

## Metabolic Dysfunction and Liver Disease: A Growing Health Concern

At least 25% of people in the US have non-alcoholic fatty liver disease (NAFLD), now called metabolic dysfunction-associated steatotic liver disease (MASLD).<sup>1,2</sup> This metabolic condition occurs when larger-than-normal amounts of fat build up in the liver, causing inflammation and scarring. NAFLD/MASLD affects both adults and children and rarely causes symptoms.

If left untreated, it impairs liver function, potentially leading to liver failure and liver cancer. It also significantly increases the risk of heart disease and diabetes. The number of people with NAFLD/MASLD is expected to grow over the next decade. Therefore, it is critical to learn the risk factors and how to prevent and manage the condition.

### Who Is at Risk?

The new name for this common liver disorder reflects the fact that MASLD is caused by metabolic dysfunction or problems with how your body metabolizes food and converts it to energy. These factors increase risk in both adults and children:<sup>1,2</sup>

- Overweight or obesity (a BMI over 25).
- A large waist size.
- High triglycerides.
- Insulin resistance or type 2 diabetes.
- High LDL (bad) cholesterol.
- Metabolic syndrome. This group of health conditions includes having three or more of the following: a large waist size, high triglycerides and blood sugar, low HDL (good) cholesterol, and high blood pressure.
- Certain ethnicities, such as Hispanics, non-Hispanic whites, and Asian Americans.
- A diet high in refined carbohydrates and added sugars, especially high-fructose corn syrup. Sweetened soft drinks are highly associated with NAFLD/MASLD.
- A sedentary lifestyle.

Researchers are also exploring a possible association between MASLD and other health conditions, such as sleep apnea, hypothyroidism, polycystic ovary syndrome (PCOS), chronic obstructive pulmonary disease (COPD), and gut dysbiosis, or disruptions in the gut microbiome balance.<sup>2,3</sup>

## Preventing and Managing MASLD

There is currently no medication to treat MASLD, but diet and lifestyle changes can prevent or reverse it in its early stages. A healthier diet and lifestyle can also slow its progression.

One of the most effective ways to manage MASLD is with a diet pattern aimed at weight loss (a minimum of 3-5%) and improvements in insulin resistance.<sup>1</sup> The Mediterranean diet is one that many people find relatively easy to adopt. Data from a 2022 study in *Clinical Nutrition* showed it improves liver function and the reduces amount of fat in the liver in those with MASLD. Additionally, it:<sup>4</sup>

- Promotes weight loss
- Helps reduce waist size
- Improves insulin sensitivity, which can lower blood sugar levels
- Increases HDL cholesterol
- Reduces total cholesterol and triglyceride levels

The Mediterranean diet and other plant-forward diet patterns are based on these elements, which are associated with improvements in MASLD:

- Meals and snacks include whole plant foods, such as fruits, vegetables, whole grains, legumes (beans), nuts, and seeds. These are high in complex carbohydrates and fiber and low glycemic, meaning they don't rapidly increase blood sugar. Complex carbohydrates are metabolized slowly to provide long-lasting fuel.
- Legumes and fish are primary protein sources, along with small amounts of Greek yogurt, cheese, eggs, and poultry. In contrast, eating more animal protein, especially red and processed meat (such as bacon or hot dogs), is associated with a higher risk of MASLD.<sup>5</sup>
- Olive oil is plentiful. Along with nuts, seeds, and fatty fish, olive oil provides unsaturated fatty acids, which reduce inflammation, a critical factor in the progression of this disease.
- Desserts and sweets are reserved for special occasions, and soft drinks or other foods with added sugar are rare. Honey is a sweetener instead of table sugar or high fructose corn syrup.
- Meals and snacks are always prepared from scratch using whole ingredients. There are no ultra-processed foods. Research links higher intakes of ultra-processed, ready-to-eat foods with a higher risk of MASLD.<sup>6</sup>

## The Benefits of Physical Activity

Exercise is another crucial component of MASLD management. Not only does exercise promote body fat loss and muscle gain, but it also improves insulin sensitivity and glucose levels. Together, these support healthier metabolism with less fat stored in the liver.

A 2021 meta-analysis that examined data from 10 studies showed that regular exercise, even without weight loss, improves MASLD.<sup>7</sup> Researchers determined that regular, long-term aerobic exercise reduces the amount of fat in the liver and improves liver function tests. Adding strength training or resistance exercises provides further benefits by reducing triglycerides and cholesterol levels.<sup>7</sup>

These findings align with the exercise recommendations for all adults; get at least 150 minutes per week of moderate aerobic exercise plus two to three strength training sessions each week.

## The Link Between Gut Health and Liver Health

MASLD is also associated with disturbances in the gut microbiome, which includes the vast ecosystem of microbes in the intestinal tract.<sup>2</sup> Healthy individuals have a rich, diverse gut microbial mix with high numbers of beneficial gut bacteria that aid digestion and metabolism of nutrients and keep harmful bacteria and other pathogens in check. Beneficial gut bacteria also produce health-promoting compounds that promote a healthy response to inflammation and support immune and digestive health.

Researchers have noted differences in the microbiomes of people with NAFLD/MASLD.<sup>2</sup> The microbial mix is frequently disrupted, with less diversity and richness — a state known as dysbiosis. Dysbiosis is associated with impaired immune function, production of toxic metabolites, and higher levels of inflammation, which may trigger or worsen MASLD.

Strategies to support the gut microbiome may help slow the progression of MASLD or prevent it in those at high risk. These include:

- Eat a high-fiber diet with ample fruits, vegetables, whole grains, legumes, nuts, and seeds. The fiber and certain plant compounds in these foods help nourish and stimulate beneficial gut bacteria.
- Minimize highly processed foods and foods or beverages with added sugar. These may promote dysbiosis.
- Get regular daily physical activity.
- Aim for seven to nine hours of quality sleep each night.
- Manage stress.
- Avoid environmental toxins.
- Use a [broad-spectrum probiotic supplement](#) to add beneficial bacteria to the gut.

## Research on Nutraceuticals for Liver Health

Supplementing with specific nutraceuticals may enhance the benefits of diet, exercise, and microbiome support for liver health. However, it is vital to note that any nutraceutical approach must be personalized with health history and

medications in mind, and is best done under guidance of a trained healthcare provider. These compounds may protect liver health by supporting a healthy insulin response, liver detoxification, and metabolic health:<sup>3</sup>

- [Silymarin](#). This plant compound, extracted from milk thistle, is known for liver detoxification, antioxidant, anti-inflammatory, and insulin-sensitizing actions.
- [Berberine](#). This plant extract shows promise for its anti-inflammatory and insulin-sensitizing actions and microbiome support.
- Coenzyme Q10. This antioxidant is present in all cells and concentrated in liver cells. It has been shown to reduce inflammatory markers.
- [Omega-3 fatty acids](#). These essential fats reduce inflammation and are beneficial for the gut microbiome.
- [Certain probiotic species and strains](#) can support metabolic function, glucose balance, and weight management.

In summary, MASLD is becoming an increasingly more common diagnosis, but it is largely preventable. Understanding the risk factors and making the necessary diet and lifestyle changes early can protect your liver.

## REFERENCES

1. Non-Alcoholic Fatty Liver Disease (NAFLD) & NASH. National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases. <https://www.niddk.nih.gov/health-information/liver-disease/naflid-nash>. Updated April 2021. Accessed June 18, 2024.
2. Khan A, Ding Z, Ishaq M, et al. Understanding the Effects of Gut Microbiota Dysbiosis on Nonalcoholic Fatty Liver Disease and the Possible Probiotics Role: Recent Updates. *Int J Biol Sci*. 2021;17(3):818-833. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7975705/>
3. Cicero AFG, Colletti A, Bellentani S. Nutraceutical Approach to Non-Alcoholic Fatty Liver Disease (NAFLD): The Available Clinical Evidence. *Nutrients*. 2018;10(9):1153. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6163782/>
4. Haigh L, Kirk C, et al. The Effectiveness and Acceptability of Mediterranean Diet and Calorie Restriction in Non-Alcoholic Fatty Liver Disease (NAFLD): A Systematic Review and Meta-Analysis. *Clin Nutr*. 2022 Sep 1;41(9):1913-31. <https://www.sciencedirect.com/science/article/pii/S026156142200231X>
5. Hydes TJ, Ravi S, Loomba R, E Gray M. Evidence-Based Clinical Advice for Nutrition and Dietary Weight Loss Strategies for the Management of

NAFLD and NASH. *Clin Mol Hepatol*. 2020 Oct;26(4):383-400.  
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7641567/>

6. Henney AE, Gillespie CS, Alam U, Hydes TJ, Cuthbertson DJ. Ultra-Processed Food Intake Is Associated with Non-Alcoholic Fatty Liver Disease in Adults: A Systematic Review and Meta-Analysis. *Nutrients*. 2023;15(10):2266.  
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10224355/>
7. Babu AF, Csader S, Lok J, et al. Positive Effects of Exercise Intervention without Weight Loss and Dietary Changes in NAFLD-Related Clinical Parameters: A Systematic Review and Meta-Analysis. *Nutrients*. 2021;13(9):3135. [https://  
www.ncbi.nlm.nih.gov/pmc/articles/PMC8466505/](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8466505/)