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Rowing Medicine

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1.0 INTRODUCTION

This booklet will introduce some topics related to the medical aspects of rowing. The interested reader is encouraged to consult a specialist or other available literature for more information on any of these topics.

2.0 NUTRITION

The athlete's diet is similar to a non-athlete since it should promote general health and well-being and contribute to the establishment of proper lifetime nutritional practices. Although it is probably more critical that an athlete receives a well-balanced diet to ensure top performance, the principal difference between an athlete's diet and that of a non-athlete is that an athlete's diet is higher in carbohydrates (see Appendix A).

2.1 Carbohydrate Replenishment

An exercising athlete will use energy obtained primarily from carbohydrate stored in the muscle as glycogen. Although fats are also stored and used as a source of energy particularly during long training sessions, it is the carbohydrate level in the muscle that must be replenished for the next training session to reduce the effect of fatigue after hard physical training.

Research studies have clearly established that a failure to replenish this level, particularly after a number of hard training sessions, will result in an impairment of performance. This condition of reduced carbohydrate level may result in substantial impairment of performance during a 2000 meter rowing race due to the greater dependence on carbohydrates as the fuel for the energy requirement than on stored fats.

It has been suggested that a heavy weight man requires about 500 grams of carbohydrate daily to ensure proper replenishment in the muscle. An athlete, male or female, rowing in a limited weight category may require about 300-400 grams of carbohydrate daily. If this individual is undertaking a weight reduc-

tion programme, the athlete should maintain the carbohydrate intake while reducing fats (for example butter, oils, lard, fat on meat, etc.). If the athlete already eats relatively little fat, it will be necessary to reduce the total quantity of food consumed which will result in weight loss from lean body mass and consequent loss of strength.

2.2 Strength Development

Success in rowing, as in many sports, depends on the power that the athlete is able to develop (see INTERMEDIATE ROWING PHYSIOLOGY) or, in other words, the force that the athlete is able to produce from the contracting muscles. The size and strength of the muscle depends on heredity, exercise and diet.

An athlete is generally restricted in the type of fibres in the muscle by genetic inheritance. Although different types predominant in successful athletes in sports ranging from sprinters to rowers to marathon runners, an athlete can increase the size and strength of the muscle fibres inherited. (The FISA CDP Level III will provide more information about the various types of muscle fibre.)

This increase in the size and strength is obtained by exercising. It is necessary in the training programme to exercise the specific muscles to be developed by using a progressive training load that exceeds or overloads the capabilities of the muscles.

During this period, the muscles require a nutritionally adequate diet to support muscular development. It is generally not necessary to consume diets enriched with certain foods (for example proteins, minerals and vitamins) to enhance development unless the diet is lacking in some of these nutrients. But, it is recognized that women have demonstrated a requirement for additional iron to prevent anaemia or iron deficiency. This may be accomplished by ensuring that their diet includes iron-rich foods. Iron supplementation should only be directed by a physician.

It is also advisable to consult a physician or the national health services of your country for more information about the sources and availability of food from the four food groups described in Appendix A. This is particularly important in regions or countries where the quality and quantity of food may not be readily available.

2.3 Weight Control

A regime of exercise and proper diet will result in an increase in the size and strength of the muscles. This may not necessarily increase the total body weight if the exercise level is such that the calorie expenditure (the amount of total energy consumed by the body) exceeds calorie intake (the amount of total energy taken in by the consumption of food) in which case the total body weight may remain the same or even decrease.

In the event that the athlete's intake of calories exceeds the expenditure of calories or the athlete maintains the same percentage of lean body weight, the increase in the size and strength of the muscles will result in a net gain in weight.

It is possible to control the lean body weight of the athlete throughout the training season by determining the athlete's percentage of body fat. This determination is performed by either taking skinfold measurements or underwater weighing. The taking of skinfold measurements is probably more common because it involves the use of a simple mechanical device, called a skinfold caliper. These measurements are taken at a numer of sites on the body, generally from 4 to 8 sites, and are relatively quick and easy to perform.

These measurements are used either directly by the sum or through a computation formula to determine the percentage of body fat or the percentage of lean body weight. A system utilizing measurements over six sites was demonstrated by Dr. Fernando A. Rodrigues in a study conducted during the 1985 World Championship in Hazewinkel, Belgium. A summary of this method is presented in Appendix B.

It should be noted that the rowing athlete would generally have a percentage of body fat in the range of 8-12 and 16-20, for men and women respectively. The increase in popularity of max-

imum weight categories has resulted in many studies of weight control, particularly in regard to a minimum level of body fat and rapid weight loss. The study performed by Rodrigues suggests that athletes should not be permitted to perform with less than 5% and 9% body fat, for men and women respectively. An athlete approaching this limit and still desiring to lose body weight must do so by the loss of lean body mass (with the accompaniment of strength loss).

The easiest and best method to lose weight is with a combination of diet and exercise. If you eat 500 Calories less and lose 500 Calories more each day, you will have a 1000 daily Calorie reduction. At that rate, you will lose about 1 kg of body weight per week. Obviously, if an athlete is training properly, this decrease in Calories will occur with a change in diet (in particular, a decrease in consumption of fat). This guideline is the reponsible method to lose weight over an extended period to ensure a top (and healthy) performance on the day of the competition.

It must be remembered that a rapid decrease in weight will only occur with a decrease in the level of carbohydrates and water and not the loss of body fat. This results in an impairment of performance.

2.4 Hydration

It is important to realize that water is an important nutrient since it makes up 60% of the total body weight and 40% of the muscles. Without enough water, the athlete will not be able to achieve top level performance and may cause harm to his or her body.

The most important fact about water is that it cools the body. An exercising body will increase in temperature creating sweat which will evaporate from the skin to provide a cooling effect.

If sweating is prolonged or pronounced, the body will become progressively dehydrated. During this period, the lose of water will be accompanied by the loss of electrolytes. (These are substances that are vital for conducting signals along the communication system of nerves.) This fact is not necessarily a problem unless water loss becomes severe and is not replenished then pronounced impairment to muscle contraction will occur. (In severe cases, dehydration will cause heat illness ranging from cramps to heat exhaustion to heat stroke which is life threatening.) This event will occur more quickly in an athlete who has undergone rapid weight loss because, at the beginning, the body will have a reduced water level.

The loss of water or dehydration can be controlled by recording morning heart rate and body weight, observing urine (clear to pale yellow if hydrated and dark yellow to brownish and strong-smelling if dehydrated), and recording body weight before and after training or racing. It should be noted that to hydrate sufficiently it is usually necessary to drink fluids frequently during the day and the training session. Further, the consumption of fluids should exceed the desire to drink as the body's thirst mechanism may not provide sufficient stimulation to hydrate completely.

In summary, hydration is important to ensure top athletic performance and for good health. This applies to all athletes, paricularly to athletes undergoing weight loss or operating in very hot or dry climates. (Remember, the loss of fluids is also a problem during the dry winter months and training at high attitudes).

2.5 Summary

This section is not exhaustive and is intended only as an introduction to the topic of nutrition. For further information, the interested reader is encouraged to read a paper presented at the l4th FISA Coaches Conference in Peterborough, England by Dr. Stephen Wootton of Great Britain or consult a doctor, a dietician or nutritionist.

3.0 ALTITUDE TRAINING

It is clear that training at altitude is good preparation for competing at altitude and that performance at altitude will improve

as adaptation continues. But, it is somewhat contentious that altitude training will improve performance on returning to lower altitudes.

However, altitude training is often used by top international athletes as an important part of their competition preparation to achieve the best possible performance.

In the event that an athlete travels to an altitude training site, these are guidelines for training at altitude:

a. The training site should be about 1800 to 2000 metres above sea level.

b. A visits of minimum 20 days (with 3 to 4 days to acclimatize) for maximum effect.

c. Altitude training will supplement a good training programme but it is not intended to substitute for proper preparatory training.

d. Training loads should be reduced and recovery time increased during the initial period at altitude.

e. Consumption of fluids should be increased and the appropriate clothing worn because of the lower humidity and temperatures at altitude.

Further information about altitude training will be presented in the FISA CDP Level III.

4.0 OVERTRAINING

It is obvious that athletes who do insufficient training will not increase their performance level. But, this may also be true of athletes who do too much, too soon and for too long. In these circumstances, the performance level may, in fact, decrease. This is a result of overtraining.

The athlete will generally display a "feeling of tiredness" and may be described as suffering from "staleness". The effect essentially arises from the athlete's inability to recover between training sessions. If this condition persists, the general symptoms of overtraining appear, namely:

1. Behavioural Symptons

a. Increase in nervousness or depression.
b. Inability to relax or sleep.
c. Loss of appetite.
d. Loss of motivation.
e. General fatigue.

2. Physical Symptons

a. Extreme muscular soreness and stiffness the day after hard training.
b. General increase in muscular soreness over time.
c. Decrease in body weight.
d. A sudden or gradual increase in morning heart rate.
e. Predisposition to infections.

This condition will be rectified by permitting the athlete an opportunity to decrease or, even stop, training for a few days. If the condition persists, the athlete may require a longer rest followed by a gradual increase in the training load to allow the body to build up its reserves.

The best solution to this problem is prevention. This includes:

a. a gradual increase in training load, particularly during the early season or after periods of reduced activity;

b. a proper recovery after heavy training sessions, controlled by taking morning heartrate, observing physical appearance and monitoring muscle soreness;

c. a balanced diet; and

d. observing changes in personality.

The most important fact for the coach and athlete too understand is the value of rest since it may be necessary to provide the athlete with an opportunity to take one or more days of rest. This allows the athlete to adapt better to continual training and to maintain the necessary enthusiasm for the sport.

5.0 SUMMARY

This booklet has introduced a number of topics related to the medical aspects of rowing. The FISA CDP Level III will provide further information about these and other related topics.

6.0 APPENDICES

6.1 Appendix A - FOOD CHART

Note:
Athletes will obtain the necessary nutrients for body development by both eating the recommended number of daily servings and choosing a variety of foods from each food group. The most important nutrients supplied by each food group are listed.

This chart has been adapted from How To Select A Diet For You by the National Diary Council. Rosemont, Ilinois. 60018 USA.

FOUR FOOD GROUPS	*BASIC DIET recommended daily servings*	*TRAINING DIET recommended daily servings*
MILK GROUP *Milk, cheese, yogurt and ice cream* *(For calcium, riboflavin and protein)*	*Teenagers = 4 or more* *Adults = 2 or more*	*Teenagers = 4 or more* *Adults = 2 or more*
MEAT GROUP *Meat, fish, poultry, eggs, dry beans, peas and nuts* *(For protein, niacin, iron and thiamin)*	*2 or more*	*2 or more*
FRUIT-VEGETABLE GROUP *Fresh, frozen, canned, dried and juiced fruits and vegetables.* *(For vitamins A and C)*	*4 or more*	*8 or more*
GRAIN GROUP *Cereals, breads, rolls, pasta, muffins and pancakes* *(For carbohydrate, iron, thiamin and niacin)*	*4 or more*	*8 or more*

6.2 Appendix B - WEIGHT CONTROL STUDY

A practical stratagem to evaluate participation (minimal weight) in the lightweight category in rowing.

MATERIAL:

- A skinfold caliper (Harpenden, Holtain and Lange). A constant pressure of 10 g/mm2 is exerted by the jaw surfaces at all openings.
- A calibrated weighing balance.
- A pocket calculator (optional).

METHOD:

1. Estimation of adiposity (%FAT).

Skinfold measurement. Six skinfolds (triceps, subscapular, supraspinacle, abdominal, front thigh and medial calf) were measured twice, (mean value as actual value), following the measuring standards in Carter (1982) and Ross (1983). A fold of skin and subcutaneous tissue is picked up firmly between thumb and forefinger and pulled away from the underlying muscle. The sites and direction of the skinfold are indicated in the figure 1.

Calculation of estimated fat percentage (%FAT). The equations in Yuhasz (1977) and Carter (1982), where SUM6 is the sum of the six skinfolds, was used.

Men % FAT = (SUM6 x 0.1051) + 2.585
Women % FAT = (SUM6 x 0.1548) + 3.580

2. Calculation of the lean body weight (LBW).
With Body Weight = BW

FAT WEIGHT (FW) = (BW x %FAT) x 0.01
LEAN BODY WEIGHT (LBW) = BW - FW

3. Estimation of minimal weight for lightweight rowing (MW)

Men MW = LBW + (0.06 x LBW)
Women MW = LBW + (0.1 x LBW)

If the estimated minimal weight is (MW) is over 72.5 kg (men) or 59 kg (women), participation in the lightweight category should not be recommended unless close professional monitoring of health and nutritional status makes it possible to change the body composition of the athlete mainly by reducing his or her body mass which will probably reduce his or her physical potential for rowing.

4. Examples:

SUBJECTS	BW	% FAT	FW	LBW	MW
MALE A	78	14	10.92	67.08	71.1
MALE B	78	10	7.8	70,2	74.41
FEMALE A	65	18	11.7	53.3	58.63
FEMALE B	65	14	9.1	55.9	61.52

Subjects MALE A and FEMALE A can be considered as "true" lightweight rowers.

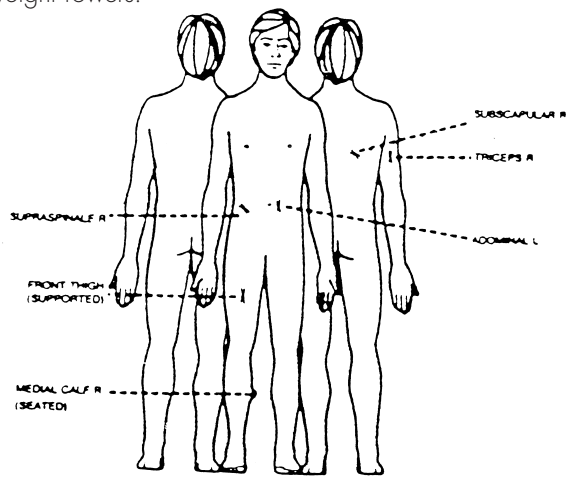

Figure 1. Skinfold sites.