

## AUTISM SPECTRUM DISORDERS (ASD)

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### ABSTRACT

Autism or Autism Spectrum Disorders (ASD) is a serious neurological disorder affecting communication skills, social interactions, adaptability in an individual, and also causes dramatic changes in behavioral patterns. This condition typically lasts throughout one's lifetime and affects both, children as well as adults. Research has shown a tenfold increase in autism cases over the past decade and still rising at an alarming pace. The origins of autism are not known even to modern science. Autism exists at different levels in individuals affected by the disease and is classified into five types. Symptoms for autism are more pronounced and prevalent in children compared to adults. Though some studies attribute autism to gene abnormality, science is yet to furnish hard facts about exact autism causes. Scientists and doctors are also unanimous in their opinion that autism, as of yet, has no cure. Treatments of autism are widely available and help in alleviating the symptoms of autism which make living with the condition easier.

Several factors work together in causing autism but isolation and identification of a chief cause or causes has yet to be accomplished by modern science. Some people mistakenly believe that autism is related to bad parenting, vaccinations, or malnutrition. But these misconceptions are due to improper knowledge related to the disease. Symptoms of autism usually surface within the first two years of birth in children. Autistic children usually avoid eye contact and are poor imitators of sound together with a disliking towards a change in routines as well as non adaptability to new environments. At present, there is an absence of medical tests which can diagnose autism. The diagnosis of autism is largely based on developmental history and behavioral patterns. Medicinal treatments of autism have a downside as autism patients develop resistance to certain drugs over long period of use. All types of autism demand a good plan of treatment, or an appropriate management therapy to better deal with the disease. Autism is a lifetime disease that can be controlled to a vast degree with proper care and due attention.

**Key words:** Autism Spectrum Disorders, Behavioral patterns, Gene abnormality, Management therapy, Neurological disorder

### INTRODUCTION

Autism Spectrum Disorders(ASD) are developmental brain disorders that cause impaired social interaction, problems with verbal and nonverbal communication, and unusual, repetitive, or severely limited activities and interests.<sup>6</sup> The autism spectrum disorders can often be reliably detected by the age of 3 years, and in some cases as early as 18 months.<sup>14</sup>

Autism is a pervasive developmental disorder (PDD), a group of illnesses that involve delays in the development of many basic skills, most notably the ability to socialize or form relationships with others as well as the ability to communicate and to use imagination.<sup>5</sup>

Autism Spectrum Disorders (ASD), also known as Pervasive Developmental Disorders (PDDs), cause severe and pervasive impairment in thinking, feeling, language, and the ability to relate to others. These disorders are usually first diagnosed in early childhood and range from a severe form, called autistic disorder<sup>2</sup>

Autism is a spectrum disorder, and although it is defined by a certain set of behaviors, children and adults with autism can exhibit any combination of these behaviors in any degree of severity. Two children, both with the same diagnosis, can act completely different from one another and have varying capabilities.<sup>3</sup>

1. Autism (say: aw-tih-zum) causes kids to experience the world differently from the way most other kids do. It's hard for kids with autism to talk with other people and express themselves using words. Kids who have autism usually keep to themselves and many can't communicate without special help.
2. They also may react to what's going on around them in unusual ways. Normal sounds may really bother someone with autism — so much so that the person covers his or her ears. Being touched, even in a gentle way, may feel uncomfortable.
3. Kids with autism often can't make connections that other kids make easily. For example, when someone smiles, you know the smiling person is happy or being friendly. But a kid with autism may have trouble connecting that smile with the person's happy feelings.
4. A kid who has autism also has trouble linking words to their meanings.

5. Autism causes kids to act in unusual ways. They might flap their hands, say certain words over and over, or play only with one particular toy. Most kids with autism don't like changes in routines. They like to stay on a schedule that is always the same.<sup>1</sup>

The earliest well-documented case of autism is that of Hugh Blair of Borgue, as detailed in a 1747 court case in which his brother successfully petitioned to annul Blair's marriage to gain Blair's inheritance. The Wild Boy of Aveyron, a feral child caught in 1798, showed several signs of autism; the medical student Jean Itard treated him with a behavioral program designed to help him form social attachments and to induce speech via imitation.

The New Latin word autismus (English translation autism) was coined by the Swiss psychiatrist Eugen Bleuler in 1910 as he was defining symptoms of schizophrenia. He derived it from the Greek word autós(αὐτός, meaning self), and used it to mean morbid self-admiration, referring to "autistic withdrawal of the patient to his fantasies, against which any influence from outside becomes an intolerable disturbance".

The word autism first took its modern sense in 1938 when Hans Asperger of the Vienna University Hospital adopted Bleuler's terminology autistic psychopaths in a lecture in German about child psychology. Asperger was investigating an ASD now known as Asperger syndrome, though for various reasons it was not widely recognized as a separate diagnosis until 1981. Leo Kanner of the Johns Hopkins Hospital first used autism in its modern sense in English when he introduced the label early infantile autism in a 1943 report of 11 children with striking behavioral similarities. Almost all the characteristics described in Kanner's first paper on the subject, notably "autistic aloneness" and "insistence on sameness", are still regarded as typical of the autistic spectrum of disorders. It is not known whether Kanner derived the term independently of Asperger.<sup>1</sup>

### Characteristics

Different terms used to describe children within this spectrum, such as autistic-like, autistic tendencies, autism spectrum, high-functioning or low-functioning autism, more-abled or less-abled.

Every person with autism is an individual, and like all individuals, has a unique personality and combination of characteristics. Some individuals who are mildly affected may exhibit only slight delays in language and greater challenges with social interactions. They may have difficulty initiating and/or maintaining a conversation.<sup>3</sup>

People with autism also process and respond to information in unique ways. In some cases, aggressive and/or self-injurious behavior may be present. Persons with autism may also exhibit some of the following traits:

- Insistence on sameness; resistance to change
- Difficulty in expressing needs; using gestures or pointing instead of words
- Repeating words or phrases in place of normal, responsive language
- Laughing (and/or crying) for no apparent reason; showing distress for reasons not apparent to others
- Preference to being alone; aloof manner
- Tantrums
- Difficulty in mixing with others
- Not wanting to cuddle or be cuddled
- Little or no eye contact
- Unresponsive to normal teaching methods
- Sustained odd play
- Spinning objects
- Obsessive attachment to objects
- Apparent over-sensitivity or under-sensitivity to pain
- No real fears of danger
- Noticeable physical over-activity or extreme under-activity
- Uneven gross/fine motor skills
- Non-responsive to verbal cues; acts as if deaf, although hearing tests are in normal range<sup>3</sup>

Many children with autism can develop good functional language and others can develop some type of communication skills, such as sign language or use of pictures. Children do not "outgrow" autism, but symptoms may lessen as the child develops and receives treatment.

### Communication

About a third to a half of individuals with autism do not develop enough natural speech to meet their daily communication needs. Differences in communication may be present from the first year of life, and may include delayed onset of babbling, unusual gestures, diminished responsiveness, and vocal patterns that are not synchronized with the caregiver.

In the second and third years, autistic children have less frequent and less diverse babbling, consonants, words, and word combinations; their gestures are less often integrated with words.

### Repetitive behavior

- Autistic individuals display many forms of repetitive or restricted behaviour, which the Repetitive Behaviour Scale-Revised (RBS-R) categorizes as follows:
- Stereotypy is apparently purposeless movement, such as hand flapping, head rolling, or body rocking.
- Compulsive behaviour is intended and appears to follow rules, such as arranging objects in a certain way.
- Sameness is resistance to change; for example, insisting that the furniture not be moved or refusing to be interrupted.
- Ritualistic behaviour involves the performance of daily activities the same way each time, such as an unvarying menu or dressing ritual. This is closely associated with sameness and an independent validation has suggested combining the two factors.
- Restricted behaviour is limited in focus, interest, or activity, such as preoccupation with a single television program or toy.

- Self-injury includes movements that injure or can injure the person, such as biting oneself.
- No single repetitive behaviour seems to be specific to autism, but only autism appears to have an elevated pattern of occurrence and severity of these behaviours.<sup>4</sup>

### SIGNS & SYMPTOMS

Autism is a highly variable brain development disorder that first appears during infancy or childhood, and generally follows a steady course without remission. Symptoms tend to continue through adulthood, although often in more muted form.

It is distinguished not by a single symptom, but by a characteristic triad of symptoms: impairments in social interaction; impairments in communication; and restricted interests and repetitive behaviour. Other aspects, such as atypical eating, are also common but are not essential for diagnosis.<sup>5</sup> The common beliefs that people with autism never express emotion, never smile or laugh, never make eye contact, never talk, and never display affection are simply that-myths. Just as every person is unique, with his or her own personality and characteristics, every person with autism manifests the disorder in his or her unique way.

The list of symptoms and behaviors associated with autism is long, and each affected person expresses his or her own combination of these behaviors. None of these clinical features is common to all people with autism, and many are occasionally exhibited by people who are not autistic.

That said, however, all people with autism have abnormal functioning in 3 core areas of development: social interaction, verbal and nonverbal communication, and the presence of repetitive and restricted patterns of behavior, interests, and activities. The diagnosis of autism is typically made when impairment is significant in all 3 areas.

Impaired reciprocal social interaction - Examples include the following:

- Poor use of body language and nonverbal communication, such as eye contact, facial expressions, and gestures
- Lack of awareness of feelings of others and the expression of emotions, such as pleasure (laughing) or distress (crying), for reasons not apparent to others
- Remaining aloof, preferring to be alone
- Difficulty interacting with other people and failure to make peer friendships
- May not want to cuddle or be cuddled
- Lack of or abnormal social play
- Not responding to verbal cues (acting as if deaf)

Impaired communication - Examples include the following:

- Delay in, or the total lack of, the development of spoken language or speech
- If speech is developed, it is abnormal in content and quality.
- Difficulty expressing needs and wants, verbally and/or nonverbally
- Repeating words or phrases back when spoken to (known as echolalia)
- Inability to initiate or sustain conversation
- Absent or poorly developed imaginary play

Restricted repertoire of interests, behaviors, and activities –

Examples include the following:

- Insisting on following routines and sameness, resisting change
- Ritualistic or compulsive behaviors
- Sustained odd play

Repetitive body movements (hand flapping, rocking) and/or abnormal posture (toe walking)

- Preoccupation with parts of objects or a fascination with repetitive movement (spinning wheels, turning on and off lights)
- Narrow, restricted interests (dates/calendars, numbers, weather, movie credits)

There are a number of associated features and behaviors that are seen in some people with autism, including the following:

**Cognitive function:** Autism occurs at all intelligence levels. Although about 75% of autistic individuals have an intelligence quotient (IQ) below average, the other 25% have an average or above average intelligence. The performance IQ is generally higher than the verbal IQ. A small percentage have high intelligence in a specific area such as mathematics.

#### **Neurologic function**

- Seizures may develop in 25-35% of children with autism and can be resistant to treatment. The onset of seizures peaks in early childhood and again in adolescence. There is an increased risk of seizures in children with autism who have mental retardation or a family history of autism.
- Uneven gross and/or fine motor skills

#### **Behavioral symptoms**

- Aggressive or self-injurious behavior
- Noticeable extreme underactivity or overactivity
- Throwing tantrums
- Short attention span
- Abnormal responses to sensory stimuli (expressing oversensitivity or undersensitivity to pain)
- Abnormalities in eating or sleeping
- Not responding to normal teaching methods
- Playing in odd or unusual ways
- Having inappropriate attachment to objects
- Having no apparent fear of dangerous situations
- Mood and affect vary considerably, and may include being unaware of the feelings of others, withdrawn, or emotionally labile. Some people with autism become outwardly anxious or they may become depressed in response to the realization of their problems.
- In some children with autism who express affection, the affection may be indiscriminate<sup>6</sup>

#### **Do symptoms of autism change over time?**

For many children, symptoms improve with treatment and with age. Children whose language skills regress early in life—before the age of 3—appear to have a higher than normal risk of developing epilepsy or seizure-like brain activity. During adolescence, some children with ASD may become depressed or experience behavioral problems, and their treatment may need some modification as they transition to adulthood. People with ASD usually continue to need services and supports as they get older, but many are able to work successfully and live independently or within a supportive environment.<sup>11</sup>

#### **CLASSIFICATION**

These are definitions and characteristics of the five different autism disorders.

##### **Classic autism**

Autism is the second leading childhood developmental disorder and is considered the most severe of the different types of Autism disorders. People with Classic Autism develop language late, or not at all. People affected with Classic Autism have difficulties talking with other people or a profound lack of affection or emotional contact with others, an intense wish for sameness in routines, muteness or abnormality of speech, high levels of Visio-spatial skills, but major learning difficulties in other areas. Symptoms of autism usually appear during the first three years of childhood and continue throughout life. Autism is a spectrum disorder because the

severity of impairment in each of these areas differs in each individual.

##### **Aspergers syndrome**

A Person with Aspergers Syndrome can exhibit a variety of characteristics and the disorder can range from mild to severe. Children show deficiencies in social skill and have difficulties with transitions or changes. They compulsively cling to rituals and any changes in their routine can upset them. They have a great difficulty reading body language and determining proper body space. Some children with Aspergers Syndrome have reduced sensitivity to pain and an increased sensitivity to bright lights and loud noises. With this type of Autism disorders they also have average or above-average intelligence.

##### **Childhood disintegrative disorder**

Childhood Disintegrative Disorder includes severe regression in communication skills, social behavior, and all developmental motor skills. At the beginning these children seem perfectly normal. They start to regress at between ages 2-4 years. At that time these children stop socializing, lose potty-training skills, stop playing, lose motor skills and stop making friends.

##### **Rett syndrome**

Rett syndrome is a neurological and developmental disorder that mostly occurs in females and is marked by poor head growth. Loss of muscle tone is usually the first symptom. Other early symptoms may include problems crawling or walking and diminished eye contact. They stop using their hands to do things and often develop stereotyped hand movements, such as wringing, clapping, or patting their hands. The inability to perform motor functions is perhaps the most severely disabling feature of Rett syndrome, interfering with every body movement, including eye gaze and speech. Infants with Rett syndrome seem to grow and develop normally at first, but then stop developing and even lose skills and abilities.

##### **Pervasive developmental disorder-not other specified**

This tends to describe people who have many or all of the different types of Autism disorders. Children with PDDNOS either do not fully meet the criteria of symptoms used to diagnose any of the four specific types above, and/or do not have the degree of impairment described in any of the above four specific types.<sup>7</sup>

##### **CAUSES**

Autism affects about 1 in every 150 kids, but no one knows what causes it. Some scientists think that some kids might be more likely to get autism because it or similar disorders run in their families. Knowing the exact cause of autism is hard because the human brain is very complicated.<sup>9</sup>

Although autism is the result of a neurologic abnormality, the cause of these problems with the nervous system is unknown in most cases. Research findings indicate a strong genetic component. Most likely, environmental, immunologic, and metabolic factors also influence the development of the disorder.

There is probably no single gene or genetic defect that is responsible for autism. Researchers suspect that there are a number of different genes that, when combined together, increase the risk of getting autism. In families with one child with autism, the risk of having another child with autism is 3-8%. The concordance of autism in monozygotic twins is 30%. A number of studies have found that first-degree relatives of children with autism also have an increased risk of autism spectrum disorders.

In some children, autism is linked to an underlying medical condition. Examples include metabolic disorders (untreated phenylketonuria [PKU]), congenital infections (rubella, cytomegalovirus [CMV], toxoplasmosis), genetic disorders (fragile X syndrome, tuberous sclerosis), developmental brain abnormalities (microcephaly, macrocephaly, cerebral dysgenesis), and neurologic disorders acquired after birth (lead encephalopathy,

bacterial meningitis). These medical disorders alone do not cause autism as most children with these conditions do not have autism.

Environmental factors and exposures may interact with genetic factors to cause an increased risk of autism in some families.<sup>6</sup>

#### **PREVALENCE**

A recent study of a U.S. metropolitan area estimated that 3.4 of every 1,000 children 3-10 years old had autism.<sup>15</sup> A list of students with Autism is Shown in Table 1<sup>13</sup>

It is well established that autism occurs in four times as many boys as girls (NICHCY, 1999) and that there are no known racial, social, economic, or cultural distinctions. Although it is possible that there are some genetic linkages with some forms of autism, there are no associations with particular familial or cultural histories or practices. Earlier theories that implicated parents' behavior in the occurrence of autism have been thoroughly discredited.

There have been occasional speculations about clusters of autism in some areas of the country, and it has been suggested that such clusters may be associated with environmental contaminants or regional medical practices. To date, however, there have been no clear data that support these speculations.<sup>12</sup>

#### **MECHANISM OF ACTION**

##### **Molecular mechanisms of autism: a possible role for Ca<sup>2+</sup> signaling**

Autism spectrum disorders (ASDs) are a group of developmental disorders characterized by social and emotional deficits, language impairments and stereotyped behaviors that manifest in early postnatal life. The molecular mechanisms that underlie ASDs are not known, but several recent developments suggest that some forms of autism are caused by failures in activity-dependent regulation of neural development. Mutations of several voltage-gated and ligand gated ion channels that regulate neuronal excitability and Ca<sup>2+</sup> signaling have been associated with ASDs. In addition, Ca<sup>2+</sup>-regulated signaling proteins involved in synapse formation and dendritic growth have been implicated in ASDs. These recent advances suggest a set of signaling pathways that might have a role in generating these increasingly prevalent disorders.

Neuropathological studies of autistic patients suggest a wide spread defect in neuronal development that manifests in the early postnatal years. These developmental defects can lead to disruptions in the connectivity between brain areas involved in higher-order associations. Genetic studies suggest that autism has a strong genetic component that might involve the interaction of many different genes. many ASD candidate genes have been identified through genome scans for susceptibility loci on human chromosomes and through linkage and association studies. in a few cases, specific mutations in individual genes have been found to cause both syndromic and non syndromic forms of ASD

The causes of ASD lie in understanding how mutations in many different genes can ultimately produce specific deficits in cognitive and social behavior. one approach to tackle this problem is to look for signaling cascades that involve multiple ASD candidate genes. recent studies have identified many such genes that either directly or indirectly control intracellular ca<sup>2+</sup> levels or are regulated by elevations in neuronal ca<sup>2+</sup> levels. these genes encode ion channels, neurotransmitter receptors and Ca<sup>2+</sup>-regulated signaling proteins that are crucial for development of the central nervous system.

Early in neural development, spontaneous and sensory driven electrical activity leads to increased intracellular Ca<sup>2+</sup> levels and to activation of signaling pathways that are important in regulating processes such as neuronal survival, differentiation, migration and synaptogenesis.

Defects in these developmental processes could give rise to some of the neuro anatomical abnormalities identified in ASD patients, including increases in cell-packing density, decreases in neuron size and alterations in connectivity.

Genetic evidence from the past two years that supports the hypothesis that defects in activity-dependent signaling events are a molecular cause of autism. We also discuss a possible link between environmental factors that might lead to autism, and Ca<sup>2+</sup> signaling pathways in neurons that have been implicated in ASDs.

Environmental influences although autism has the strongest genetic component of any neuro-psychiatric disorder, the discordance in autism diagnosis between some monozygotic twins and the recent sharp rise in ASD prevalence suggest that the environment might also have an effect.

One of the most controversial and widely debated environmental influences is ethylmercury, which is a component of some vaccinations. Recent epidemiological studies suggest that these vaccines do not have a large effect on the development of ASDs, but a role for other sources of ethyl and methyl mercury cannot be discarded. Both ethyl and methyl mercury increase Ca<sup>2+</sup> signals by altering ryanodine receptors and other Ca<sup>2+</sup> signaling mechanisms in neurons, suggesting that they affect development by altering Ca<sup>2+</sup>-dependent pathways .In addition to mercury, embryonic exposure to the anticonvulsant valproic acid has been shown to lead to ASDs in a substantial percentage of patients.

Exposure of embryonic rats to valproic acid can lead to neuroanatomical and behavioral deficits similar to those seen in ASDs. Valproic acid is a common antiepileptic drug that can increase GABA production and so might increase electrical activity in the developing embryonic brain.<sup>8</sup>

#### **CONCLUSION FOR MECHANISM OF ACTION**

Ca<sup>2+</sup> signaling pathways integrate environmental stimuli with genetic programs to sculpt the adult nervous system. A body of recent genetic evidence suggests that some ASDs result from a failure in Ca<sup>2+</sup>-dependent development of the central nervous system (Figure 1). Whether this is a common cause of ASDs will need to be determined, both by epidemiological studies, to correlate ASDs with measures of cellular excitability such as cardiac QT intervals and electroencephalograms (EEGs), and by looking for additional ASD candidate genes. Much is known about the molecules that regulate activity-dependent development of the central nervous system and these will be a fertile ground to search for additional ASD candidate genes. Most of the ASD-associated mutations in genes that encode Ca<sup>2+</sup>-regulatory molecules lead to an increase in Ca<sup>2+</sup> signaling, suggesting that ASDs might arise from excessive activation of Ca<sup>2+</sup>-dependent processes. The specific mechanisms that connect misregulation of Ca<sup>2+</sup> signaling to the complex phenotype of ASD patients is a key question that will need to be addressed. Finally it will be interesting to test whether existing FDA-approved drugs that modify Ca<sup>2+</sup> signaling are effective pharmacological agents to treat or prevent ASDs.<sup>8</sup>

#### **Treatment**

There is no standard treatment for autism, and different professionals have different philosophies and practices in caring for their patients.

A pediatrician will refer the caregiver and the child to a specialist in developmental disorders for the assessment. Some people may want to have this specialist treat their child's condition, but they are free to seek treatment elsewhere.

When seeking a specialist to treat a child's autism, the opportunity should be available to ask questions and discuss the treatments available to the child. Be aware of all the options so that an informed decision can be made.

A reputable specialist will present each type of treatment, give the pros and cons, and make recommendations based on published treatment guidelines and his or her own experience.

The decision of which treatment to pursue is made with this specialist (with input from other members of the care team) and family members, but the decision is ultimately the parents.

There is no cure for autism, nor is there a standard therapy that works for all people with autism. A number of different treatment approaches have evolved over time as we have learned more about autism.

Different approaches work for different people. Accepted interventions may work for some and not for others. Different professionals, each with excellent credentials and experience, may disagree about what is the best approach for the child.

As a parent, one will learn to weigh each treatment recommendation in light of what he or she knows about their child and what makes sense for him or her.

Whatever approach is used for the child, an individualized treatment plan designed to meet his or her unique needs is essential.

Most people with autism show developmental progress and respond to a combination of treatment and education.

The traditional approach for a child with autism includes special education and behavioral management. There is some evidence that the earlier behavioral, educational, speech, and occupational therapy is begun, the better the long-term outcome. This is often an intensive and long-term commitment, and there is no easy answer. Behavioral treatments, medications, and other treatments may help manage some of the problems associated with autism.

Treatment strategies used in autism include behavioral, educational, biomedical, and complementary therapies. Some of these are supported by scientific studies, while others are not. It is important to discuss and consider the research support for the treatments chosen.<sup>6</sup>

#### **Is there a link between Autism and Vaccines?**

There is no conclusive scientific evidence that any part of a vaccine or combination of vaccines causes autism, even though researchers have done many studies to answer this important question. There is also no proof that any material used to make or preserve the vaccine plays a role in causing autism.

Although there have been reports of studies that relate vaccines to autism, these findings have not held up under further investigation.

Currently the U.S. Centers for Disease Control and Prevention (CDC) provides the most accurate and up-to-date information about research on autism and vaccines.<sup>10</sup>

#### **Medications**

Medication does not treat the underlying neurologic problems associated with autism. Rather, medication is given to help manage behavioral manifestations of the disorder, such as hyperactivity, impulsivity, attention difficulties, and anxiety. In most cases, medication is given to lessen these problems so that the person can receive maximum benefit from behavioral and educational approaches.

Medications used in autism are psychoactive, meaning they affect the brain. Those used most often include the following:

**Antipsychotic drugs:** This is the most widely studied group of drugs in autism. These drugs have been found to reduce hyperactivity, repetitive behaviors, withdrawal, and aggression in some people with autism. The newer, atypical antipsychotics, including risperidone (Risperdal), olanzapine (Zyprexa), and quetiapine (Seroquel), have replaced the older, traditional antipsychotics, which had more side effects.

**Antidepressants:** Selective serotonin reuptake inhibitors (SSRIs) are one class of antidepressants that are commonly used to treat people with depression, obsessive-compulsive disorder, and/or anxiety. In some people with autism, these drugs reduce repetitive behaviors, irritability, tantrums, and aggression. Examples of SSRIs include fluoxetine (Prozac), fluvoxamine (Luvox), sertraline (Zoloft), and paroxetine (Paxil). Other antidepressants, including Clomipramine (Anafranil), Mirtazapine (Remeron), amitriptyline

(Elavil), and bupropion (Wellbutrin), have less frequently been used.

**Stimulants:** Drugs used to treat attention-deficit/hyperactivity disorder (ADHD) may help some people with autism. These drugs work by increasing the person's ability to concentrate and pay attention and by reducing impulsivity and hyperactivity. Examples include methylphenidate (Ritalin) and amphetamines (Adderall, Dexedrine).

**Other drugs:** Other drugs may also help some people with autism. Anticonvulsants are frequently used to manage seizures in people with autism. Anticonvulsants may also be used to stabilize mood and/or behavior. Alpha-2 adrenergic agonists (clonidine) are also sometimes used to manage hyperactivity and behavioral problems in some individuals with autism. Buspirone (Buspar) and propranolol have also been used. Very few of these drugs have been tested in scientific studies in individuals with autism.

Moreover, issues related to dosage (especially important in children), monitoring, and interactions with other drugs and foods are concerns, as are short- and long-term side effects. Many of these medications have side effects such as sleepiness (sedation). Dependence may develop with some of these drugs. These drugs should be prescribed only by a medical professional experienced in treating persons with autism.

#### **Vitamins, Minerals, and Dietary Interventions**

Although many studies have been done to assess whether abnormal amounts of vitamins, minerals, or other nutrients can be found in people with autism, results have not clearly pointed to any abnormalities that are consistently linked with the disorder. Although few, if any, of these claims are backed up by scientific studies, parents and physicians alike have reported improvement in symptoms in people given certain supplements, including vitamin B, magnesium, cod liver oil, and vitamin C.<sup>6</sup>

#### **Dietary and Other Interventions**

In an effort to do everything possible to help their children, many parents continually seek new treatments. Some treatments are developed by reputable therapists or by parents of a child with ASD. Although an unproven treatment may help one child, it may not prove beneficial to another. To be accepted as a proven treatment, the treatment should undergo clinical trials, preferably randomized, double-blind trials, that would allow for a comparison between treatment and no treatment. Following are some of the interventions that have been reported to have been helpful to some children but whose efficacy or safety has not been proven.

Dietary interventions are based on the idea that

- 1) food allergies cause symptoms of autism, and
- 2) an insufficiency of a specific vitamin or mineral may cause some autistic symptoms.

If parents decide to try for a given period of time a special diet, they should be sure that the child's nutritional status is measured carefully.

A diet that some parents have found was helpful to their autistic child is a gluten-free, casein-free diet. Gluten is a casein-like substance that is found in the seeds of various cereal plants—wheat, oat, rye, and barley. Casein is the principal protein in milk. Since gluten and milk are found in many of the foods we eat, following a gluten-free, casein-free diet is difficult.

A supplement that some parents feel is beneficial for an autistic child is Vitamin B6, taken with magnesium (which makes the vitamin effective). The result of research studies is mixed; some children respond positively, some negatively, some not at all or very little.

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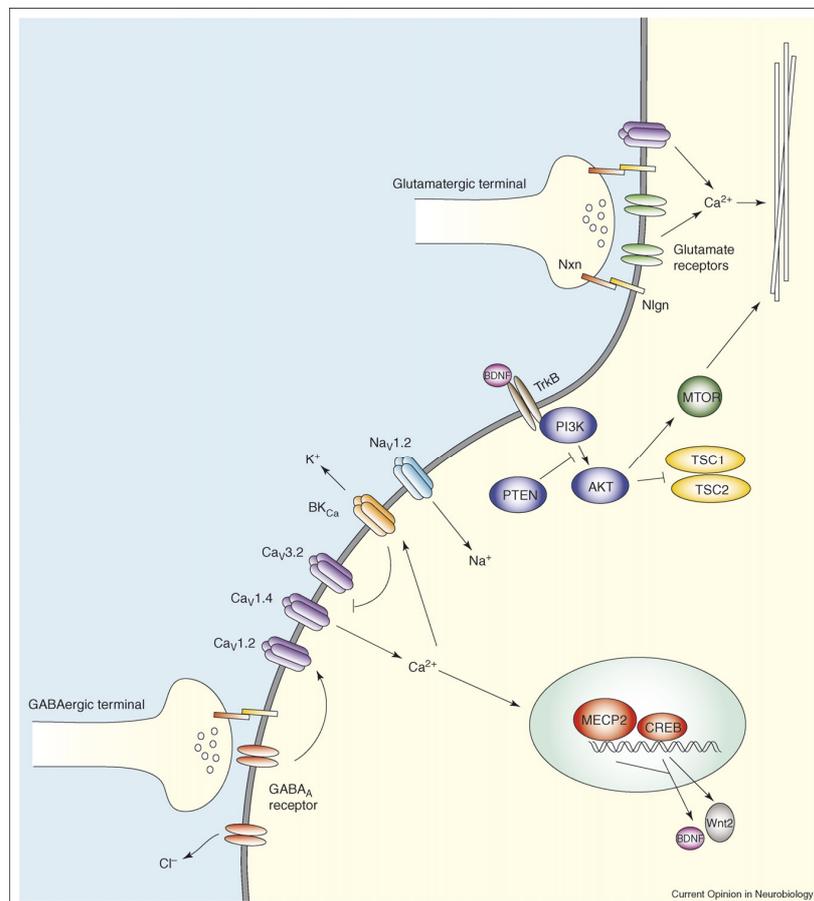
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**Table 1 : Students with Autism**

| Region               | Rate per 1,000 |
|----------------------|----------------|
| California           | 8.5            |
| Alameda County       | 8.7            |
| Contra Costa County  | 8.2            |
| Marin County         | 6.4            |
| San Francisco County | 8.0            |
| San Mateo County     | 10.3           |
| Santa Clara County   | 9.6            |



**Figure 1: Mechanism of Action**