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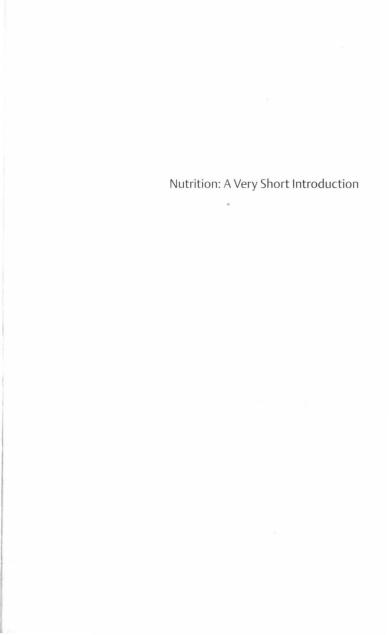
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Chapter 1 **Why eat?**

A healthy adult eats about a tonne of food a year. This book attempts to answer the question *why?*—and it does this by exploring the need for food and the uses to which that food is put in the body. Clearly, we eat because we are hungry. However, why have we evolved such complex physiological and psychological mechanisms to control not only hunger and satiety, but also our appetite for different types of food? Why do meals form such an important part of our life?

There is an obvious need for energy from food to perform physical work. Work has to be done to lift a load against the force of gravity and there must be a source of energy to perform that work. As will be discussed in Chapter 2, the energy used in various activities can be measured, as can the energy yield of the foods that provide the fuel for that work. Fats, carbohydrates, protein, and alcohol all provide metabolic fuels.

Apart from its role as a metabolic fuel, there is a requirement for protein in the diet. In a growing child this need is obvious. As the child grows, and the size of its body increases, so there is an increase in the total amount of protein in the body. Adults also require protein in the diet, because there is a continual turnover of body proteins, which have to be replaced. Protein nutrition will be discussed in Chapter 3.

In addition to metabolic fuels and protein, the body has a requirement for two groups of nutrients that are required in very much smaller amounts—the micronutrients, minerals and vitamins. If a metal or ion has a function in the body, it must be provided by the diet, since it is not possible to convert one chemical element into another. The vitamins are organic compounds with a variety of functions. They cannot be synthesized in the body, and so must be provided by the diet. Micronutrients will be discussed in Chapter 7.

Other compounds in the diet (especially from fruit and vegetables) are not dietary essentials, but they may have beneficial effects in reducing the risk of developing a variety of chronic diseases. These compounds will also be discussed in Chapter 7.

The need for water

The body's first need is for water. The human body contains about 60 per cent water—a total of 42 litres in a 70 kg (11 st) person. We excrete water in our urine as a way of ridding the body of the end-products of metabolism, and so we obviously need an intake of water to balance losses from the body. It is possible to survive for several weeks without any food, by using body reserves of fat and protein, but without water, death from dehydration occurs within a few days. There is no storage of water in the body; if water intake is in excess of-what is required to maintain the normal levels in the blood stream, cells, and tissues any excess is rapidly lost in the urine. Daily fluid balance for adults is shown in Table 1.

Average daily output of urine is often said to be 1.5 litres (although the figures in Table 1 show that this is an over-estimate), and advertisements for bottled water suggest that we should drink at least this much water per day. At first glance it might seem obvious that we would need an intake of the same amount of fluid to replace the loss in urine. However, as shown in Table 1, total

Table 1. Daily fluid balance

		Adı	Adult man	Adult	Adult woman
		ml/day	% of total	ml/day	% of total
Intake	fluids	1,950	65	1,400	29
	water in food	700	23	450	21
	metabolic water	350	12	250	12
	total	3,000		2,100	
Output	urine	1,400	47	1,000	84
	sweat	650	22	420	20
	exhaled air	320	11	, 320	15
	insensible losses	530	17	270	13
	through the skin				
	water in faeces	100	33	90	4
	total	3,000		2,100	

From data reported by W. S. Snyder, M. J. Cook, E. S. Nassett, L. R. Karkhausen, G. Parry-Howells and I. H. Tipton (1975). International Commission on Radiological Protection, Report of the Task Group on Reference Man, Pergamon Press, Oxford

daily fluid output from the body is about 3 litres for an adult man and about 2.1 litres for a woman; urine accounts for less than half of this. Equally, fluid consumption in beverages accounts for only about two-thirds of total fluid intake.

In addition to the obvious water in beverages, food provides a significant amount of water: around 22 per cent of total intake, and more if you eat the recommended five servings of fruit and vegetables per day. Most fruits and vegetables contain 60–90 per cent water.

A further source of water is metabolic water—the water produced when fats, carbohydrates, and proteins are oxidized to yield energy. This accounts for about 12 per cent of total water 'intake', and more on a high fat diet, or when metabolizing fat reserves. The camel is able to survive for a considerable time in desert conditions without drinking because it metabolizes the fat stored in its hump; the water produced in fat oxidation meets its needs.

Urine accounts for less than half the total fluid output from the body; as shown in Table 1, the remainder is made up of sweat, water in exhaled air, so-called insensible losses through the skin (this is distinct from the loss in sweat produced by sweat glands), and a relatively small amount in faeces. This last will also increase on a diet rich in fruit and vegetables, because of their content of dietary fibre. Part of the beneficial effect of a high fibre diet is that the fibre retains water in the intestinal tract, so softening the faeces.

Sweat losses obviously depend on the environmental temperature and the intensity of physical activity; we do indeed need to drink more in a hot environment or after strenuous exercise. Losses in exhaled air, faeces, and other insensible losses are relatively constant; urine output varies widely, depending on how much fluid has been consumed. Although average urine volume is 1–1.4 litres per day, this reflects average fluid intake; the output of urine required to ensure adequate excretion of waste material and