

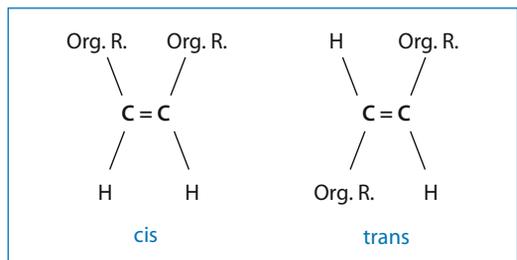
16 Trans-fatty acids

Not all fats are suitable for high frying at temperatures of 130–180°C. Water in fats, like in butter, evaporates at 100°C and then starts to spatter. Excipients from the pulp of cold-pressed oils can become altered and develop an unpleasant odor or taste when heated above 150°C. That means good cooking fats contain little water, are free of odorants and flavorings and have a high smoke point. Examples of these include clarified butter, palm oil and refined rapeseed oil.

When certain cooking methods are used, reactions with oxygen cause nutrients high in polyunsaturated fatty acids to lose their valuable properties because oxidation breaks down the double bonds into single bonds. The health-related benefit of raw or poached fish is therefore greater than when the fish is prepared by baking, broiling or frying (► Chapter 31 and ► Chapter 32).

Another effect of high frying temperatures is that, for a split second, the double bonds are broken and small-scale rearrangements of the natural **cis-fatty acids** can take place, turning them into harmful **trans-fatty acids** (TFA). TFA elevate the levels of bad **Low-Density Lipoprotein** (LDL) cholesterol and lower those of good **High-Density Lipoprotein** (HDL) cholesterol (Dietz et Scanlon 2012). That is how TFA increase the risk for cardiovascular disease (Brouwer et al. 2013). Furthermore,

TFA can induce endothelial dysfunction (► Chapter 51), are involved in the development of insulin resistance (► Chapter 40) and increase visceral adiposity (Micha et Mozaffarian 2009). There is also an apparent connection between their intake and an increased incidence of depression (Sanchez-Villegas et al. 2011). Dietary TFA should therefore be limited to a maximum of 1% of a person's total energy intake, i.e. approximately 2–3 g per day are considered safe. TFA are mainly found in fatty baked goods, chips, fries, dried soups, ready-made meals, candy and most brands of margarine. The amount varies by method of preparation. TFA are also produced naturally by microorganisms in the rumen of ruminant animals. That is why TFA make up 3–5% of the total fat content of milk and beef fat.



■ **Fig. 16.1** cis-trans isomerism