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## CASE REPORT

# MODULATION OF AUTISM SYMPTOMS IN A 13-YEAR-OLD BOY BY FOOD SUPPLEMENT JUVENIL

**Jela Hrnciarova [1,2], Anna Hanusova [1,3], Tereza Horakova [4], Josef Fusek [5,6], Klara Kubelkova [5]✉, Ales Macela [5]**

[1] Medical Faculty, Charles University, Hradec Kralove, Czech Republic
[2] Mental Health Centre, Hradec Kralove, Czech Republic
[3] HANNES Ltd., Clinic of Child and Adolescent Psychiatry in Hradec Kralove, Hradec Kralove, Czech Republic
[4] Special Educational Center, Hradec Kralove, Czech Republic
[5] University of Defence, Military Faculty of Medicine, Hradec Kralove, Czech Republic
[6] University of Pardubice, Faculty of Health Studies, Pardubice, Czech Republic

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**Summary**

Antidepressants, antipsychotics, anti-anxiety drugs, or sleeping pills are most often used to treat autism spectrum disorders. The treatment thus focuses on the manifestations accompanying autism, such as inattention, irritability, or sleep disorders, but does not address the essence of the social deficits of autistic children. In addition, drug treatment is often poorly tolerated. Since a certain association of autism with gut microbiota dysbiosis has been demonstrated, and given the existence of the microbiota-gut-brain axis, it can be assumed that modulation of the gut microbiota could contribute to the treatment of the essence of some Autism Spectrum Disorders category manifestations. Here, we present an example of the use of the nutritional supplement Juvenil to alleviate the manifestations of Autism Spectrum Disorders in a patient with Asperger's syndrome.

*Key words: Autism; Juvenil; Biological response modifier; Treatment; Social behavior*

## Introduction

One of the known behaviorally defined neurodevelopmental disorders is autism spectrum disorder (ASD). Children and adults with ASD lack specific clinical biomarkers. Moreover, ASD often manifests with a wide range of comorbidities including morphological, physiological, and psychiatric conditions (1). The co-occurrence of two or more disorders in the same individual was noticed. Comorbid conditions such as multiple psychiatric disorders anxiety, depression, attention deficit/hyperactivity disorder (AD/HD), epilepsy (2,3), gastrointestinal symptoms/problems (4), sleep disorders (5,6), learning disability (7–9), obsessive compulsive disorder (10,11), intellectual disability (12–14), sensory problems (15–17), and immune disorders (18,19) were found in ASD.

✉ University of Defence, Military Faculty of Medicine, Department of Molecular Pathology and Biology, Třebešská 1575, 500 01 Hradec Králové, Czech Republic
klara.kubelkova@unob.cz
☎ 420 973 255 193

Although there is no pharmacological cure for ASD, supportive therapies and other helpful techniques can aid in improving the quality of life to a certain degree. In the absence of a causal or specific treatment, certain medications are used with the aim of alleviating at least some of autism's symptoms. Cannabidiol is given to reduce the number or intensity of a variety of symptoms, including difficulties in social interaction, hyperactivity, self-harm and rage attacks, sleep problems, anxiety, restlessness, psychomotor agitation, irritability, aggression, persistence, and depression (20,21). Aripiprazole, risperidone, and haloperidol are used to reduce the severity of ASD symptoms, especially irritability, but these are associated with adverse metabolic and neurological events (22,23). There is also information on low-dose use of the well-tolerated anti-epileptic drug phenytoin (24). Methylphenidate, atomoxetine, and guanfacine are used to moderate the symptoms of ADHD and attention deficit disorder (25,26). Melatonin is recommended for the treatment of sleep disorders (27,28).

There are many uncertainties about the effectiveness of such remedies for individuals with ASD, and therefore alternative ways to ameliorate the manifestations of ASD are still sought. Nutritional and dietary treatments of people with ASD have demonstrated certain benefits. Dietary supplements containing minerals, vitamins, essential fatty acids, carnitine, digestive enzymes, and gluten-free, casein-free, or soy-free diets have been tested (29–31). Also in this case, there is still little evidence to support the use of nutritional supplements or dietary therapies for children with ASD (32). Over the past decade, ample evidence has accumulated about gut dysbiosis in autistic people (33–37). Microbiota compositions in children with ASD are significantly different from those in healthy controls (38). Nutritional supplements such as prebiotics, probiotics, and symbiotics, including fecal microbiota transplantation, have been used to reverse the gut dysbiosis of people with ASD to attain a microbiota composition of neurotypical individuals (39–41). Similarly, Juvenil, which is an alcohol–ether extract of bovine tissues that significantly modifies gut microbiota (42,43), can be included among effective nutritional supplements for autistic people (38). In this report, we present the case of a 13-year-old boy with Asperger's syndrome who was provided with the nutritional supplement Juvenil for 3 months. Egocentric child became, under the treatment of this food supplement, a pleasant boy; this situation is permanent up to date.

## Case description

### *Developmental and family history*

Thomas is a 14-year-old boy with a pervasive developmental disorder specified as Asperger's syndrome, which was diagnosed at 4 years of age. The parents of the child are healthy, without any history of genetic disease in the family. In the first trimester mother´s pregnancy was defined as high-risk. Childbirth was by caesarean section. Thomas underwent all vaccinations according to the current vaccination calendar valid in the Czech Republic. The boy started walking in the 11$^{th}$ month and talking in the 18$^{th}$ month of life. He has a dietary preference for dairy products and meat, consumption of fruits and vegetables is problematic, and the popularity of given foods served depends on the smell and taste of the foods. The parents observed certain "differences" in his development between the second and third year of age. According to the parents, these "differences" consisted in the fact that he did not normally play with toys, did not like strange environments, had problems falling asleep and sleeping, established certain rituals, was soothed by music and singing, had problems with social contacts, did not have eye contact, and he was a non-cuddly child. In kindergarten, he separated himself from the other children, was hypersensitive to sounds, also followed certain rituals and showed anxiety.

## Diagnostic assessment

At 4 years of age, he was diagnosed with pervasive developmental disorder – Asperger's syndrome and hyperkinetic syndrome at the Psychiatric Clinic of the University Hospital. When he entered the Elementary School, he was entrusted to the care of the Special Pedagogical Center, where he was tested for mental abilities, adaptability, and social skills. At that time, his mental abilities corresponded to the age norm, but there were certain irregularities. The area of nonverbal skills exceeded verbal skills. According to the examination, he had impaired phonological memory. He had difficulty with visual–motor coordination. His ability to adapt was significantly impaired; he had impulsive behavior, reacted impulsively, and demanded compliance with old-fashioned stereotypes. He refused to be alone anywhere. An overview of the results of outpatient psychiatric examinations at the Psychiatric Clinic is shown in Figure 1.

Not specified | Yes | Mitigated

| Behavioral parameters reported | 2015/I. | 2015/II. | 2016/I. | 2016/II. | 2017/I. | 2018/I. | 2020/I. | 2021/I. | 2022/I. |
|---|---|---|---|---|---|---|---|---|---|
| Fluctuating moods | yes | yes | yes | yes | yes | yes | yes | yes | yes |
| Impaired social contact | yes | yes | yes | yes | yes | yes | yes | yes | yes |
| Repeating questions and comments | yes | yes | NS | yes | NS | NS | yes | yes | yes |
| Intolerance of change | yes | yes | yes | yes | yes | yes | yes | mitig. | yes |
| Reduced ability to empathize | yes | yes | yes | yes | yes | yes | yes | yes | yes |
| Stereotypical elements of action | yes | yes | yes | yes | yes | yes | yes | yes | yes |
| Aggressive attacks | no | yes | mitig. | yes | yes | yes | yes | NS | yes |
| Unrest | yes | yes | yes | yes | yes | yes | yes | yes | yes |
| Adaptation problems | yes | yes | yes | yes | yes | yes | yes | yes | yes |
| Special intonation of speech (sentence structure) | NS | yes | yes | yes | yes | NS | yes | yes | yes |
| Is not time oriented | NS | NS | NS | yes | yes | yes | yes | yes | yes |

**Figure 1.** Longitudinal assessment of the boy's psychological state. The beginning of the assessment corresponds to the beginning of the boy's care at the Psychiatric Clinic of the University Hospital in Hradec Kralove. The results are a summary for the entire period of the care. The assessment "no" means the absence of this behavioral parameter, the assessment "NS" - insignificant, the assessment "Yes" indicates a significant manifestation of this parameter. "Mitigated" indicates an improvement in the given behavioral parameter compared to the previous period.

Initially, during the first outpatient examination (2015), only supplementation with omega-3 fatty acids was recommended. During the next examination, Novo-Passit syrup (TEVA Pharmaceuticals Czech Industries, Ltd.), a preparation that is a combination of plant extracts with a sedative effect and guaifenesin) and supplementation with B vitamins were recommended. Subsequently, in 2016, Pediakid syrup (Laboratoires INLDEA, France) was further recommended. In the summer of 2016, due to the development of symptoms of the disease (aggressive behavior and anxiety), the medication was supplemented with Sertivan 50 mg tablets (Hexal AG, Germany) and Strattera 40 mg (Eli Lilly and Company Ltd., Spain). Due to the boy's non-improving condition, the medication was changed to Circadin 2 mg (Temmler Pharma GmbH & Co., Germany) and Sertivan 50 mg at the end of 2016. The following year, Sertivan was changed to 7 drops of Seropram (H. Lundbeck A/S, Denmark), Cirkadin remained, and Melatonin Sníček (Pharma Activ Czech) was recommended if there occurred trouble falling asleep. In October 2018, the medication was changed again. Seropram was gradually discontinued by reducing the number of drops, melatonin remained, and Risperdal (Janssen-Cilag S.P.A., Italy), 0.1 ml at evening, was newly prescribed. Atarax 25 mg tablets (UCB S.A. Pharmaceutical sector, Belgium) were recommended for anxiety. Due to the boy's unchanged mental state, in terms of irritability, urgency, worries, and fear, Seropram was prescribed again for the following years, it was recommended to omit Cirkadin, and Trittico 75 mg tabs (Angelini Pharma, Italy) were newly prescribed. In 2021, Fevarin 50 mg capsules (Viatris Healthcare Ltd., Dublin) were prescribed instead of Seropram. It was recommended to take Splenyto 1 mg (Iberfar Indústria Farmaceutica, S.A. Portugal) or another product with melatonin at evening. This medication remained stable until the use of the Juvenil food supplement in May 2024. Despite the various medications designed to alleviate the symptoms of Asperger's syndrome, basic behavioral patterns remained virtually unchanged throughout (Figure 1).

*Application of food supplement Juvenil and its effect on behavioral parameters*

Food supplement Juvenil (Uniregen, a.s., Czech Republic) is an alcohol–ether extract of beef tissues. Based upon tests performed on animal models and the results of clinical studies, the food supplement Juvenil (Uniregen, a.s., Czech Republic) was labeled as a biological response modifier with psychobiotic properties (43). A dosage of 1.5 mg in capsules to be administered twice daily was chosen for Thomas.

Twenty-three parameters were determined to assess changes in the boy's behavior based on Juvenil supplementation; 12 parameters were from the area of behavior itself, 5 parameters were focused on his thinking, 3 on emotional experiences, and finally 3 on sleep and its quality. The given parameters were evaluated by the mother twice a week, on Wednesday and Sunday. The evaluation took place over 4 months, during which time the boy was given Juvenil in the specified dose (Figure 2).


| Monitored behavior parameters | | Weeks | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | // | 14 | 15 | 16 | 17 | 18 |
| **Behavior** | Passion for details | | | | | | | | | // | | | | | |
| | Management with rituals | | | | | | | | | // | | | | | |
| | Clinging to stereotypes | | | | | | | | | // | | | | | |
| | Solitariness | | | | | | | | | // | | | | | |
| | Overreaction | | | | | | | | | // | | | | | |
| | Abnormal reaction | | | | | | | | | // | | | | | |
| | Weird behavior | | | | | | | | | // | | | | | |
| | Attention | | | | | | | | | // | | | | | |
| | Depression | | | | | | | | | // | | | | | |
| | Anxiety | | | | | | | | | // | | * | * | | |
| | Explosiveness | | | | | | | | | // | | | | | |
| | Mood | | | | | | | | | // | | | | | |
| **Thought** | Ability to understand ordinary communication | | | | | | | | | // | | | | | |
| | Ability to engage in communication | | | | | | | | | // | | | | | |
| | Level of abstract thinking | | | | | | | | | // | | | | | |
| | Level of understanding of commands | | | | | | | | | // | | | | | |
| | Ability to understand human feelings | | | | | | | | | // | | | | | |
| **Feelings** | Hypersensitivity to noise | | | | | | | | | // | | | | | |
| | Color sensitivity | | | | | | | | | // | | | | | |
| | Hypersensitivity to smells and odors | | | | | | | | | // | | | | | |
| **Sleep** | Difficulty falling asleep | | | | | | | | | // | | | | | |
| | Sleep duration and quality | | | | | | | | | // | | | | | |
| | Assessment of awakening | | | | | | | | | // | | | | | |

**Figure 2.** Twenty-three parameters were selected to monitor the boy's psychological state, covering the parameters "Behavior", "Thought", "Feeling", and "Sleep". The assessment was performed subjectively by the boy's mother weekly, always on Friday. No further changes were observed between weeks 8 and 14, therefore this time period is omitted to simplify the table. Changes in the boy's behavior were rated as "Poor" if the change was not observable, "Average" if the change occurred but was not significant enough, and "Very good" if the change was a completely significant and stable enough.

According to his mother's assessment, Thomas rid himself of dark thoughts, lost his negative attitudes toward the world around him, and began to perceive his surroundings and activities around him positively. The anxiety has also disappeared, Thomas looks forward to school, albeit more to the teachers than to his classmates, but he feels tired toward the end of the school year. At the end of the holidays, however, he looks forward to school again. During the 15$^{th}$ and 16$^{th}$ weeks of Juvenil administration, the mother suffered from a digestive illness. At that time, Thomas had pains of psychosomatic origin (confirmed by a doctor). When the mother stabilized, Thomas' health returned to normal. This temporary change shows that Thomas, who was only interested in himself, has stopped being egocentric. He now shows interest about his mother and all family members every day. He wants to receive more information, asks his parents about things, and has started actively to search for information in books. He is interested in being part of events and participating in independent decision-making.

In addition, Thomas' stools have improved without the previous worries he had before using the Juvenil food supplement; he no longer suffers from constipation. He also has stopped complaining of abdominal pain. There has been a significant improvement, too, in his falling asleep and the quality of his sleep. He stopped tossing and turning in bed at night and stopped talking in his sleep. The objectivity of the mother's assessment of the boy's health status can be supported by the fact that she and the grandfather have a health care and medical university education, respectively.

## Conclusion and patient perspective

A targeted examination at the HANNES Ltd., Outpatient Department of the Clinic of Child and Adolescent Psychiatry in Hradec Kralové, Czech Republic after completing of Thomas' supplementation with the Juvenil noted an overall improvement in his psychological state. He is not negative; he has started to be interested in what is happening around him. He is in the eighth grade of elementary school, learns well, is very talkative, and there are no problems with his behavior. His ability to understand human feelings has improved, he is better involved

in conversation with adults, and there is no verbal aggression now. Although he is able to be with children, he is still a loner and has better contact with adults.

An objective assessment at the Psychiatric Clinic of a University hospital revealed: improvement in an intensity of depression and mood, negativism decreased, he is better involved in communication (especially with adults), overall social contact was improved based on improved communication, no signs of physical self-aggression after administration of Juvenil. Social awkwardness, rigidity of attitudes and interests, stereotyped movements, peculiar intonation of speech, peculiar sentence structure and certain stereotypes however still persist (Figure 3). Conclusion: Asperger's syndrome, recommended medication: Fevarin 125 mg in the evening, Splenyto 1 mg.

Not observed Yes Improved

| **Behavioral parameters reported** | **2023/I** | **2024/I** |
|---|---|---|
| Fluctuating moods | yes | improved |
| Impaired social contact | yes | yes |
| Repeating questions and comments | yes | improved |
| Intolerance of change | yes | yes |
| Reduced ability to empathize | yes | improved |
| Stereotypical elements of action | yes | improved |
| Aggressive attacks | yes | not observed |
| Unrest | yes | improved |
| Adaptation problems | yes | yes |
| Special intonation of speech (sentence structure) | yes | yes |
| Is not time oriented | yes | improved |

**Figure 3.** Evaluation of the boy's behavioral parameters by the Psychiatric Clinic during the last examination before supplementation with Juvenile and behavioral parameters during the examination after supplementation was discontinued. A rating of „yes" means the presence of a given parameter in the boy's behavior, "improved" - improvement in a given parameter, and "not observed" means the disappearance of this behavioral trait.

## Discussion

The publication of this case report complements the findings presented in the previous study. It can be stated that not all behavioral changes occur after supplementation at the same time and that the dynamics of changes occur after only a week of supplementation with Juvenil. This food supplement represents a complex of natural molecules containing free amino acids, including all the essential ones, short peptides, nucleotides, and traces of phospholipids. All components of the extract are, among other things, important components needed for cell proliferation and maintaining the functional profile of the body's cellular systems, including the immune and nervous system. This extract has been tested in a number of domestic and foreign scientific institutions, and the essence of its biological effect is multifactorial. There are two working hypotheses for its effects. The first is that Juvenil helps normalize the intestinal microbiome and eliminates dysbiosis, which, through the microbiota–gut–brain axis, is reflected in modulation of the expression of functional systems of the body. Alternatively, it can be assumed that some specific short peptides contained in Juvenil find corresponding receptors on various cell types and that their ligation leads to the activation of predetermined cellular functions.

Recently, we demonstrated the alteration of gut microbiota in children with ASD. An altered composition of gut microbiota of children with ASD was modulated toward a neurotypical profile by 3 months' supplementation of ASD children with the Juvenil preparation. Along with the modification of the gut microbiome, Juvenil positively modified some manifestations of autism in ASD children, namely in the categories of motor manifestations, visual reactions, fear and nervousness, nonverbal communication, and activity level. Regarding the presented case of Asperger's syndrome in the boy Thomas, it can be stated that the egocentric child became a pleasant boy who does care about how others are doing and how he feels. No impulse for this turnaround can be found other than

the effect of the food supplement. The same applies to the improved sleep and digestion, including the improved stool. Then again, the improvement in communication can also be attributed simply to the child's natural development. Moreover, we must admit that the main outcomes of this study rely on the mother's subjective reporting, but in general terms they are supported by the results of a clinical evaluation. Despite all the improvements, Juvenil cannot be considered a cure for Asperger's syndrome; it provides relief to the child and parents, but the essence of the syndrome remains intact.

**Author contributions**

**JH** – Data curation, formal analysis; **AH** – Outpatient examination, psychological examination, data collection; **TH** – Psychological examination; **JF** – Data curation; writing – original draft; **KK** – Data curation, writing – original draft – review and editing; **AM** – Conceptualization, data curation, formal analysis, writing – original draft.

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**Conflict of interest statement**

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

**Ethics approval and informed consent statement**

Written informed consent was obtained from the patient and his parent for publication of this case report and accompanying data. Copies of the written consents were collected in accordance with the journal's patient consent policy. Our institution does not require ethical approval for reporting individual cases or case series.

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