

## Chapter 7

# The Coach and Nutritionist – A partnership in performance A Case Study – Applied Nutrition with the US Ski Team and Mount Everest Expedition

by

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Athletic events today are so competitive that the difference between gold and silver medals may be measured in hundredths of seconds. Elite athletes must push themselves as never before to the limits of physical endurance, and now more than ever nutrition is one of many factors which may be optimised to yield peak performance. Unfortunately, in many cases nutrition is an aspect of training and preparation of which many athletes and coaches have in the past had very little awareness and the impact of good dietary habits on both the general health and performance of the competitor received little consideration. An example of how coaches and nutritionists can work together to optimise the diet of a national team can be seen in the successful programme involving the United States Ski Team and Shaklee Corporation.

In 1980, the physicians looking after the US Ski Team were becoming increasingly concerned with the physical health, performance, resistance to infections, and nutritional intakes of the team members. As the team was usually pressed for both time and funds, nutrition was not considered to be essential to athletes such that it needed direction or professional consideration. When travelling to events in foreign countries they ate whatever was available. In one European hotel, for example, there was nothing to be had in the morning except wine and bread. Other locations typically supplied high fat meat or sausage products and a lack of fresh fruits or vegetables.

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Shaklee Corporation was approached by the team physicians for nutritional advice as they hoped that dietary shortfalls which might affect athletic performance could be identified and subsequently avoided through a complete programme of nutritional education and, if necessary, supplementation.

In early 1981 Shaklee became the official nutrition consultant to the Ski Team with a commitment through to the end of the 1984 Winter Olympic Games. The agreement included the provision of nutritionists and researchers for an evaluation programme, the development of a nutrition education programme for the coaches, trainers and skiers, and the supply of products.

Shaklee staff worked in collaboration with researchers at Stanford University to evaluate the dietary habits of both the male and female teams. It was decided that intakes would be monitored on four separate occasions, at home during training, twice whilst on tour, and during dry land training. Diet analysis was carried out by two methods: interview and food diary.

By taking four separate records at 3 month intervals in different locations, dietary intake data could be obtained unbiased by similar foods and surroundings which would result in a wide range of caloric intake and balance.

The interviews were conducted by coaches and trainers' wives who were specially trained for the purpose. They employed a standard questionnaire and used food models which had been developed to allow the evaluation of serving sizes to be more accurately determined. The food models are standard portion control teaching tools commonly used by dietitians to familiarise patients with common portion sizes and food exchange groups.

Diaries were kept by the skiers in a small waterproof booklet which was designed to fit into the pockets of a ski suit. All food, supplement and medication intakes and a summary of physical activity for the period were recorded, and at the end of each day the appropriate pages were removed for evaluation (Figure 1). A ruler and 2 and 3 inch circles were also contained in the booklet to help determine the dimensions of food servings as accurately as possible.

Data from both interviews and diaries were analysed for macro and micronutrient composition by computer at Stanford University, using a modified national Heart, Lung and Blood Institute data base and data collection system including over 800 food items and 15 nutrients.

The diets of 14 members of the female teams and 13 male skiers were studied. The ages of the women ranged from 15 to 31 years with a mean of 20, their mean height was 163cm and mean weight 57kg. The men

ranged from 18 to 28 years in age with a mean of 22, and their mean height and weight were 177cm and 73kg.

The analysis of the skiers' caloric intakes is summarised in Table 1. The results indicate that the skiers diets were very similar to the remainder of the American population of the same age. The major difference was that the skiers in general consumed twice or more the number of calories per day as the general population. However, their diets did not show any better balance. This suggests that up to some caloric level (about 1500 to 2000 kcals) the skiers' diets were reasonably balanced but intake above this level is predominated by snacks with poor nutrient density.

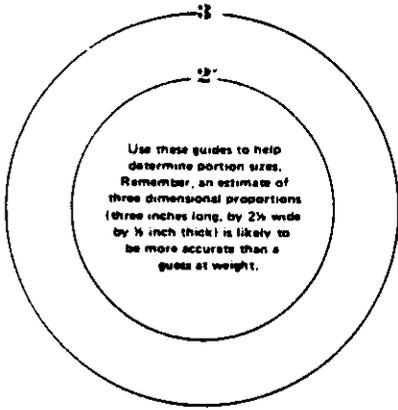
	Skiers		Typical United States Diet
	Female	Male	
Protein	15%	14%	16.6%
Fat	43	41	40.3
Carbohydrate	39	42	42.8
Alcohol	3	3	—
Total calories	3251	4707	1600 - Female 2400 - Male (age 23-34)

Fat intake was higher and carbohydrate intake was lower than optimal. Cholesterol intake was found to be high, particularly in the male skiers, who on one recording session had group means of  $1210 \pm 351$ mg/day (4 times recommended intake). The American Heart Association recommends an average daily intake of less than 300mg.

Despite the high caloric intake, many athletes showed inconsistent and sporadic intakes of vitamins and minerals. (50% of all individuals' records were less than the RDA for iron, and 22% were less than the RDA for calcium).

A large proportion of the womens' diets were found to be below the Recommended Daily Allowance (RDA) for iron and a significant number of women were below the RDA for calcium (Table 2). Only two of the women who completed more than one three day record consumed an average of 18mg per day (RDA for women) or more of iron.

(a)



# 3 DAY DIET HISTORY

(b)

## Menu: DAY I

ID Number \_\_\_\_\_  
 Name \_\_\_\_\_

TIME	FOOD, BEVERAGES & SUPPLEMENTS	AMOUNT	TIME	PLACE	HOW FOOD IS PREPARED OR OTHER COMMENTS
Breakfast	FRUIT SMOOTHIE HARD BROWNIES 4" x 2" x 1/2" 2 PIECES WITH TART WITH VANILLA		7:30	RESTAURANT	2 CUPS OF JUICE WITH SUGAR
Mid Day Snack					
Lunch	TOASTED CHEESE SANDWICH 1 DILL PICKLE AND SLICE 1 BANANA AND SLICE	1 SANDWICH	12:30	HOME	MAYO & BUTTER 1 PINT BEER (MILK)
Mid Day Snack					
Dinner	1 GRILLED STEAK - BAKED 4 PKE - STRAWBERRY - 2" x 3" x 2" CABBAGE, FRESH, FRIED IN VE. OIL		8 PM		1 PINT RED WINE
After Dinner Snack	1 BOWL ICE CREAM, 1" x 2" x 2"				1 CUP MENS TEA BY HONEY

Figure 1: Example of 3-day diet record book showing (a) cover with measures and (b) typical entry.

It was also found that the training table foods were often inadequate and coaches and trainers were unable to provide sound nutritional guidance to the athletes. In addition, the stressful lifestyle of the skiers made it difficult for them to focus on proper nutrition.

**Table 2: Percentage of female Nordic skiers below Recommended Dietary Allowances (daily) for thiamin, calcium and iron. Results from four intake recording sessions (1981-1982)**

Nutrient	RDA	% Skiers Below RDA Recording Session			
		I n=14	II n=10	III n=7	IV n=5
Thiamin	0.5mg/1000kcal	0	0	14	0
Calcium	800mg	21	40	0	20
Iron	18mg	36	70	43	60

Shaklee nutritionists collaborated with the Ski Team Sports Medicine Council to develop a comprehensive nutrition education programme. Information on basic nutrition was given in the form of illustrated lectures using slides and food models to develop an appreciation for proper personal diet management. The programme was first aimed at the coaches and trainers and then at the athlete with the objective of supporting in depth the relationship between athlete, coach and trainer. The participants in the programme were provided with specific dietary guidelines aiming towards a low fat (target 30%), high carbohydrate (target 55%) diet. In addition, a number of nutritional products were made available as a means of dietary support. These included a multivitamin-multimineral supplement<sup>1</sup> which supplied in each tablet 25% of the US RDA for all vitamins and minerals except calcium and magnesium which were at the 15% level. The skiers were encouraged to take one and preferably two tablets each day.

Another product was a nutritious drink mix<sup>2</sup> supplying 16g protein, 8g of carbohydrate and 1g of fat per serving. This drink was convenient and portable and was usually mixed with milk. As a snack they could use a confectionery bar<sup>3</sup> supplying 9g protein, 24g carbohydrate and 8g of fat (together with 30% of the US RDA of 17 vitamins and minerals). This energy bar was highly portable, could be carried in the pockets of the ski suit, and provided a nutritious alternative to the snack foods the young skier was likely to consume on the slopes.

<sup>1</sup> *Shaklee Vita-Lea (Shaklee Corporation)*

<sup>2</sup> *Shaklee Instant Protein Drink Mix (Shaklee Corporation)*

<sup>3</sup> *Shaklee Energy Bar (Shaklee Corporation)*

Other supplements were made available on request. The women were encouraged to use iron supplements and all athletes encouraged to supplement calcium. With the help of supplementation all the RDA's were being met regularly.

Nutrient intake varied considerably from one recording session to the next. Unexpectedly, intake from session 2 (at home) was usually the session of least intake while intake from session 3 (at training camp) was usually the session of highest intake. Different subsets of skiers, nutritionist availability, food weighing, and different physical activity levels could account for these session to session differences.

Attention was then turned to the build up for the Winter Olympics at Sarajevo and the first stage of this was to determine the availability in Yugoslavia of the required types of food.

A member of the Shaklee research team joined the US Ski Team coaching and sports medicine staff on their visit to the Yugoslavian facilities. A diet survey was taken during a week of competition when athletes consumed food at a typical Yugoslavian hotel. The survey displayed the expected high fat diet (as high as 47% of total calories), moderate protein intake (17%) and the lack of fresh fruits and vegetables.

This visit resulted in a redesign of the buffet line in the restaurant where the skiers were to eat. All the carbohydrate rich foods were placed at the beginning of the entrée section, whilst the fat rich foods were placed at the end. The emphasis of the skiers education was to encourage a high carbohydrate, low fat diet by the consumption of more pasta, vegetables, cereals and other high carbohydrate foods. The use of appropriate supplements was also encouraged to ensure a full complement of all micronutrients.

One year later, at the 1984 Olympics, a much improved training table was made available to the athletes after meetings between US Ski Team physicians, Shaklee nutritionists, the organising committee for the Winter Games and the Agriculture Trade and Industry Ministry of Yugoslavia. Lists of available foods were analysed by Shaklee nutritionists, and diet plans and guidelines were compiled for coaches and athletes (Table 3).

These guidelines included different calorie levels and different carbohydrate intake levels to be specifically chosen by each individual. Finally, the athletes were encouraged to bring their own fresh fruits and vegetables and high carbohydrate whole grain products when possible. The athletes obliged by packing suitcases full of fresh foods along with their skis.

**Table: 3 A Training Table Menu 70% of Calories as Carbohydrates  
Typical high carbohydrate menus for intakes of 3000,  
4000 and 5000 kcal per day.**

	Calorie Intake Per Day		
	3000	4000	5000
<i>Breakfast</i>			
Orange juice	2 cups	2 cups	2 cups
Bacon	1 slice	1 slice	1 slice
Pancakes	5	6	8
Maple syrup	4 tblsp	5 tblsp	6 tblsp
Milk	1 cup	1 cup	—
Coffee	6oz	6oz	6oz
<i>Lunch</i>			
Macaroni Salad	½ cup	1 cup	1½ cups
Ham, Roast Beef	2oz	2oz	3oz
Bread	4 slices	4 slices	6 slices
Mustard	2 tsp	4 tsp	6 tsp
Apples	2	3	3
Tea	1 cup	1 cup	1 cup
<i>Dinner</i>			
Green Salad			
Lettuce	1 cup	½ cup	1 cup
Tomatoes	1 cup	½ cup	2 cups
Italian Meat Sauce	¾ cup	1 cup	1½ cups
Spaghetti Noodles	3 cups	4 cups	5 cups
Peas and Carrots	1½ cups	2 cups	2 cups
Bread	—	3 slices	4 slices
Vanilla Ice Cream	—	1 cup	—
Chocolate Cake	2in×2in×2in	—	3in×3in×2in
Apple juice	12oz	16oz	16oz

In a critique session with the skiers they concluded that the nutrition programme was of great benefit and they all felt that the improved nutrition had reduced the number of sick days and helped them to sleep more soundly and train longer. Although their subsequent victories were the result of the intensive efforts of everyone involved from the staff who serviced the skis to the skiers themselves, all agreed that the nutrition programme made a great contribution to what in 1984 proved to be the ski teams' best Olympics ever.

Shaklee Corporation have been asked to continue the programme through to 1988 and the staff are already conducting nutritional training courses for the new skiers who will compete in the World Cup

competition on a yearly basis up to the 1988 Olympic Winter Games in Calgary, Canada.

### **Mount Everest Expeditions**

The rigors of Mount Everest expeditions usually result in severe weight loss and general decline in nutritional status. Since the climbers spend much time above 14,000 feet this is the outcome of the logistics of moving adequate food up the mountain, the inability to make appetising meals at altitude, loss in appetite from altitude and the enormous caloric expenditure of about 6,000kcal per day.

The primary objective with the climbers was to develop a nutritional regimen which enabled them to complete the climbs with minimal weight loss, minimal dehydration and proper nutritional support throughout the expedition.

The first specific objective was to provide highly portable, high density nutritional foods for consumption while climbing. The second was to provide an easily prepared hot meal which was palatable, nutritious and easily consumed. Third was a supply of nutritional supplements which could maintain adequate nutrition delivery under all circumstances.

The first two objectives were met with a high protein energy bar and meal replacement chicken soup. The soup supplied one third of the US RDA for all nutrients, including protein, and required only hot water for preparation. The third objective was met with supplements which deliver 100% of the US RDA for vitamins and minerals. In addition, extra supplements of vitamin E, vitamin C and the B complex were supplied. These were used ad libitum by the climbers.

While the expeditions were very successful, several things were learned which could benefit future expeditions. It may be useful, for example, for future expeditions to use olive oil capsules as a caloric source, as they are portable and can be taken without water if necessary. It is also believed that it would be appropriate to use supplementary EPA (eicosapentaenoic acid) as a means of minimising blood viscosity and reducing the probability of an internal clot which could result in stroke. Stroke is one of the greatest risks due to constant dehydration.

Using the techniques recommended, two climbers maintained their weight on the most recent expedition. This suggests that a high fat diet is necessary to achieve adequate caloric delivery.