# Project Research Paper

# Suratism

# STEM Egypt School for Girls

Created by

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## STEM Egypt School for GirlsYara Islam Abd El Aziz & Rawda Waleed Khafaga

**Abstract__** if someone is discouraged and need to take a break, we regularly leave him yet imagine a scenario where this misery is boundlessness. will we abandon him?
That what happens to Autism spectrum disorder (ASD) sufferers. It is a blemish happened to 1 of each 166 children all over the world. Those sufferers complicated from some disturbance in the brain in the purinergic cells exactly in the cerebellum. They almost have communication imperfection and other disorders. Our project aims to help people to deal with the ASD by knowing from old documented researches the symptoms of the ASD, diagnosing of it, some old therapies used. And finally, there will be a whole section for a kind of treatment for the ASD that was discovered to be a therapy for human sleeping sickness that called "Suramin" that helps in blocking the binding the eATP and eADP to the purinergic receptor. But, there's a problem with this cure as it causes rash. So, after long researches we found that there's a compound called Trisulfonaphthalen has a central role as a mediator of itching. It causes the rash after taking the Suramin. So, we concluded that we could use a safe cure called Benadryl which doesn't react or causing any bad effects.

***Keywords*: [Autism & Suramin & Purinergic & Rash & cerebellum]**

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## 1. Introduction

Autism Spectrum disorder (ASD) is a developmental disorder in which symptoms generally appears in the first two years of toddler's life. It's about three types or similar conditions including Asperger syndrome, Autism and PDD-NOS. ASD affects the person's social interaction, communication and behavior. Although a diagnosis can sometimes be made after 3 years of appearing the symptoms. According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), a guide created by the American Psychiatric Association used to diagnose mental disorders,
Restricted interests and repetitive behaviors
•Symptoms that hurt the person’s ability to function properly in school, work, and other areas of life. By knowing these symptoms it's estimated that there is about 1 of each 100 people in UK has ASD. There is no accurate cure for the ASD that causes the whole recovery. Almost, some treatments that decrease the worth of the disorder and some physiological therapies as speech and language therapy, occupational therapy, educational support, plus a number of other interventions are available to help children and parents to let them more sociable or to make them interact normally with people. Also, there is a treatment that called "Suramin" was invent to help people suffers from human sleeping sickness that helps in treatment of ASD as the mechanism of existing ASD is, Stressed cells emit ATP and other molecules made by mitochondria into the extracellular space

through channels in the cell membrane. Extracellular ATP (eATP) is an ancient danger signal. It is called a "damage associated molecular pattern" or DAMP. When too much eATP is emitted, it joins purinergic receptors and activates the CDR. So, Suramin blocks the binding of eATP and eADP to these receptors and sends the cellular equivalent of the "all's clear" or safety signal. But, there's a problem with this cure as it causes rash. So, after long researches we found that there's a compound of histamine has a central role as a mediator of itching. It causes the rash after taking the Suramin. So, we concluded that we could use a cure to resist rash which doesn't react or causing any bad


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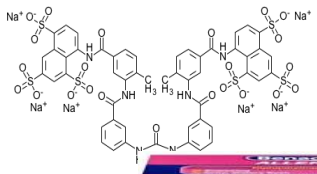
## 2. Materials

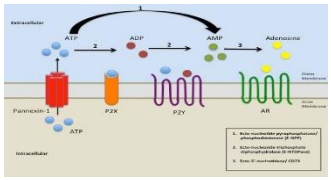
2.1 **Suramin ($C_{51}H_{40}N_6O_{23}S_6$)**: is 100 years old drug which used to many medical conditions such as African sleeping sickness. After searching we found that suramin has properties which is an anti-purinergic receptor so, we used it to treat Autism.

2.2 **Purinergic receptors:** they have 19 different types and they are a family of plasma membrane molecules that found in many types of cells specially in nervous cells. The receptors have been implicated in learning and memory, locomotor and feeding behavior, and sleep.

2.3 **ATP:** Inside the cell there are nucleotides like ATP that is a carrier energy and important molecules in normal metabolism but when cell be stressed by process called "damage associated molecular pattern" or DAMP, it releases ATP and other molecules made by mitochondria outside the cell through channels in the cell membrane and when too much eATP is released, it binds to purinergic receptors and activates the CDR which decrease the communication with cells and make the cell membrane thicker. Because of Suramin inhibits the binding of eATP and eADP to these receptors and return cell to a safety signals, we use suramin in this project by using 20mg/kg.

2.4 **Benadryl:** the results was very perfect and we observe big improvement in symptoms of ASD but also, we observe that patient can suffer from rash so, he can take Benadryl to treat it when he takes suramin.







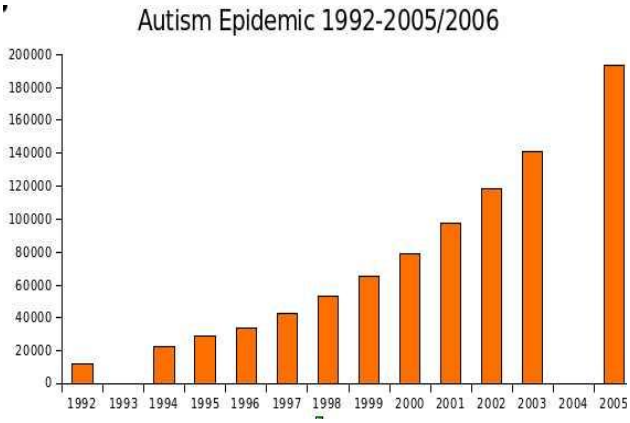
## 3. Test Plan

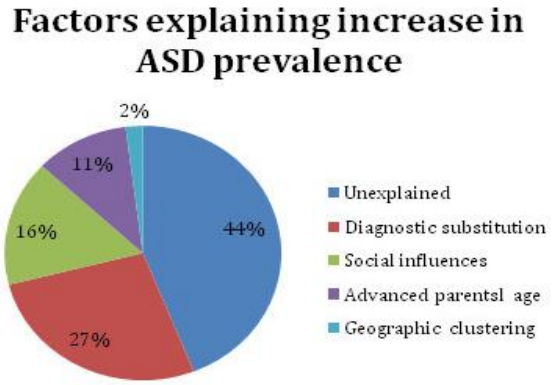
No drug is yet approved to treat the core symptoms of autism spectrum disorder

(ASD). Only Low‐dose suramin was effective in the maternal immune activation and Fragile X mouse models of ASD.
The Suramin Autism Treatment‐1 (SAT‐1) trial was a double‐blind, placebo‐controlled, translational pilot study to examine the safety and activity of low‐dose suramin in children with ASD. 1st edition (ADOS‐2) examination. Inclusion criteria were male subjects, ages 4–17 years, with a confirmed diagnosis of ASD. Exclusion criteria included children who weighed less than the 5th percentile for age, took prescription medications, or had laboratory evidence of liver, kidney, heart, Children with known syndromic forms of ASD caused by DNA mutation or chromosomal copy number variation (CNV) were excluded in this first study. Families were asked not to change their children's therapy or diet throughout the study period. The study was conducted between 27 May 2015 (date of the first child to be enrolled) and 3 March 2016 (date of the last child to complete the study). Ten male subjects with ASD, ages 5–14 years, were matched by age, IQ, and autism severity into five pairs, then randomized to receive a single, intravenous infusion of suramin (20 mg/kg) or saline. The primary outcomes were Expressive One‐Word Picture Vocabulary, aberrant behavior checklist, autism treatment evaluation checklist, repetitive behavior questionnaire, and clinical global impression questionnaire.

## 4. Results

Results Blood levels of suramin were 12 ± 1.5 μmol/L (mean ± SD) at 2 days and 1.5 ± 0.5 μmol/L after 6 weeks. The terminal half‐life was 14.7 ± 0.7 days. A self‐limited, asymptomatic rash was seen, but there were no serious adverse events. ADOS‐2 comparison scores improved by −1.6 ± 0.55 points (n = 5; 95% CI = −2.3 to −0.9; Cohen's d = 2.9; P = 0.0028) in the suramin group. Secondary outcomes also showed improvements in language, social interaction, and decreased restricted or repetitive behaviors. Safety Suramin has been used safely for nearly a century to treat both children and adults with African sleeping sickness. Although side effects occurred occasionally, the low dose of suramin used in this study produced blood levels of 1.5–15 μmol/L for 6 weeks. Previous studies have never. examined the side‐effect profile of suramin in this low‐dose range. The side‐effect profile of high‐dose suramin (150–270 μmol/L) is known from cancer chemotherapy studies. The side‐ effect profile from medium‐dose suramin (50–100 μmol/L) is known from African sleeping sickness studies. However, the side‐effect profile of low‐dose suramin (5–15 μmol/L) used for anti-purinergic therapy (APT) in autism is unknown. Low‐dose suramin was found to be safe in five children with ASD, ages 5–14 years, in this study.




## 5. Discussion

**5.1** The ASD caused by problems on cerebellum where all of the disorder happens which causes disturbance in social communication and interaction Also, up to 50% of people with severe learning difficulties have an ASD. There are many symptoms to diagnosis it and they include:

- Making inconsistent eye contact and do not look or listen to people when they talk because they have difficulty with eye contact, facial expressions, body language and gestures.
- Play alone and do not sharing or showing things to others.
- Being slow to respond to someone calling or talking them.
- Talking about their favorite things without giving others a chance to respond.
- Doing emotions do not match with what they are being said and they can find it hard to understand other people's emotions and feelings.
- Repeating certain behaviors like words.
- Flap their hand or twist or flick their fingers when they're excited or upset.
- Getting upset by slight changes in a routine.
- Being more or less sensitive from light, noise and temperature.
- Having a hyperactivity and be very active and do things fact and sometimes be very irritable.
- Speaking less than 50 different words by the age of two or not speaking at all.
- 70% of children which suffer from ASD have a non-verbal IQ.
- Remember information and able to learn in details also, have strong visual and auditory learners.
- Being perfect in one or more of these branches (math, science, music, art).

**5.2** Scientists don't know the exact causes of ASD and they are still trying to understand it. But, after searching we discovered many causes include:

- **Genes:** It's a hereditary trait which can transport from parent and it have certain genetic conditions like Down syndrome because they are more likely to have ASD.
- Children who have problems when they born such as very low birth and have an older parent.
- **MMR:** In the past, scientists think that MMR vaccine caused ASD and they had many studies around the world to know this link and there were millions of children involved these studies but unfortunately, researchers have found no evidence of a link between MMR and ASD.
- **Muscular dystrophy:** a group of inherited genetic conditions that gradually cause the muscles to weaken.

- **Down's syndrome:** a genetic condition that typically causes a learning disability and a range of physical features.
- **Cerebral palsy:** conditions that affect the brain and nervous system, causing problems with movement and co-ordination.
- **Infantile spasms:** a type of epilepsy that develops while a child is still very young (usually before they're one year old).
- **Neurofibromatosis:** a number of genetic conditions that cause tumors to grow along the nerve.

**5.3** Doctors diagnose ASD by looking at a person's behavior and development. ASD can usually be reliably diagnosed by the age of two. It is important for those with concerns to seek out assessment as soon as possible so that a diagnosis can be made, and treatment can begin. Diagnosis is often a two-stage process:

Stage 1: General Developmental Screening During Well-Child Checkups

- Every patient should receive well-child check-ups with a pediatrician or an early childhood health care provider. The American Academy of Pediatrics recommends that all children be screened for developmental delays at their 9-, 18-, and 24- or 30-month well-child visits and specifically for autism at their 18- and 24-month well-child visits. Additional screening might be needed if a child is at high risk for ASD or developmental problems. Those at high risk include children who have a family member with ASD, have some ASD behaviors, have older parents, have certain genetic conditions, or who were born at a very low birth weight.
- Parents' experiences and concerns are very important in the screening process for young children. Sometimes the doctor will ask parents questions about the child's behaviors and combine those answers with information from ASD screening tools, and with his or her observations of the child.
- Children who show developmental problems during this screening process will be referred for a second stage of evaluation.

Stage 2: Additional Evaluation

This second evaluation is with a team of doctors and other health professionals who are experienced in diagnosing ASD. This team may include:

- A developmental pediatrician—a doctor who has special training in child development
- A child psychologist and/or child psychiatrist—a doctor who has specialized training in brain development and behavior
- A neuropsychologist—a doctor who focuses on evaluating, diagnosing, and treating neurological, medical, and neurodevelopmental disorders
- A speech-language pathologist—a health professional who has special training in communication difficulties

The evaluation may assess:

- Cognitive level or thinking skills
- Language abilities
- Age-appropriate skills needed to complete daily activities independently, such as eating, dressing, and toileting

Because ASD is a complex disorder that sometimes occurs along with other illnesses or learning disorders, the comprehensive evaluation may include:

- Blood tests
- Hearing test

## 6. Conclusion

We write all things you should know after our whole search. Firstly, you should know that ASD in not like other disease as it's not infectious but it transfers to the next generation by genetics and hereditary traits. Also, you should know how to

deal with him behaviorally and psychology as they have communication disorders and also, you should take care of the neuroscience part which you can treat by the cures as suramin but take care about sensitivity because maybe you will have rash so, you can take Benadryl cure after take suramin.

## 7. Acknowledgment

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