2002 LEVEL 111 – ASSESSMENT TASK

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MAXIMIZING SPORTS PERFORMANCE IN THE FUTURE

INTRODUCTION

Genetic endowment and specific physical training are the two major factors contributing towards athletic success. Proper nutrition, adequate hydration and correct psychological preparation are also essential elements. In the pursuit of success athletes are often willing to try anything to improve their performance, enhance energy utilization and delay the onset of fatigue.

It has been proven in a number of studies that optimum nutrition is a key element in maximizing sporting performance. I will attempt briefly discuss some of the latest findings in this complex area. The role of macronutrients, micronutrients and hydration will be looked at in relation to Sports specific performance.

I will then explain how some athletes are now using sophisticated blood tests to gain nutritional information, to providing them with specific feedback that may be used to their advantage in preparation and competition.

FOOD AS WE KNOW IT

Before I begin to describe the scientific specifics I would like to outline briefly an interesting line of evidence that has a direct bearing on the idea of food as positive fuel in general.

Dr Michael Colgan, an internationally acclaimed nutrition research scientist highlights in his book "The New Nutrition, Medicine for the Millennium" (1995) some thought provoking facts. He believes we have fouled the land with fertilizers. Through this practice the land does not contain adequate levels of the minerals for optimum human health. Soil depletion is only the first assault on the food supply. Our degraded foods produced by NPK -Nitrogen (N), Phosphorus (P), Potassium (K) fertilizers on depleted soils are further assaulted by mass production methods of ripening, storing, drying, cooking, freezing, pasteurization, hydrogenation and ultra filtration. The latest Recommended Dietary Allowances (RDI) Handbook is the official government word on the quality of our food. Hundreds of studies show that crops of today lose their mega supply of nutrients between harvesting and your table. Here are a few examples;

* Vitamin E - the tocopherol content of foods varies greatly depending on processing, storage and preparation procedures during which large losses occur. (p101)

* Vitamin C – may be considerably lower because of destruction by heat and oxygen. (p117)

* Vitamin B6 – 50- 70 % is lost in processing meats, and 50 – 70 % is lost in milling cereals. (p144)

As the use of NPK fertilizers spread throughout the world it became necessary to protect

crops against pests that were previously controlled by traditional farming methods. So developed the new business empire of pesticides to further damage and poison our food. Currently used pesticides include captan, alachlor,1,3 dichloropropene, dinoseb,ethyl dibromide,lindane,pronamide and trifluralin. I have highlighted these because all of them have been cited as probable human carcinogens. Recent tests by the RDA sampled 26 different fruit and vegetables. Of these, residues of pesticides in 9600 out of 20 000 were detected. So there is about 50/50 chance that the food you had for lunch is contaminated.

Pesticides are poisons. They do not in their own rite deplete mineral levels but they progress through the food chain. They are stored in fat because they are fat soluble and compromise energy production on a cellular level. Since fat is broken down in exercise, blood levels of pesticides increase with this fat loss. It is possible to measure some pesticide levels in the blood. It is a recognized cause of cronic fatigue syndrome. In Australia 'Round up' has been identified as one of the most efficient poisoners of mitochondria on the planet. (Colgan,1995)

Food for thought……..

MACRONUTRIENTS – CARBOHYDRATES, FATS AND PROTEINS

Carbohydrates and fat are the two main sources of energy used in athletic activity. Protein makes a contribution and becomes more significant with the depletion of carbohydrate stores and inadequate energy intake.

The primary need for an athletes training diet is <u>fuel</u> for performance and recovery.

(Wilmore and Costill, 1994). Carbohydrate is stored in the liver and skeletal muscle in the form of glycogen. When required for energy, glycogen is released and broken down to provide the glucose necessary for energy. Glycogen stores are limited and need to be replaced daily. It is especially important to provide carbohydrates in the post exercise period to prevent gluconeogenesis from proteins.

Endurance training increases the capacity of muscles to store glycogen. Untrained individuals have muscle glycogen stores of 80-90 mmol / kg, whereas trained individuals may have stores as high as 130- 135 mmol/kg. (Martin and Klein, 1998)

SHORT DURATION / HIGH INTNSITY

In high intensity exercise of short duration (1-2 minutes) almost all energy is supplied from glycogen stored in the skeletal muscle. Carbohydrate is the only nutrient that provides energy when the muscles have insufficient oxygen for their needs. This type of exercise is called anaerobic exercise and produces lactic acid. Lactic acid impedes the mobilization of fat from adipose tissue, further increasing the reliance of muscles on glycogen as their supply fuel. (Burke and Hawley, 1999)

LONG DURTION / MODERATE INTENSITY

Fat supplies a much higher proportion of energy in exercise of low to moderate intensity. Adrenalin (epinephrine) and growth hormone levels are increased and the insulin level is decreased with moderate exercise. These hormonal changes promote the release of free fatty acids from the adipose tissue into the bloodstream. The longer the time spent exercising the greater the contribution of fat as a fuel. Endurance training increases the

capacity of the aerobic pathway in the mitochondria to break down fat into energy and hence enable the athlete to use fat and preserve glycogen. As glycogen is spared, the onset of glycogen depletion is delayed.

MICRONUTRIENTS – VITAMINS, MINERALS AND SUPPLEMENTS

Vitamins and minerals are essential for certain metabolic processes.

Most sports dietitians would argue that a balanced diet provides an adequate intake to satisfy the recommended daily intake (RDI). However, evidence suggests that many athletes do not satisfy this. Current RDI is based on avoidance of "deficiency disease" and NOT optimal health and performance.

Heavy training causes a depletion of minerals in sweat. This increases the requirements of B complex vitamins, antioxidant vitamins E, C bioflavonoids and betacarotene.

Training and competition stress increases the requirement of vitamin C. Vitamin C is essential in the synthesis of stress hormones. Micronutrients help cells to recover from damage more easily. They will therefore exert their influence by enhancing recovery from and optimizing intensity of training.

Up to 90% of athletes take a vitamin and /or mineral supplement, hence recognizing their perceived importance to assist health and performance. To ensure success in this area, a safe nutritional supplementation programme based on the best science available is recommended. This would take into account training load, intensity, phase and event. It would incorporate competition and travel demands. It is essential that all supplements are legal and contain no stimulants. (Gillam, 2002)

FLUID AND EXERCISE

HYDRATION – This is defined as the optimal management of water at all levels from systemic down to cellular. (Gillam, 2002)

Adequate hydration levels are critical for optimal sports performance. Mild dehydration will impair exercise capacity and prevent the athlete from achieving their optimum performance levels. Exercise in a dehydrated state leads to a rapid elevation of body temperature. Consequently numerous studies reflect that there is a real need to ensure adequate fluid intake before, during and after exercise. (Maughan,1994)

So what is the function of water itself?

It creates the aqueous for all cellular biochemistry.
It provides the medium for transport of all biomolecules into and out of cells.
It provides the medium for temperature exchange and control in the body.
It gives strength and structure to cells and tissue.

It is important for the athlete to realize that dehydration is an easily preventable state, but a major factor in reduced athletic performance, particular with endurance athletes.
It is essential that water consumption is increased and dehydrating factors reduced (toxins, drugs, fats etc). It is also advisable to include fructose as it is a good water transport facilitator. Employing these strategies will ensure optimal performance.

STUDIES IN PERFORMANCE

An important role of the athlete's diet is to supply sufficient carbohydrates to fill the

glycogen storage sites in muscles. However, these vary depending on the athlete's needs. There has been big differences in performance noted if these elements are optimized. Balson et al 1999 concluded that the carbohydrate content of an athlete's diet influenced the amount of high intensity exercise performed in a football game. These researchers suggest that to optimize performance in similar multiple sprint sports of similar duration (ie rugby) a high carbohydrate diet should be administered in preparation for intense training and competition.

In a study in South Africa, Jardine et al (1988) concluded that carbohydrate loading increased pre game muscle glycogen of players tested.

I could continue to site evidence supporting this well documented fact, but the key point is this has a significant effect on sporting performance, especially in endurance events.

EXAMPLES – NUTRITION CONFUSION IN HONG KONG

Situation 1

My girls rugby program is in mid-season. The standard has improved dramatically with score lines being very close. My team is currently unbeaten and continues to set high standards of performance. I had one of my rookies turn up to play – mid way through the second half she threw up – I replaced her and after the match went to see why she was unwell. She explained that she had not eaten anything all day at school and ate a Big Mac and fries before the game to give her energy ! After giving her and the team a chat about timing of meals before games and quality food for fueling for performance – we made a vow never to have Macdonald's again before competition !

Situation 2

I have been working with my First Grade club team again this season. Our depth has been tested with significant injuries to key players. So, I have been watching the 2s, 3s and 4s play in recent weeks to identify potential players to step up. After one 2nd grade game a player was injured in the later stages of the match. I was chatting to him while our physiotherapist administered an assessment and ice treatment on his twisted knee. He stated he felt so drained – no energy at all. I asked him to tell me what he had eaten before his game today. His reply was – coffee and toast for breakfast, then water through the morning. That was it for a 3pm kick off! I explained that his body was not adequately fueled. One of the first responses to fatigue is reduced proprioception and joint positional awareness. Most injuries take place later in games due to brain and cellular fatigue. The fact that he was fatigued greatly increased his chance of injury

BLOOD TESTING AND SPORTING PERFORMANCE

I believe this could be a key area in the future of Sports performance with our elite athletes. As the world of professional rugby becomes a commercial entity and international teams look for any competitive edge this new area could potentially be of immense value.

Lance Armstrong who is currently ranked the number one cyclist in the world is an elite athlete who has been using blood testing to improve his training and cycling performances. He is a cancer survivor who has been using blood testing to highlight his nutritional deficiencies. After supplementation he has been recording record times and enhanced performances.

So how does the process work ?

Blood tests are being used to specifically assess the degree of oxidative stress that the athletes body is under. When this has been performed on elite athletes these tests correlate with reduced performance, especially from over training syndrome (OTS). This provides specific feedback for the medical staff and deficiencies can be immediately addressed.

Blood tests include levels of vitamin E and C (the important antioxidants) Testosterone / cortisol ratio and CO Enzyme Q 10. Current research has shown that many elite athletes have shown deficiencies in essential vitamins and have high markers of oxidative stress during intensive training and competition. In addition elite athletes often have relatively low values of some minerals, for example zinc, which is lost in excessive sweat. This has significant bearing on athletes competing in warm climates (i.e. Hong Kong Rugby Players). The use of these tests could take the guess work out of providing our athletes with their optimal nutritional requirements.

CONCLUSION

Nutrition plays an important part in maximizing sports performance especially in elite competition. There are numerous studies that support this correlation.

The role of macronutrients has been well studied. There is a big difference in performance if they are optimized. This is especially true for endurance athletes.

The use of micronutrients has been shown in many studies to increase function at a cellular level and the role of hydration is also key contributor towards athletic success. If these current practices are combined with blood sampling, then a more comprehensive analysis of individual feedback and nutritional requirements can be established.

The differences between success and failure are usually very small. Maximizing performance with the use of these techniques can give the athlete the edge over his / her rivals.

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