

# Intermittent Fasting During Adolescence Could Have Long-Term Effects on Metabolism

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## STORY AT-A-GLANCE

- › Long-term intermittent fasting disrupts insulin production in adolescents, which leads to poor blood sugar regulation and increased metabolic risks in adolescence
- › Fasting reduces beta-cell maturity in young people, making it harder for their young bodies to regulate glucose properly
- › Adolescents experience insulin decline from fasting, which mimics patterns seen in Type 1 diabetes
- › Instead of long-term fasting, it's best for young people to focus on consuming regular, balanced meals. Getting the right nourishment supports their metabolic stability and prevents insulin resistance
- › Healthy lifestyle choices that protect beta-cell function include avoiding seed oils, optimizing gut health, and getting daily sun exposure

Intermittent fasting (IF) has become one of the most popular health trends in recent years, with benefits stating it helps boost immunity, reduces the risk of autoimmune diseases and diabetes, and even [promotes longevity](#).<sup>1</sup> However, this eating pattern is not a one-size-fits-all strategy, and a 2025 study demonstrates why.

While prolonged fasting has been praised for its potential metabolic benefits in adults, doing it during developmental years carries serious risks. This raises important questions about the effects of fasting trends, particularly among teenagers and young

adults, and whether they could be setting the stage for future metabolic dysfunction rather than preventing it.

## How Does Long-Term Intermittent Fasting Affect Insulin Production in Adolescents?

An animal study published in Cell Reports,<sup>2</sup> conducted by researchers from the Technical University of Munich (TUM), LMU Hospital Munich and Helmholtz Munich, investigated how intermittent fasting impacts metabolism at different stages of life.

- **Researchers sought to identify how fasting cycles affect metabolic responses —** The study examined how short-term and long-term fasting cycles affect mice subjects, taking note of the differences in their metabolic responses.<sup>3</sup>
- **The mice subjects were divided into three age groups —** They were grouped into adolescents (2 months old), middle-aged (eight months old) and older (18 months old). The researchers subjected these groups to intermittent fasting cycles, wherein they were not given food for one day, and then fed normally for two days.
- **Researchers analyzed pancreatic beta cell function —** Beta cells are responsible for regulating blood sugar by releasing insulin. By understanding how intermittent fasting affects beta cell function, they were able to determine who actually benefits from this eating strategy and who could be harmed by it. As reported by News-Medical.net:

*"After ten weeks, insulin sensitivity improved in both the adult and older mice, meaning that their metabolism responded better to insulin produced by the pancreas. This is key to regulating blood sugar levels and preventing conditions like Type 2 diabetes."*<sup>4</sup>

- **Longer fasts revealed notable differences —** Initially all groups showed improvements in terms of how they handled sugar; however, significant differences between the age groups emerged the longer they fasted.<sup>5</sup> While positive results

were seen on the older mice, the adolescent mice group had a completely different outcome.

Apparently, the younger mice developed beta cell impairment after doing intermittent fasting — this means that adopting this eating strategy disrupted how their beta cells functioned and their ability to produce insulin was significantly weakened.

## **Beta Cell Impairment in Adolescent Mice Mimic Type 1 Diabetes**

For the researchers, the results were quite unexpected. As explained by co-lead author Leonardo Matta, "Intermittent fasting is usually thought to benefit beta cells, so we were surprised to find that young mice produced less insulin after the extended fasting."<sup>6</sup>

- **Seeking to understand what triggered beta cell impairment** — The researchers used single-cell sequencing to examine the blueprint of the pancreas, where they discovered that the impairment occurred because the beta cells failed to mature properly.
- **Fasting lead to effects similar to Type 1 diabetes** — One of the most striking findings was that gene expression patterns in fasting-exposed adolescent mice resembled those found in individuals with Type 1 diabetes, which is an autoimmune disorder wherein the body attacks its own beta cells, leading to a severe deficiency in insulin.
- **Beta cells did not mature fully because of fasting** — The researchers discovered that fasting-induced impairment in adolescent mice mirrored this process, with beta cells failing to reach full maturity and producing less insulin. According to lead author Peter Weber from Helmholtz Munich, "At some point, the cells in the adolescent mice stopped developing and produced less insulin."
- **No effects on beta cell maturity were seen in older mice** — Since the older mice's beta cells were already mature before they were put on intermittent fasting, they were unaffected and were able to reap the benefits from the experiment. This

suggests that extended fasting at a young age could trigger metabolic conditions resembling early-stage diabetes, even in individuals without genetic predisposition. The researchers noted:

*"The finding that longer IF periods may also have deleterious consequences is a novel finding with relevant implications, especially for using IF in adolescents and people at high T1D risk.*

*In light of our study, this supports the notion that during the period of development and maturation, IF might impair proper nutrient flux and hormonal balance required for proper cell differentiation and organ development."*<sup>7</sup>

## **Long-Term Fasting Impairs Protein Production and Cell Proliferation in Adolescents**

Beta cells require a steady supply of nutrients and hormones to mature properly, but since insulin and glucose levels drop during fasting, cellular stress occurs instead. In fully developed beta cells, this stress activates protective mechanisms that enhance their function. However, in immature beta cells, it leads to dysfunction and reduced insulin output.

- **Fasting disrupted key metabolic pathways** — The study found that adolescent mice subjected to fasting experienced a reduction in key metabolic pathways related to beta cell growth, including decreased activation of the mTORC1 pathway, which is crucial for cell proliferation and function.
- **It also affected production of essential proteins** — Another notable finding was that adolescent mice had lower levels of key proteins, including MAFA, GLUT2, and NKX6.1. These proteins are essential for glucose transport and insulin synthesis and secretion, and having reduced levels indicates a fundamental disruption in pancreatic function.

- **There's also a notable difference in beta cellular proliferation between age groups**
  - In adolescent mice, fasting led to a decrease in the replication and survival of beta cells. The study used a marker called BrdU to track cell proliferation, revealing that beta cells in fasting-exposed young mice were dividing at a much lower rate. In contrast, older mice showed no such decline, and their beta-cell function actually improved.<sup>8</sup>

Stephan Herzig, a professor at TUM and director of the Institute for Diabetes and Cancer at Helmholtz Munich, comments:

*"Our study confirms that intermittent fasting is beneficial for adults, but it might come with risks for children and teenagers. The next step is digging deeper into the molecular mechanisms underlying these observations. If we better understand how to promote healthy beta cell development, it will open new avenues for treating diabetes by restoring insulin production."*<sup>9</sup>

## **Intermittent Fasting Is Not a 'One-Size-Fits-All' Strategy**

It's no secret that obesity is a growing problem among the youth today. According to the U.S. Centers for Disease Control and Prevention (CDC), 14.7 million U.S. children ages 2 to 19 are now considered obese — that's 19.7% or nearly one-fifth of all children in the country.<sup>10</sup>

Hence, many concerned parents, as well as older teens, are often looking for strategies to manage weight and most of them resort to fasting. For more facts about childhood obesity, read "[Toddler Obesity Is on the Rise](#)."

But as the featured research shows, even a healthy strategy like intermittent fasting could backfire, especially for younger audiences. Instead of long-term fasting, I believe that a more effective way to regain your health and address metabolic issues like obesity and diabetes is to evaluate your lifestyle and diet. For children whose bodies are still developing, the key to long-term metabolic health isn't restriction — it's supporting their body's natural growth and energy needs.

For young adults who are looking to change their eating habits, here are tips to ensure your metabolism stays strong and resilient:

- **Eat enough carbohydrates to fuel cellular energy** — Your body needs carbohydrates to produce insulin and maintain stable blood sugar. If you restrict carbs too much, you put unnecessary stress on beta cells, which leads to insulin dysfunction. A child's optimal carbohydrate intake depends on age, activity level, and overall energy needs. Based on general dietary guidelines:
  - **Toddlers (1 to 3 years)** — ~30 to 150 grams/day
  - **Young children (4 to 8 years)** — ~150 to 180 grams/day
  - **Preteens (9 to 13 years)** — ~180 to 220 grams/day
  - **Teenagers (14 to 18 years)** — ~220 to 250+ grams/day (approaching adult needs, especially for active teens)

These amounts ensure proper cellular function, brain development, and sustained energy levels. Healthy sources include fruits, vegetables, whole grains, and legumes.

- **Remove processed seed oils that disrupt insulin function** — One of the biggest hidden threats to metabolic health is excess linoleic acid from seed oils. These fats accumulate in your tissues and interfere with mitochondrial energy production, increasing stress on beta cells.

If you're eating out frequently or consuming packaged foods, you're likely getting too much. Replace seed oils with saturated fats from tallow, grass fed butter, or ghee. Avoid fried foods at restaurants, as even "healthy" options are often cooked in industrial oils.

- **Prioritize balanced meal timing over fasting** — Instead of skipping meals, aim for consistent eating patterns that support metabolic stability. Your body thrives on regular nutrient intake, especially during adolescence when growth and hormonal

balance are at their peak.

Eating every three to five hours ensures beta cells receive a steady glucose supply, reducing stress on insulin production. If you've been practicing fasting and feel sluggish, cold, or have irregular energy levels, it's a sign to adjust your approach and incorporate more frequent meals. To learn more about meal timing, read "[How Meal Timing Impacts Your Blood Sugar Levels](#)."

- **Get sunlight exposure for metabolic support** — Your metabolism isn't just influenced by food — sunlight also plays a crucial role in energy production. Morning sunlight exposure helps regulate circadian rhythms, which are tied to insulin sensitivity. Sunlight also promotes mitochondrial energy production, supporting overall cellular function.

If you've been avoiding the sun or spending most of your time indoors, gradually increase your daily sun exposure, but avoid high-intensity sunlight if you're still clearing vegetable oils from your system. When exposed to peak sunlight, the linoleic acid (LA) in these oils oxidize in your body, triggering inflammation and DNA damage.

To mitigate this problem, you need to work to purge LA from your body. In the meantime, avoid midday sun exposure until you've been off seed oils for at least six months. Go outside in the early morning or late afternoon instead. For more tips on optimizing sun exposure, check out "[2024 International Virtual Vitamin D Forum Unlocks the Power of Vitamin D](#)."

- **Support gut health to improve blood sugar regulation** — Your gut microbiome plays a major role in how your body processes carbohydrates and manages insulin function. If you have digestive issues, bloating, or irregular energy levels, your microbiome might not be supporting you properly.

Start by introducing *Akkermansia muciniphila*, a beneficial gut bacterium that strengthens the gut lining and improves insulin sensitivity. Avoid excessive fiber if your gut is compromised — stick to easily digestible carbs first, then gradually

reintroduce more fiber as your digestion improves. Butyrate supplementation is another option.

The key to a strong metabolism isn't restriction — it's providing the right fuel, balancing meal timing, and removing metabolic stressors. Addressing these root causes now will set the foundation for long-term metabolic resilience.

## **FAQs — Commonly Asked Questions About Intermittent Fasting for Adolescents**

**Q: Why is intermittent fasting during adolescence different from fasting as an adult?**

**A:** Intermittent fasting impacts metabolism differently depending on age. The research found that while adults and older individuals experienced improved insulin sensitivity and better glucose regulation, adolescent mice developed impaired beta-cell function.

Since beta cells are responsible for producing insulin, this means fasting disrupted their ability to regulate blood sugar properly, which leads to long-term metabolic issues.

**Q: How does fasting affect insulin production in younger individuals?**

**A:** The study revealed that fasting-exposed adolescent mice had fewer mature beta cells and lower levels of insulin production. Their pancreatic cells failed to develop properly, mimicking patterns seen in Type 1 diabetes.

Insulin production is crucial for maintaining stable blood sugar levels, and when beta cells don't mature correctly, the risk of insulin resistance, blood sugar imbalances, and metabolic dysfunction increases. In contrast, older individuals

whose beta cells were already fully developed were able to benefit from fasting without these negative effects.

**Q: What are the risks of long-term intermittent fasting for teenagers?**

**A:** Long-term fasting in adolescents leads to impaired insulin secretion, increased cellular stress, and disrupted metabolic regulation. The research found that beta-cell function declined in young mice that underwent prolonged fasting, leading to lower insulin production and reduced ability to handle glucose.

This could set the stage for insulin resistance, metabolic dysfunction, and a higher risk of developing Type 1 or 2 diabetes later in life. Since the adolescent body is still developing, fasting could interfere with crucial hormonal and cellular processes needed for lifelong metabolic stability.

**Q: What can teenagers and young adults do instead of fasting for metabolic health?**

**A:** Instead of restricting food intake through fasting, young individuals need to focus on balanced eating patterns that support cellular energy and beta-cell function. Eating enough carbohydrates — around 250 to 300 grams per day — ensures stable insulin production and metabolic regulation. Prioritize whole-food carbohydrates like fruit, root vegetables, and fiber-rich foods to support long-term glucose control.

Removing processed seed oils, optimizing gut health, and getting regular sunlight exposure are also key strategies to maintain healthy metabolic function without the effects associated with fasting.

**Q: Can intermittent fasting permanently damage metabolism in younger individuals?**

**A:** The long-term effects of adolescent fasting on metabolism are still being explored, but the study suggests that prolonged fasting at a young age could cause lasting disruptions in insulin function. Since fasting-exposed adolescent mice showed genetic patterns similar to those seen in Type 1 diabetes, there is concern that fasting causes metabolic stress that leads to long-term dysfunction.

However, adopting proper nutrition and lifestyle habits — such as regular meal timing, adequate carbohydrate intake, and avoiding metabolic disruptors like seed oils — helps restore and protect metabolic health.

## Sources and References

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- <sup>1</sup> [Immunology, October 2024, Volume 173, Issue 2, Pages 227-247](#)
- <sup>2, 7, 8</sup> [Cell Reports, February 25, 2025, 44, 115225](#)
- <sup>3, 4, 9</sup> [News-Medical.net, February 14, 2025](#)
- <sup>5, 6</sup> [Study Finds, February 16, 2025](#)
- <sup>10</sup> [CDC, Childhood Obesity Facts](#)