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Health Benefits of Fasting {UPAVASA}: Review of Ayurveda and Modern Science Perspectives

Dr. Bhupendra Kumar[1], Dr R K N Priyangika[2], Dr. Abhinav Sharma[3], Dr. Amol S Kadu[4], Dr. Anita Sharma[5]

[1,2,3]MD Scholar, Department of Agada Tantra, National Institute of Ayurveda (DU), Jaipur
[4]Senior Assistant Professor, Department of Agada Tantra, National Institute of Ayurveda (DU), Jaipur
[5]Professor and Head of Department, National Institute of Ayurveda (DU), Jaipur

Abstract

Fasting (*Upavasa*) has been an integral practice in Ayurveda for centuries, believed to purify the body, enhance digestion, and promote overall well-being. Modern scientific research also supports various health benefits of fasting, including improved metabolism, cellular repair, and longevity. This review explores the Ayurvedic principles of *Upavasa*, its physiological effects, and its alignment with modern scientific findings on intermittent fasting, autophagy, and metabolic health. By bridging traditional wisdom with contemporary research, this study highlights the comprehensive benefits of fasting for the human body, including its effects on physical, mental, and spiritual health.

Keywords: *Upavasa*, Ayurveda, fasting, intermittent fasting, autophagy, metabolism, detoxification, insulin sensitivity, longevity, holistic health.

Introduction

Ayurveda guides three therapies for the wellbeing and health i.e. spiritual, psychological and rational/physical[1]. Ayurveda focus on curing of illness as well as prevention & promotion of health in healthy individual. Ayurveda has explained various such treatment modalities Amongst the *Shat Upakarma* as explained by *Acharya Charaka* one is *Langhana* therapy[2]. Acharyas had already mentioned the importance of *langhana* in many diseases and as preventive measure and has aptly suggested "*langhanam Paramaushadam*" It can be considered as costless therapy of Ayurveda[3]. *Acharyas* has mentioned various type of *Langhana.* Fasting (*Upawasa)* is one of them. Fasting/*Upavasa* is a type of *adravya aushada*[4.]

It is defined as abstinence from all the four forms of food: chewing, licking, swallowing, anddrinking[5].*U pavasa* also means abstinence from *krodha* (anger), *shokha* (grief), *lobha* (greed), *mohadi* (fascination) etc[6]. In Ayurveda it is stated that "*aho ratribhojana abhavaha*" which means the condition of withdrawal of food for a night. It is also considered as one type of fast along. Fasting is also revealed as "*sarva bhoga vivarjana*" which means abstaining from every single delight[7].

Fasting is an effective way to kindle the digestive fire and burn away accumulated toxins from the body and mind. *Agnimandya* (weakened digestive fire) and *ama* (metabolic toxins) are considered to be the main reason for disease manifestation. By expelling *ama* (metabolic toxins) from our digestive system, fasting frees up energy for healing and strengthens the immune system[8]. Fasting helps to generate the will

power of abstaining from the sensual gratifications and vices. It generates psychological power, stability and spiritual enlightenment. Fasting improves the symptoms of depression, alertness and even the mood - the subjective feeling of well-being[9]. In psychology, studies have suggested that fasting can alleviate the symptoms of some psychiatric conditions including depression and schizophrenia[10].

In Ayurveda, *upavasa* (fasting) is indicated as a treatment therapy in various diseases. Such as *Vamana* (vomiting), *Atisara* (diarrhoea), *hridroga* (cardiac disorders), *Visuchika* (cholera), *Alasaka* (paresis of bowel), *Jwara* (fever) – If these ailments are of less severity should be treated by fasting[11].

Upavasa in *Raktajaroga* (blood born diseases)- *Upavasa* is indicated for curing diseases due to the vitiation of blood (*shonita*)[12].

Upavasa in *Santarpanajanyavikara* (diseases due to over satiation)- Ailments due to over satiation are- urinary disorders, diabetes, *pidaka* (small abscess or furuncles including diabetic boils), *kotha* (urticarial patches), itching, anemia, fever, skin disorders including leprosy, disorders due to *ama* (indigested food), dysuria, anorexia, drowsiness, frigidity, excessive obesity, heaviness of body, obstruction of sense organs and channels, confusion/ delusion of intellect, always closing eyes, edema inflammation and similar other disorders. Fasting should be advised to treat these disorders[13].

Upavasa in *Alasaka* (choleric diarrhoea) and *Visuchika* (intestinal torper)- The patients suffering from *Alasaka* and *Visuchika* should be kept on fasting[14]. *Upavasa* in *Jwara Roga* (fever)- In the first stage of *jwara*, *langhana* or fasting is prescribed[15].

Upavasa in *Shotha Roga* (Oedema) - If *shotha* (oedema) is caused by *ama*, then the patient should be given *langhana* (fasting therapy)[16].

Upavasa in *Grahani Roga* (irritable bowel syndrome) - If the *dosha* in its *ama* (undigested) stage is converted into *rasa* (chyle) and pervades other parts of the body, then the patient should be made to fast, and be given drugs conducive to *pachana* (metabolic transformation) of the undigested material[17].

According to *Chakradatta* and *Yogaratnakar; Akshiroga* (eye disorders especially conjunctivitis), *Kukshiroga* (abdominal diseases), *Pratishyay* (rhinitis), *Vrana* (wound) and *Jwara* (fever); in the beginning of five days of these five diseases are destroyed by fasting therapy[18].

MATERIALS & METHODS

This comprehensive review was conducted by systematically searching the literature using the Consensus search tool, an AI-powered academic search engine. The search was performed across multiple databases, including PubMed, Web of Science, and Google Scholar.

What is Fasting

There are several different ways to do fasting, but they are all based on choosing regular time periods to eat and fast. Intermittent fasting is a dietary intervention similar to caloric restriction, as it uses the principle of restricting food intake. However, intermittent fasting focuses on the timing of when one can consume meals either within a day or a week**. Table 1** present the types of fasting.

Table:1 Common types of Intermittent Fasting

Type of Intermittent Fasting	Description	Common Variations
Alternate-Day Fasting (ADF)	Involves alternating between fasting and non-fasting days. A subset includes 24-hour fasts followed by 24-hour eating periods.	- **5:2 Strategy:** 2 fasting days mixed with 5 non-restrictive days. - 24-hour fasting cycles several times a week.
Time-Restricted Fasting (TRF)	Limits eating to a specific window of time each day, with the remaining hours dedicated to fasting.	- **16:8 Method:** 16-hour fast with an 8-hour eating window. - **20:4 Method:** 20-hour fast with a 4-hour eating window. - Other customized variations.

Although both caloric restriction and intermittent fasting may result in overall decreased caloric intake, this is not integral to intermittent fasting. Intermittent fasting has been linked to better glucose control in both humans and animals[19].

Fasting involves a radical change in cellular physiology and metabolism. Blood glucose normally provides the body with sufficient energy through glycolysis. During a fast, maintenance of blood glucose levels initially relies on glycogen stores in the liver and skeletal muscle. Glycogen is made up of chains of polymerized glucose monosaccharides that are used for energy by the process of glycogenolysis. Most glycogen is stored in the liver, which has the greatest role in the maintenance of blood glucose during the first 24 hours of a fast. After fasting for around 24 hours, glycogen stores are depleted causing the body to utilize energy stores from adipose tissue and protein stores[20].

The drastic change in metabolism that follows glycogen depletion is primarily dependent on the metabolism of triglyceride stores in adipose tissue. Triglycerides are separated into free fatty acids and glycerol that the liver respectively converts into ketone bodies and glucose. Ketone bodies made from free fatty acids through the process of ketogenesis. These ketone bodies travel through the body and are reconverted back into acetyl-CoA at the tissues requiring energy.

In addition to adipose catabolism, protein catabolism, through the process of gluconeogenesis, simultaneously takes place in times of fast[21 22]. Gluconeogenesis produces glucose from amino acids broken down from various tissues including muscle. After glycogen stores become depleted, the dependence of body tissues for glucose gradually declines as ketone bodies become more readily available to metabolize[23].

Benefits of fasting in Neurological disorders

Endothelial cells play a major role in the movements of ions, molecules, and cells into and out of the brain and, thus, the thromboresistance property of vessels and vascular homeostasis[24]. Endothelial dysfunction is a broad term encompassing oxidative stress, low-grade inflammation, increased vascular tone, loss of BBB integrity, atherosclerosis, and thrombosis[25]. Human trials have shown improved endothelial function as assessed by markers of endothelial integrity, such as asymmetric dimethylarginine and cutaneous microcirculation with laser Doppler scan, in individuals after fasting[26-28].

Parkinson's disease- The benefits of IF likely originate from controlled amounts of small stress and recovery, or hormesis. In PD models, IF has resulted in improving insulin sensitivity, decreased excitotoxicity, reduced neurodegeneration, and protection against autonomic dysfunction, and motor and cognitive decline[29]. IF counteracts other pathologic features of PD by enhancing neurogenesis and improving survival of neuronal progenitors. Moreover, the resulting ketosis may promote decreased excitotoxicity with the upregulation of GABA. Importantly, IF may provide benefit for the non-motor symptoms of PD in addition to the motor symptoms. Intermittent fasting (energy restriction relative to a high energy diet) led to a decreased burden of alpha-synuclein in the brainstem that contributes to autonomic dysfunction (elevated resting heart rate, impaired cardiovascular stress response, reduced parasympathetic activity) commonly seen in PD. As autonomic dysfunction contributes to worse functional status, it remains an important therapeutic target in addition to motor symptoms[30].

Alzheimer's disease - Extracellular b-amyloid plaques and intracellular tangles are the characteristic neurological lesions in AD[31-32]. The neurofibrillary tangles are composed of abnormally phosphorylated tau proteins, which are regarded as the downstream effect of excess b-amyloid[33-34] Although early-onset AD arises from the excess production of b-amyloid, late onset AD, the most common type, results from decreased clearance of b-amyloid from the brain[35-36]. Apolipoprotein E e4 is associated with impaired clearance of b-amyloid and hence contributes to an increased risk of dementia[37-39].

The BBB plays a critical role in the clearance of b-amyloid from the brain[40-42]. The blood-brain barrier (BBB) lies within the neurovascular unit and regulates the transport of molecules between the brain interstitial fluid and cerebrovascular compartment. Postmortem data indicate BBB damage in AD[43.] b-Amyloid–induced neuroinflammation occurring in the early stage of prodromal Alzheimer's dementia may be protective, but later in the prodromal stage, activated microglia fail to clear b-amyloid deposition, and the inflammatory response diminishes. As b-amyloid continues to increase, it triggers tau propagation through a yet unknown mechanism with which the second wave of inflammation ensues[44].

Intermittent fasting (IF) has gained attention for its potential role in Alzheimer's disease (AD) due to its effects on various metabolic and cellular processes that could impact brain health. Intermittent fasting has been shown to promote the clearance of beta-amyloid plaques, which are a hallmark characteristic of Alzheimer's disease. Animal studies have demonstrated that fasting triggers autophagy, the cellular process responsible for removing damaged or dysfunctional proteins, including beta-amyloid[45].

Intermittent fasting has been associated with increased levels of BDNF, a protein that supports the growth and survival of neurons. Higher levels of BDNF may help protect against neurodegeneration and promote the growth of new neurons, potentially slowing down the progression of Alzheimer's disease[46].

Stroke- Human studies on the direct effects of fasting in ischemic stroke are lacking. However, fasting reduces levels of pro-inflammatory factors, such as C-reactive protein, IL6, and homocysteine, which may inhibit the formation of atherosclerotic plaques, a common source of stroke in humans[47].

Schizophrenia- Schizophrenia is a disabling psychiatric condition impacting around 1% of people worldwide and ranking among the top 10 global disability causes[48]. Schizophrenia is characterized by positive psychotic symptoms such as hallucinations, delusions, disorganized speech, and disorganized or catatonic behavior; negative symptoms such as reduced motivation and expressiveness; and cognitive impairments affecting executive function, memory, and mental processing speed[49].

In 1972, Nicolayev claimed to have used fasting to successfully treat over 10,000 patients, many of whom suffered from chronic refractory schizophrenia, noting a significant improvement in 65% of those treated. An estimated 30% of people with schizophrenia have refractory schizophrenia, which means their positive

schizophrenia symptoms have proven resistant to treatment with antipsychotic drugs. Cott undertook his own fasting study at Gracie Square Hospital in New York with 35 schizophrenic patients, reporting that over 60% of those who completed the fast remained well, provided that they stayed on a special low-fat diet[50].

Epilepsy- Fasting has been used to treat epilepsy since the era of Hippocrates[51], but it was not until 1911 that Guelpa and Marie formally documented the effectiveness of fasting in the treatment of 20 people with epilepsy[52]. With the introduction of Wilder's ketogenic diet and a long succession of anti-epileptic drugs, virtually no studies of fasting in epilepsy were published for nearly a century. Our findings suggest that fasting does not merely intensify the therapeutic effects of the ketogenic diet but may actually represent an entirely new way to change the metabolism of children with epilepsy," says lead investigator Adam Hartman, M.D., a pediatric neurologist at the Johns Hopkins Children's Center.

In the study, six children, ages 2 to 7, and all on the ketogenic diet, were asked to fast on alternate days. All six children had seizure disorders incompletely resolved by the diet alone.Four of the six children experienced between 50 percent and 99 percent fewer seizures after the fasts were added to the dietary regimen. Three of the six were able to continue the fasting regimen for two months or longer[53].

Multiple Sclerosis- Multiple sclerosis (MS) is an autoimmune disease characterized by and neurodegeneration, demyelination, and chronic inflammation in the central nervous system[54]. This condition manifests with a wide range of neurological symptoms, such as vision impairment, numbness and tingling, focal weakness, bladder and bowel dysfunction, and cognitive impairment. Multiple sclerosis has various disease courses, including relapsing-remitting, primary progressive, and secondary progressive[55].

Currently, there is no cure for MS, but several immunomodulatory therapies are available that may slow disease progression[56]. However, all of them may have substantial side effects and patients respond differently due to the complex nature of the disease. Consequently, there is a need for complementary therapies such as specific diets that may reduce MS symptoms, improve the patient's quality of life and even delay disease progression[57].

Fasting not only induces ketosis, but might also activate autophagy in the brain, liver and muscle[58]. KDs and fasting diets (FDs) both drastically reduce carbohydrate intake and it has been suggested that the resulting ketone bodies facilitate the regeneration of demyelinated axons[59]. Intermittent fasting has been shown to stimulate autophagy, a cellular process that helps remove damaged cells and cellular components. This could be particularly beneficial in MS, where dysfunctional immune cells and damaged myelin contribute to disease progression[60].

Benefits of fasting in Gastrointestinal disorders

Fasting has long been recognized as a powerful practice for improving overall health and well-being. Beyond its effects on weight management and metabolism, fasting offers specific benefits for resetting and rejuvenating the digestive system. Intermittent fasting provides periods of rest for the digestive system, reducing the constant workload of digesting and absorbing nutrients. This rest period can reduce inflammation in the gut and improve issues such as bloating and irregular bowel movements. Intermittent fasting can also influence the gut microbiota, promoting the growth of beneficial bacteria and reducing harmful ones.

Ulcerative Colitis - Ulcerative colitis is an inflammatory disease that affects the colon, generating a crisis period associated with diarrhea and ulcerations[61]. Ulcerative colitis affects the innermost lining of your

large intestine, also called the colon, and rectum.It caused by abnormal reactions of immune system.It can start gradually or suddenly , and symptoms can vary from mild to severe.

Therapeutic management includes anti-inflammatory drugs, such as corticosteroids and 5-aminosalicylates, which have limited efficacy and cannot be used for long periods. When immune system inhibitors, such as azathioprine, mercaptopurine, and methotrexate, are used, patients experience several side effects, causing liver inflammation, nausea, and vomiting[61-62].

There are few studies that have assessed the mechanisms involved in anti-inflammatory responses induced by intermittent fasting. A short-term fasting study showed decreased monocyte metabolic and inflammatory activity. This study showed that a reduction in the inflammatory response was associated with the regulation of the number of peripheral monocytes, which were dependent on glucose and protein intake. A reduction in the number of monocytes was mediated by the activation of AMPK and PPARα pathways[63].

Irritable Bowel Disease- Inflammatory bowel diseases (IBDs) including UC and CD are chronic inflammatory GI disorders of unknown etiology that are characterized by recurrent GI symptoms such as diarrhea, bleeding, and abdominal pain[64]. Patients with IBD present with varying clinical symptoms and various clinical courses, ranging from quiescent to acute or chronic refractory disease, often leading to repetitive hospitalizations because of disease exacerbation[65-66]. In addition, intestinal Behçet's disease (BD), a chronic, relapsing, inflammatory disorder, presents with a variety of bowel symptoms similar to those of IBD, including GI bleeding and abdominal pain[67-68].

Fasting can reduce inflammation by decreasing the number of luminal bacteria and antigens in the colon and can affect the anabolic pathway, thus altering the immune system and inflammation[69]. Some studies have reported that fasting with administration of total parenteral nutrition (TPN) has positive effects on nutritional deficits and as perioperative nutritional support[70-71].

Benefits of Fasting in Immune Disorder

Intermittent fasting, which includes periods of fasting and nutrition, has been considered a dietary approach for weight loss and metabolic health improvement. Intermittent fasting may have beneficial effects on various autoimmune diseases, such as type 1 diabetes, rheumatoid arthritis, and systemic lupus erythematosus, by reducing inflammatory markers, modulating the immune system, altering and improving gut microbiota, and enhancing cellular repair mechanisms through autophagy[72].

Metabolism and immune response present a tight interdependency, and today's research has shown that glucose, amino acids (AAs), and fat acids (FAs) metabolism regulate leukocyte activation, subset differentiation, and function.Particularly, T cells during activation use mainly aerobic glycolysis converting glucose to lactate[73]. Fasting alters cellular metabolic pathways and affects immune function, through its impact on cell trafficking and proinflammatory cytokine expression[74].

Psoriasis- Psoriasis is a prevalent and chronic skin disease characterized by red, scaly, and thickened skin lesions. The extent of the lesions determines the severity of the disease and is commonly defined by the Psoriasis Area and Severity Index (PASI). The disease has a significant impact on quality of life (QoL)[75]. The disease affects between 2-3% of the worlds' adult population, and <1% of children.

Dietary lifestyle interventions have been reported to affect the disease in terms of lesional severity[76]. MIF is a form of intermittent fasting which requires to restrict calorie intake for a certain amount of time. IMF offers anti-inflammatory effects, reduced oxidative stress, and circadian rhythm synchrony, which are beneficial for inflammatory conditions like psoriasis and PsA (8-10)[77]. Popular MIF diets include the 5:2

diet (eating normally for 5 days and restricting calorie intake on 2 non-consecutive days) show a significant reduction in scaling and thickness in patients[78]. Many studies show that MIF has significant clinical benefits including psoriasis area and severity index (PASI) and quality of life scales in Psoriasis[79 80].

Rheumatoid arthritis- Rheumatoid arthritis (RA) is a systemic autoimmune disease characterized by inflammatory arthritis and extra-articular involvement. It is a chronic inflammatory disorder caused in many cases by the interaction between genes and environmental factors, including tobacco, that primarily involves synovial joints[81]. It typically starts in small peripheral joints, is usually symmetric, and progresses to involve proximal joints if left untreated[82]. Joint inflammation over time leads to the destruction of the joint with loss of cartilage and bone erosions. RA with a symptom duration of fewer than six months is defined as early RA, and when the symptoms have been present for more than six months, it is defined as established RA[83.]

Intermittent fasting (IF) diets have recently become popular for improvement in many chronic diseases. IF can have positive effects on improving the autoimmunity in several autoimmune diseases[84]. IF can benefit a person with RA because it may reduce inflammation. Studies suggest that IF reduces the release of monocytes (a type of white blood cell). During fasting, monocytes go into what researchers consider a "sleep mode" and exhibit less inflammation than fed monocytes. Additionally, multiple studies have shown microbial gut composition changes and increased anti-inflammatory effects following an IF diet[85 86 87].

Benefits of Fasting in Metabolic disorders

IF could benefit health subjects by strengthening their circadian rhythms, migrating immune cells, lower inflammatory factors, and enriching microbials. In addition of the anti-inflammatory effect by regulating macrophages, protection against oxidative stress with hormone secretion and oxidative-related gene expression plays a key beneficial role for the influence of IF on obese subjects[88]. Intermittent fasting, which involves alternating cycles of fasting and eating, can help control calorie intake and encourage the body to use stored fat for energy, improving metabolic health.

Fasting, but not low-calorie diets, results in numerous hormonal adaptations that all appear to be highly beneficial on many levels. Toxicity and inflammation block the receptor sites on our cells, making them unable to receive vital hormones and communication. Intermittent fasting is one of the most effective ways of inducing the cellular repair processes and removing waste material from cells.

Diabetes -Type 2 diabetes (T2D) is a lifelong progressive disease characterized by insulin resistance and hyperglycemia. Intensive therapy is required over time, with most patients ultimately requiring 2 or more medications to achieve and maintain glycemic control goals[89]. People with insulin-treated type 2 diabetes often struggle with weight gain, resulting in a vicious cycle of increasing insulin doses required to overcome the insulin resistance, leading to further weight gain, and ultimately resulting in higher cardiovascular risk[90].

The causes of T2D include both genetic predisposition and lifestyle factors such as diet, exercise, sleep, stress, and environmental exposures. When you have T2D, your body has consistently high levels of inflammatory immune cells and chronic levels of low-grade systematic inflammation. A helpful way to approach treating T2D is to focus not just on lowering blood sugar but on increasing insulin sensitivity, decreasing chronic inflammation, and improving cardiovascular health.

Intermittent fasting, as described previously, may reduce adiposity and subsequently insulin resistance via reduction of caloric intake as well as due to metabolic reprogramming[91]. Sometimes muscle, fat, and liver

cells don't respond This is called insulin resistance because the cells resist the effects of insulin. The primary goal of intermittent fasting for weight loss is to get insulin levels low enough so your body burns stored fat (instead of sugar) for energy. Many studies show that, 5:2 diets for 3 or 6 months, blood insulin levels and insulin resistance were significantly reduced[92 93].

Role Of Fasting in Cancer

The commonly accepted basis of the pathogenesis of cancer is the damage to the genetic apparatus of cells (such as mutation, disturbance of gene expression, activation of tumor promoter gene, inactivation of tumor suppressor genes, etc.) It is believed that damage to the genetic apparatus of the cell along with inactivation of anti-tumor genes takes place and is essential for the development of malignant tumors. But it should be noted that the inactivation of tumor suppressor gene is one of the natural physiological reactions of the organism, and when this reaction becomes pathophysiological condition of an organism it results in cancer development. Both benign and malignant tumors are classified according to the type of cell from which they arise. Most cancers fall into one of three main groups: carcinomas, sarcomas, and leukemias or lymphomas[94].

Intermittent fasting (IF) has garnered considerable interest as a dietary intervention with potential therapeutic benefits for various medical conditions, particularly cancer. Fasting in mammals has been shown to induce autophagy and this starvation-induced autophagy may protect normal cells against malignant transformation[95]. IF increases autophagic processes in humans is unknown, and more research is needed to better understand the possible benefits and harms of fasting-related autophagy in patients with cancer. The dietary approaches based on fasting that have been investigated more extensively in oncology, both preclinically and clinically, include water fasting (abstinence from all food and drinks except for water). Preliminary clinical data indicate that a fast of at least 48 hours may be required to achieve clinically meaningful effects in oncology, such as preventing chemotherapy-induced DNA damage to healthy tissues and helping to maintain patient quality of life during chemotherapy[96 97].

Discussion

Fasting has been widely studied for its potential health benefits, ranging from weight management to improved metabolic health and longevity. This review highlights key findings related to different fasting protocols, their physiological effects, and their potential applications in clinical and everyday settings.

One of the most significant advantages of fasting is its role in metabolic regulation. Studies indicate that intermittent fasting (IF) and prolonged fasting can improve insulin sensitivity, enhance fat oxidation, and reduce systemic inflammation. Additionally, fasting has been linked to autophagy, a process that aids in cellular repair and longevity. However, the degree of these benefits may depend on individual factors such as genetics, lifestyle, and underlying health conditions.

Fasting also appears to have implications for neurological health. Research suggests that fasting may enhance cognitive function, protect against neurodegenerative diseases, and improve brain plasticity. Mechanisms such as the upregulation of brain-derived neurotrophic factor (BDNF) and reduction in oxidative stress may contribute to these effects. However, more extensive human trials are needed to establish definitive conclusions.

Conclusion

Evidence is accumulating that eating in a 6-hour period and fasting for 18 hours can trigger a metabolic

switch from glucose-based to ketone-based energy, with increased stress resistance, increased longevity, and a decreased incidence of diseases. Repeated exposure to fasting periods results in lasting adaptive responses that confer resistance to subsequent challenges Cells respond to intermittent fasting by engaging in a coordinated adaptive stress response that leads to increased expression of antioxidant defenses, DNA repair, protein quality control, mitochondrial biogenesis and autophagy, and down-regulation of inflammation. As fasting continues, progressive ketosis develops due to the mobilization and oxidation of fatty acids. As ketone levels rise they replace glucose as the primary energy source in the central nervous system, thereby decreasing the need for gluconeogenesis and sparing protein catabolism.

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