bacteria given to a certain amount of organisms. Interestingly, worms with mutation in the *eat2* gene have significantly reduced food uptake and thus live longer due to CR.[180,181] In the fruit fly *D. melanogaster*, there is no way to give less food so far and thus food dilution is used. There are some important factors to be pointed out. Firstly, the restriction has to be designed to avoid malnutrition by important exogenous factors like vitamins and microelements. Secondly, it is important to measure *ad libitum* food uptake in order to ensure proper reduction of given food. Finally, the restricted protocol should not induce starvation.

10.5.2 Dietary Composition

Every diet consists of carbohydrates, fats, proteins, water, vitamins, and minerals. Total caloric value or food energy is the amount of chemical energy the organism can get. Carbohydrates, fats and proteins are macronutrients that give about 95% of food energy. However, even with the same energetic value, one diet can be calorie restricted in comparison to other. For instance, sucrose and yeast are used in studies with fruit flies. Sucrose is a pure carbohydrate whilst yeast consists of protein and simple and complex carbohydrates, lipids and indigestible fibers. The caloric value of these components is virtually the same as 4 kcal g^{-1} of sucrose and 4.02 kcal g^{-1} of yeast. The diet with 65 g of yeast and 150 g of sucrose per liter has a caloricity of 861 kcal l^{-1}. The diet with 150 g of yeast and 65 g of sucrose per liter has 862 kcal l^{-1}. Experiments showed that flies of the first group are long-lived in comparison with those of the second group. This experiment shows that the caloric value of the diet is not the primary factor to regulate life span. However, these results show the possibility of using an isocaloric diet to extend the life span.

The way to extend the life span by using isocaloric diets is partial replacement of components that can be easily used to produce energy with those that cannot be used for this purpose. The easiest example is fiber. For example, the human body cannot digest cellulose, a polysaccharide composed of glucose monomers. Additionally, consumption of soluble dietary fibers before meals slows the absorption of carbohydrates by blunting the postprandial insulin spike.[182,183] Thus, addition of this compound to the diet will keep the same food energy density but the organism will produce less energy in the form of ATP during its metabolism. CR can be also achieved by addition of non-metabolizable or "zero-calorie" sugars like sucralose or L-glucose.

10.5.3 Inhibition of Food Digestion and Absorption

Affecting both food digestion and absorption processes may be a way to create CR conditions. Multiple enzymes are involved in digestion of complex nutrients to more simple forms that can be absorbed. To decrease the uptake of calories derived from complex carbohydrates, inhibitors of enzymes such as amylases, glycosidases and disaccharidases can be used. Amylases and glycosidases convert starch, glycogen and other molecules to simpler