

THE RELATIONSHIP BETWEEN NUTRITION AND AUTISM SPECTRUM DISORDER: A REVIEW OF EVIDENCE-BASED AND UNPROVEN DIETARY INTERVENTIONS

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Abstract

Several diets have been touted in recent years as possible assistance in autism, frequently based on anecdotal parental accounts or popular internet recommendations. The most popular are gluten- and casein-free, ketogenic, and other exclusionary diets. To see if any of these are supported in current research, five such studies published after 2021 were chosen and examined in our review. Consistency is lacking in the results. While several small trials show minimal improvement in selected areas, the majority of results remain inconclusive or compromised due to flawed methodology. Some diets also pose a potential risk for nutrition-related harm. Balanced, varied nutrition, particularly that which is beneficial to intestinal health, may prove more practical, in any case, due in part to the newly established associations between autism and gut imbalances in microbes.

Keywords: Autism Spectrum Disorder (ASD), Dietary Interventions, Gut Microbiota

Introduction

Autism spectrum disorder (ASD) usually appears early in life and tends to persist throughout life. It primarily affects communication, behavior, and relationships with others. The rise in diagnoses over recent years has led many to assume that ASD is becoming more common. Muhle et al. (2004) emphasized that no single factor explains ASD; instead, it is the result of both inherited genetic vulnerabilities and environmental triggers. One large-scale review by Gardener et al. (2009) looked at 50 prenatal risk factors and found that complications like hypertension or gestational diabetes during pregnancy are associated with a higher chance of ASD, underlining how critical maternal health can be.

In terms of how widespread ASD is, there is no perfect number. Salari et al. (2022) reviewed 74 studies encompassing over 30 million people and determined a global prevalence of approximately 0.6%. However, this ranged from 0.4% in Asia to 1.7% in Australia, illustrating the significant differences between countries. Differences in diagnosis, healthcare access, and general awareness likely account for that variation. One thing that does remain relatively stable is that ASD is far more often diagnosed in males than females, Zeidan et al. (2022) and Talantseva (2023) report a ratio close to 4:1. In the U.S., around 1.7% of 4-year-olds and 1.85% of 8-year-olds have ASD, while in Europe, the numbers tend to range from 0.38% to 1.55%.

ASD also frequently co-occurs with other conditions. ADHD is likely the most frequent comorbid, but anxiety, depression, epilepsy, sleep issues, and multiple issues with senses appear frequently, too. Bougeard et al. (2021) noted that symptoms such as anxiety and hyperactivity may become more prominent in adolescence. Thapar et al. (2023) established that depression was present in 10.6% of autistic adolescents, almost four times more than in neurotypical controls, and higher still in those with ADHD, up to 44.5%. Suicidality is more prevalent among autistic adults, too. Brown et al. (2024) did an exhaustive review and established that 34.2% of autistic adults experienced suicidal thoughts and 24.3% had made suicidal attempts. Those percentages

are much higher compared to the general population. Causes appear to multiply: depression, emotional fragility, exclusion, and co-occurring psychiatric problems.

Eating issues are another prevalent problem in individuals with autism spectrum disorders. Several studies (Keski-Rahkonen & Ruusunen, 2023) indicate a co-association between ASD and avoidant/restrictive food intake disorder (ARFID). Indeed, more than half of the ARFID children had ASD too. This is not surprising when we think of how prevalent sensory issues and restrictive eating for food choices are in autistic persons, frequently extending to teenage years or even adulthood. Vojdani et al. (2023) also mentioned common metabolism, immunity, and gut pathologies in autism individuals with autism, which indicate that certain dietary modifications may have an impact. Kawicka and Regulska-Ilow (2013) suggest that diet may have an effect on ASD symptoms, particularly those related to the gut and GI system. Gluten-free/casein-free (GFCF) or ketogenic diets, in addition to omega-3 fatty acids and numerous supplements, have been examined for this purpose. Peretti et al. (2018) went a step further and suggested that dysbiosis, a gut microbial imbalance, may trigger inflammation and lead to brain dysfunction through immune and metabolic mechanisms. To support this hypothesis, De Angelis et al. (2015) detected changes in gut bacteria in children with ASD, including elevated levels of *Clostridium* and *Desulfovibrio*, decreased microbial diversity, and an association between GI symptoms and behavior. Chen et al. (2022) added that even autistic persons who never had any GI symptoms have changed gut microbiota. They observed elevated levels of *Fusobacterium* and *Ruminococcus torques*, and decreased levels of *Parasutterella* and *Clostridium sensu stricto* 1 in their research, and these bacterial signatures were associated with emotional dysregulation and autism core features. Although we still don't comprehend the mechanisms, these observations suggest that gut microbiota may serve not only as a marker but also as an intervention site, particularly when personalized nutrition is taken into consideration (Vasile et al., 2024; Blendea et al., 2025).

Materials and methods

We began our research by examining the types of dietary recommendations most commonly recommended in the autism community. We belong to parental support groups, we surfed alternative health websites, and other casual sites where individuals frequently recommend methods they have tried. Throughout these, certain kinds of diets kept reappearing: gluten-free/casein-free, ketogenic, low-oxalate, and sugar-free, among others. From there, the second part was to see if science backs any of this. We searched Google Scholar for academic papers, mainly from 2021 onwards. I searched for meta-analyses, reviews, and individual studies that involve nutrition and ASD. From that group, I selected five studies that were both relevant and methodologically robust.

Results

Gluten-Free, Casein-Free (GFCF) Diet

Gluten-free, casein-free (GFCF) diets have been of interest in autism research. Keller et al. (2021) searched for six randomized, controlled trials and found no noticeable gains in any of them. Croall et al. (2021) noted that controlled trials have provided only weak support for the entire diet, taken as a whole. Hakim et al. (2023) examined seven randomized, controlled trials and only uncovered a non-significant decrease in maladaptive behaviors. Zafirovski et al. (2024) suggest that restrictive diets, such as GFCF, pose potential nutritional risks unless properly managed and monitored. Risky et al. (2024) indicated that parents who employed the diet tended to see only anecdotal, unconfirmed changes in their kids. There's also a bit of animal research to discuss. Al Dera et al. (2021) examined rats on high-gluten, high-casein diets. They uncovered increased gut

permeability, heightened oxidative stress, and indicators of neuroinflammation, physiological outcomes commonly mentioned in the autism literature.

Accordingly, despite specific positive case reports, mainly when gastrointestinal manifestations are present, the larger scientific record does not now favor interventions with GFCF diets in ASD.

Ketogenic Diet

The ketogenic diet (KD) has an increasing interest as a possible intervention in autism spectrum disorder (ASD). Li et al. (2021) examined both humans and animals and found potential improvements in several core ASD symptoms, such as repetitive behaviors, communication, and social engagement. But they emphasized the lack of high-quality clinical trials, suggesting that stronger evidence is needed. Varesio et al. (2021) highlighted factors such as mitochondrial support, reduced oxidative stress, and alterations in gut microbiota. These mechanisms may explain some positive outcomes observed in animal models, although data from human studies remain limited. Olivito et al. (2023) followed a child with ASD and comorbid epilepsy who was placed on a medically supervised long-term KD. They reported a reduction in seizure frequency and improvements in cognition and behavior. Allan et al. (2024) conducted a systematic review of ten studies. Most reported improvements in social interaction and cognitive function, but the authors noted that the studies varied significantly in design and sample size. This variability made it difficult to draw firm conclusions. Schrickel et al. (2025) conducted a meta-analysis that revealed a significant reduction in overall autism scores, using the classic ketogenic protocol, compared to more flexible diets.

Overall, while the ketogenic diet shows promise, it should be approached cautiously.

Feingold Diet

The Feingold diet often comes up in connection with autism. It was initially created for children with hyperactivity, not autism, and its primary focus is on eliminating synthetic food additives, including artificial colors, sweeteners, preservatives, and salicylates.

Tosun and Mendes (2022) noted that earlier studies connected the diet to lower hyperactivity. Matthews and Adams (2023) also reviewed similar additive-free diets and found that they lack reliable support for improving autism-related symptoms. Adıgüzel and Çiçek (2023) emphasized that most behavioral improvements attributed to the Feingold diet are speculative and lack evidence. Önal et al. (2023) suggest that any benefit might be due to placebo effects or natural behavior changes rather than the diet itself. Akhalil et al. (2023) warned that diets often promoted by caregivers aren't based on solid clinical research and might even contribute to imbalanced nutrition.

So overall, while the Feingold diet still gets attention in some circles, there is no evidence that it is suitable for autism.

Low Oxalate Diet

A low-oxalate diet, or LOD, is widely discussed on the internet among parents. Rodop et al. (2021) note that the diet typically excludes high-oxalate foods, such as spinach, cocoa, almonds, and beets, based on the hypothesis that oxalates may cause issues in the gut or trigger nervous system inflammation. Kaya and Taşci (2023) and Adıgüzel and Çiçek (2023) both refer to an increasing interest in LOD among parents, despite the lack of formal clinical evidence. Banerjee (2023) observed that specific observations revealed elevated levels of oxalates in ASD kids, yet it is not known if that is causative. Indika et al. (2023) are attempting to formulate more inclusive models that connect oxalates to gut microbiota imbalance and environmental toxin exposure, but these remain largely hypothetical.

Eventually, LOD has not been proven in controlled experiments. If you decide to experiment with it, medical advice is highly advised, since restrictive eating too strictly can do more harm than good if it is not carefully monitored.

Specific Carbohydrate Diet (SCD)

The Specific Carbohydrate Diet (SCD) is also popular among autism boards and mother blogs. Its purpose is to eliminate all complex carbohydrates, such as grains, lactose, and starchy foods, and replace them with monosaccharides. That's supposed to heal gut issues, such as dysbiosis and permeability, that supposedly have connections to behavior in ASD.

Åbele et al. (2021) and Önal et al. (2023) suggest that digestion may differ in children with autism. They observe that these kids may struggle to digest complex carbs properly, which could lead to inflammation or other gastrointestinal symptoms. Tajadod et al. (2025) tabulated accounts from parents who report that their child improved, becoming less irritable, more relaxed, and less distractible, but it is uncertain if this is due to the diet in any significant degree. Matthews and Adams (2023) observe that to date, there is no definitive proof, and nutrition risks could be potential. Mazurek et al. (2023) refer to a study that demonstrated gains in areas such as thinking and emotional regulation. But the experiment was small and had to be replicated.

So SCD may benefit confident children, perhaps in particular gut-symptom children, but it is not yet a clinically proven therapy for ASD.

Paleo diet

Matthews and Adams (2023) described this regimen as an internet-advertised alternative adopted by parents, which does not contain grains, dairy, or processed foods, and is sold online for its purported anti-inflammatory and mental health benefits; however, its effectiveness has not been proven in clinical trials. Banerjee (2022) asserts that the Paleo Diet is a speculative and unproven therapy for individuals on the autism spectrum. Briglia et al. (2024) discuss its potential for modulating gut microbiota and inflammation, and stress the absence of empirical results on its consequences for autistic individuals. Nagpal et al. (2025) also note the hypothesis-related advantages, yet affirm that non-specific ASD experiments demonstrate no clinical benefits. Generally, despite its hypothesis-related beauty, the Paleo diet cannot be supported as an evidence-supported intervention for autism.

Sugar-Free / Candida diet

The idea that *Candida* overgrowth might contribute to autism symptoms has gained some attention in recent years, primarily through parent groups and online health forums. The *Candida* diet is based on this concept, which involves cutting out sugars and refined carbohydrates to reduce the fungal load in the gut.

Chamtouri et al. (2024) researched children with ASD and found that *Candida* species were more commonly detected in autistic participants compared to neurotypical ones. Retnaningtyas et al. (2022) identified *Candida albicans* in stool samples from ASD children. While they suggested a possible connection to behavior, the research was observational and didn't give a clinical outcome.

Herman and Herma (2022) discussed how *Candida* might influence gut permeability and inflammation, which are sometimes associated with autism traits. But they also made it clear that causality hasn't been demonstrated. Nirmalkar et al. (2024) added an interesting detail: they found a bimodal distribution of *Candida* colonization, where higher yeast levels seemed to occur more frequently in children with more severe symptoms.

Still, despite all of this, no study so far has directly proven that *Candida* causes or worsens autism traits. And we don't yet have clinical trials showing that eliminating it through diet actually helps.

Discussion and Conclusion

Despite interest in dietary interventions for ASD, current evidence doesn't support any specific diet as effective. Many diets, such as gluten-free/casein-free, ketogenic, low-oxalate, Feingold,

specific carbohydrate, Paleo, and *Candida*, are promoted online; however, none have shown consistent, meaningful benefits in controlled studies. Because of the limited evidence, it is unjustified to follow diets for individuals with ASD solely for therapy. Until large, high-quality trials show clear benefits, dietary interventions shouldn't be considered evidence-based treatments for autism.

Instead of following restrictive elimination diets, an emerging perspective highlights the importance of restoring gut microbial balance. Several studies have observed that children with autism often have increased levels of *Fusobacterium* and *Ruminococcus torques*, and reduced populations of *Parasutterella* and *Clostridium sensu stricto* 1 (Chen et al., 2022). These microbial shifts could contribute to gastrointestinal inflammation and disrupted gut–brain communication. Rather than avoiding entire food groups, a more promising strategy could be to consume foods that help suppress pathogenic strains while boosting beneficial ones.

Clostridium cluster XIVa and *Parasutterella* produce butyrate, which helps reduce inflammation and support brain function. Kandeel et al. (2020) and Abuaish et al. (2021) both demonstrated that diets containing prebiotic fibers helped restore levels of these bacteria in animal models, accompanied by modest behavioral improvements. Liu et al. (2024) also found a connection between dietary diversity and higher levels of these taxa in children. Taken together, these results suggest the value of promoting fiber-rich, mixed diets to support the gut microbiome gently.

Fermented foods, such as kefir, yogurt with live cultures, sauerkraut, and kimchi, can also help maintain microbial balance (Leeuwendaal et al., 2022). In one study, fermented milk improved behavior in an autism mouse model by shifting the gut flora (Zhang et al., 2022). Another study found that fermented mushrooms encouraged the growth of beneficial bacteria in stool samples from autistic children (Saxami et al., 2023).

Taken together, this evidence suggests that instead of focusing solely on exclusionary diets with limited empirical support, parents might consider adopting a biodiversity-supporting, nutrient-dense diet, rich in prebiotics, polyphenols, fermented foods.

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