovering from a run or workout, and that most of this repair occurs while you sleep. Long-term good sleep patterns and consistency are likely the most under-rated part to anyone's training program. The reason that most of the body's repair and growth occurs during deep sleep (or REM- rapid eye movement sleep) is that most of the natural secretion of human growth hormone (hGH) occurs during the first several hours of deep sleep³. Human growth hormone does several things including increased rate of protein synthesis (increased muscle repair), increased use of fat as a fuel (helps the body stay leaner), and also has been shown to help increase glycogen replenishment (described above). For these reasons, it is easy to see why *synthetic* hGH is on the Olympic banned substance list. The body also increases natural hGH secretion during intense exercise. Interestingly enough, disrupted sleep or as little as four to five alcoholic drinks can decrease you body's natural secretion of human growth hormone by upwards of 50 to 80%, thus preventing optimal recovery and repair of muscles.

Other ways to decrease on general aches and pains are good stretching and icing routines. Many teams and athletes, (there was a recent article on the female marathon world record holder Paula Radcliffe doing this), utilize ice baths after every hard workout to bring down general inflammation and aches and pains. A light walk several hours after a tough workout or race also helps to flush some of the toxins out of the muscle and prevent stiffness, as does post-event massage and/or chiropractic.

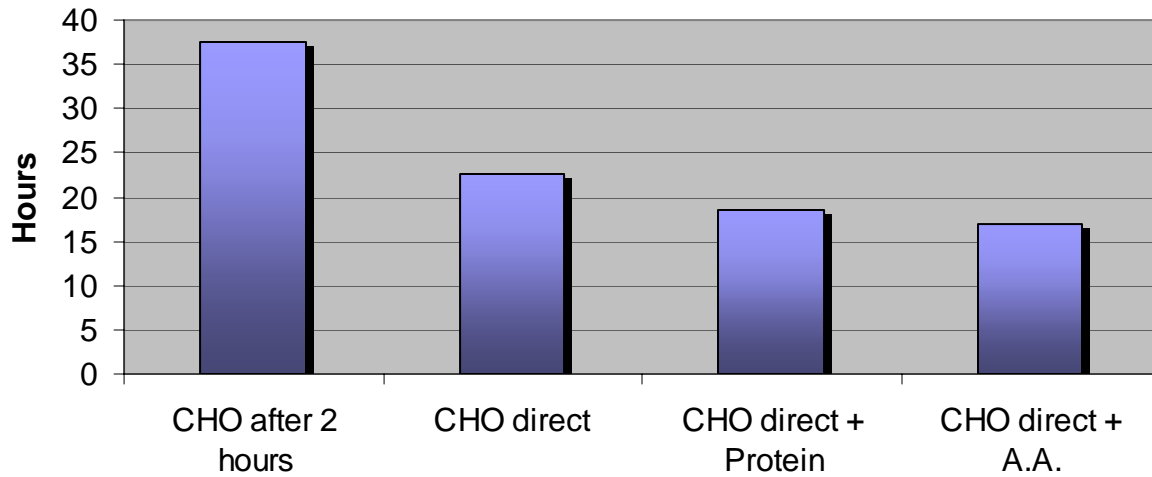
Of course, we are not all professional runners with unlimited time, and all of these recommendations take extra time that many of us don't have. But small things like immediate nutrition, some icing and a light walk several hours after a marathon, or very tough workout, will have you back quicker and stronger then ever before.

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References

1. Van Loon, L.J., Saris, W.H., Kruijshoop, M and A.J. Wagenmakers. Maximizing postexercise muscle glycogen synthesis: carbohydrate supplementation and the application of amino acid or protein hydrolysate mixtures. *American Journal of Clinical Nutrition*. 72(1): 106-111, 2000.
2. Burke, L.M., Collier, G.R. and Hargreaves, M. Muscle glycogen storage after prolonged exercise: effect of the glycaemic index of carbohydrate feedings. *Journal of Applied Physiology*. 75: 1019-1023, 1993.
3. Guyton, A.C. and Hall, J.E. *Textbook of Medical Physiology* 9th edition: Chapter 75: The Pituitary Hormones and Their Control by the Hypothalamus., pp. 939-941,1996.

Number of hours for Muscle Glycogen Resynthesis Under Different Conditions



Supplementation is ~0.8 g of CHO / kg BW *with* ~0.4 g protein / kg BW every hour.
A.A. = Amino acids - best amino acids: argenine, leucine and phenylalanine.

Data taken from W.H. Saris, L.J.C. Van Loon and

Figure 2:

EXAMPLES AND AMOUNTS OF SOME GOOD CARBOHYDRATES:

1 LITRE OF GATORADE = ~ 66GRAMS

1 LARGE POTATO = ~50GRAMS

LIMA BEANS = ~50GRAMS

10 DRIED DATES = ~50GRAMS

ENGLISH MUFFIN = ~130GRAMS

1 CUP OF RICE = ~50GRAMS

2/3 CUP OF RAISINS = ~75GRAMS