Forschende Komplementärmedizin
Wissenschaft • Praxis • Perspektiven

Editorial

Forsch Komplementmed 2013;20:410–411
DOI: 10.1159/000357828

Published online: December 16, 2013

Fasting Therapy – Old and New Perspectives

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Over centuries, mankind had to deal with a steadily changing food supply. Depending on seasonal fluctuations or greater natural disasters, either plenty or little food was available. As a consequence, people in different areas of the world developed sophisticated strategies, e.g., seasonal fasting, to handle and overcome these problems. Possibly, in these early days, people discovered also the healing power of fasting periods. Interestingly, in all religions worldwide we find instructions for and reports on fasting strategies in order to cure body and soul. In Europe, specifically the German physician Otto Buchinger was one of the first to observe and document systematically the effects of fasting on a variety of diseases and to develop a concept of therapeutic fasting [1].

Fasting is defined as the ability to meet the body's requirements for macro- and micronutrients during a limited period of either shortage or absence of food, by using almost exclusively the body's energy reserves without endangering health [1]. The term 'fasting' is often misused. It has to be clearly differentiated between zero calorie diet and starvation. During fasting, intake of food in forms of vegetable broth and vegetable or fruit juice should not exceed 500 kcal per day. Importantly, fasting is the voluntary abstinence from solid food and stimulants (like caffeine or nicotine) for a limited period of time. When fasting is done properly, one should experience a good level of vitality and absence of hunger.

It has to be pointed out that fasting is not solely related to caloric restriction but is rather a multimodal treatment program including also mind-body medicine techniques and spiritual components as well as physical activity [1].

The human organism has the physiological ability to switch from exogenous food supply to endogenous nutrient reserves. While liver and muscle glycogen stores are rather limited and normally depleted after 24 h of fasting, energy is mainly derived from fat stores. Protein is mainly used to deliver amino acids for gluconeogenesis in order to provide glucose for the brain. The caloric restriction below 500 kcal per day leads to a complex and orchestrated central and peripheral neuroendocrine response. Fasting triggers cardiovascular, metabolic, and psychological adaptations, which should be monitored during the fasting period [2].

Water-only fasting and several types of modified fasting regimens display some differences, although all are about partial or total interruption of food intake for a limited period of time. They are often mixed up, and the term 'fasting' is, unfortunately, sometimes also used for weight-reducing diets, e.g., very low calorie diet (VLCD) with an energy intake up to 600–800 kcal per day.

According to the state of health, fasting can be practiced as therapeutic fasting ('fasting cure'), preventive fasting, and fasting for the healthy (without therapeutic or medical intention). Fasting is accompanied by integral physiological adaptation processes. Overall, metabolism is geared to use mainly fat resources for fueling energy metabolism of the human body during fasting. Because of the absence or very limited supply of carbohydrates, fatty acid oxidation is partly incomplete, which leads to ketogenesis. However, 'ketone bodies', such as acetoacetate and 3-hydroxybutyrate, are mainly utilized by skeletal and cardiac muscle but also by the brain for fueling energy metabolism. During the first 3 days of fasting (adaptation phase), protein catabolism is significantly increased, followed by a steadily decrease in order to spare protein. Furthermore, nitrogen is excreted mainly in form of urea, later on as glutamine in order to spare energy. Glutamine is an important substrate for gluconeogenesis in the kidneys. The resulting ammonia ions are important to neutralize keto acids and uric acid in the kidneys.

With the increase in prevalence of obesity since the 1970s, fasting became very popular but was often reduced to low or even zero calorie intake. During that time, numerous discussions came up in the scientific community about a potentially

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dangerous loss of protein and muscle mass during fasting. In the following, a number of formula diets (mostly carbohydrate/protein shakes) were developed and tested in order to minimize protein catabolism [3]. However, results from a study on 750 obese men and women [4] who were fasting over 28 days according to the Buchinger program (either with or without an additional vigorous daily exercise program) showed that fasting leads to a substantial weight loss, but mainly due to loss of fat mass. Surprisingly, men lost about 1 kg, women 0.7 kg of protein in the non-exercise group during the fasting period. The exercise group showed just a slightly, nonsignificantly greater protein loss. Interestingly, the exercise group also showed a greater fitness and muscle strength than the non-exercise group at the end of the intervention. Although there are no systematic studies until now, protein loss is obviously not exclusively attributed to loss of muscle mass. It is known for years, that patients with rheumatic or some kind of autoimmune disease experience a substantial improvement of symptoms after some days of fasting. One might therefore speculate that protein breakdown is not a random but rather a well-organized and controlled process, focusing at first on disease-causing proteins, such as auto-antibodies or irregular processed proteins.

Although still criticized, fasting according to Buchinger became more and more popular during the last 2 decades, even reaching some kind of worldwide renaissance. Interestingly, an increasing number of reports on benefits of fasting in various chronic diseases stems from the so-called orthodox or conventional medicine. Beside the traditional short- or long-term fasting, intermittent fasting and its effects on preventing or treating disease are being increasingly acknowledged.

In 2002, the German 'Ärztegesellschaft für Heilfasten und Ernährung' (ÄGHE, Medical Society for Fasting Cures and Nutrition) published the first guidelines for therapeutic fasting [1]. Meanwhile, the body of evidence on the benefits of fasting and the revelation of putative mechanisms behind these effects on various diseases have reached a critical mass. This issue of Forschende Komplementärmedizin therefore sets a focus on this topic.

In this issue, for instance, an expert panel update of the 2002 consensus guidelines on fasting therapy [5] is presented, covering specifically indications, contraindications, and quality criteria for fasting.

Michalsen and Li [6] present a review on current state of fasting therapy, covering the history and physiology of therapeutic fasting and clinical effects in rheumatic diseases, chronic pain syndromes, cardiovascular and metabolic diseases, mood disturbances, and even cancer. Li et al. [7] present a paper regarding differences in the metabolic, endocrine, and psychological response during a 7-day Buchinger fasting in obese patients with and without metabolic syndrome. Papagiannopoulos et al. [8] show that even food- and water-deprived fasting over 5 days, a form of fasting which is popular among orthodox Christians, specifically monks and nuns, can be well-tolerated without serious changes in electrolyte balance, provided that the subjects do not suffer from cardiovascular, metabolic or renal diseases. Stange et al. [9] present observational data on the effects of Buchinger fasting on insulin sensitivity in a sample of diabetic and metabolic patients, showing that fasting may improve insulin resistance. In a retrospective study, Zerm et al. [10] analyzed the effects of a calorie-restricted oatmeal diet in diabetic patients with severe insulin resistance and found immediately reduced insulin requirements. Finally, Ekmekcioglu et al. [11] give a review of the consequences of high salt consumption, which underlines the potential long-term impact of fasting therapy, as fasting may also beneficially affect taste and nutritional behavior, thus enabling patients to better comply with a healthy and low-salt diet.

Considering these findings on fasting, this issue should encourage clinicians, clinical scientists, and basic researchers to study still unsolved problems in fasting physiology as well as the mechanisms behind the beneficial effects of fasting for preventing and treating diseases.

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