Fragile X Syndrome

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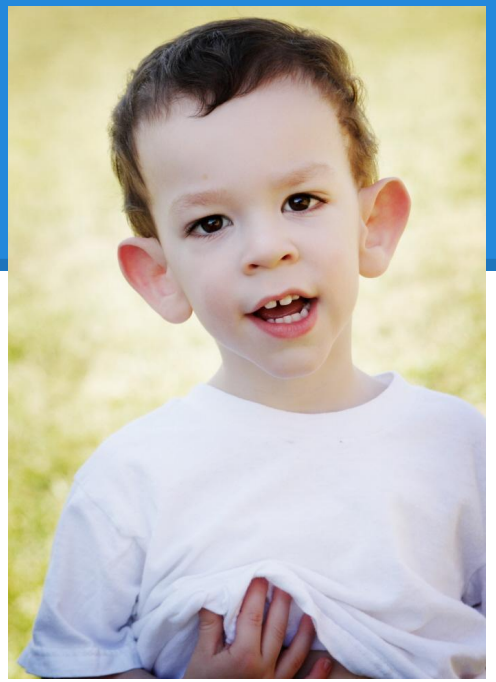
Physiology



- Fragile X is known to be the leading cause of inherited mental retardation in males, with approximately 1:1,000 males are expected to be affected with Fragile X

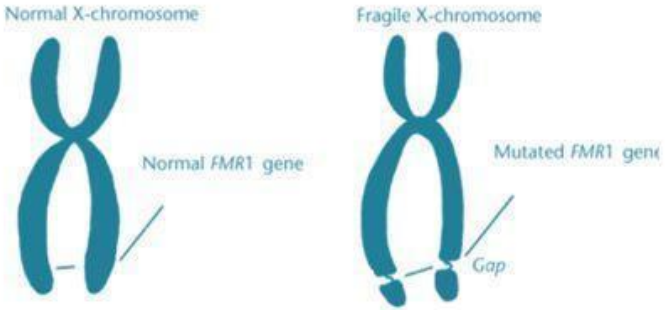
- Shows a gender bias in males as the chances of females being affected with the disease are significantly lower with 1:4,000 females acquiring the disease

- Has an early onset

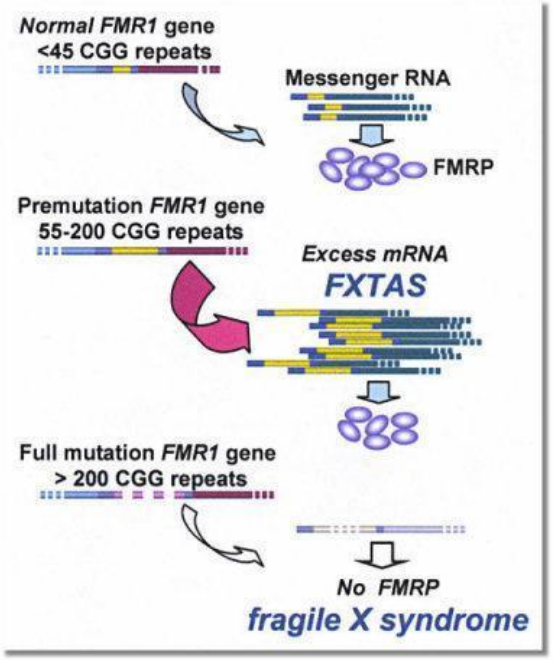
- Symptoms include:

  - Elongated and narrow face or jaw
  - Pronounced ears
  - Flat feet
  - Autistic like features such as: poor eye contact, biting of fingers, experiencing social anxiety.
  - Impaired learning and memory capabilities
  - Tend to be hyperactive or have impulsive behavior
  - Speech and language delay

Molecular Causes



- Is an X linked Dominant disease
- Caused by a partial duplication of CGG pattern in Fragile X Mental Retardation 1 gene (FMR1) located on the X chromosome.
- Explains gender bias as X-inactivation in females allows an x chromosome to become inactive, where no proteins be may be produced by the barr body.
- As the duplication increases, the more severe the symptoms will be. If the duplication is not severe enough to result in a full mutation, the individual will become premutation carriers.
- Normal FMR1 gene: pattern appears 10-40 times in a row
  Full mutation: More than 200 times
- Mutation in FMR1 results in the inability to produce sufficient amounts of FMRP, which functions in maintaining MGluR5-necessary in ordering neurons to grow and manage the size of dendrites.
- This lack of production removes the expression of FMRP



-Since synapses are capable of adapting over time in response to an individual's experience, a mechanic called synaptic plasticity, FMRP helps in regulating this adaptation. This is resultantly why the lack of FMRP is crucial for a person's learning and memory capabilities.

Treatments and/or Therapy

- Currently this is no cure for Fragile X syndrome
- Students may be offered special education courses where the child is placed in a condensed special education class, allowing personal attention.
- Medication may be taken by the patient to ease some symptoms such as seizures and mood instability.
- Several options of therapeutic sessions:
  - Speech/language therapist: Improve pronunciation of words and sentences. Teaches methods of nonverbal communication such as sign language for those that are unable to develop functional speech
  - Physical therapists: Design activities to build motor control and improve patient's posture and balance
  - Behavior therapists: May work with the patient's teachers to design helpful responses when addressing acceptable and unacceptable behavior.
- Although these treatments may help the patient cope with the disease, it wouldn't help the victim's distinguishing physical characteristics.

Proposed Cure

- Studies show that in an attempt at protein replacement, scientists state that they had already produced a sample of FMRP within a laboratory.
- Normally, FMRP functions in parts of the brain, testes and ovaries. In the brain, FMRP assists in the development of the connections that occur within synapses.
- Fragile X's early onset would allow for early intervention, providing the patient with extended time for the cure to take effect.
- Since the location of FMRP normally lies within the brain and the neurons, Intranasal methods are suggested as this form of drug delivery allows a direct pathway to the cerebral spinal fluid.
- Another proposed cure is to find a drug in which it can replace the functions of FMRP or act downstream of it. This will ultimately make the absence of FMRP irrelevant.
- However one shortcoming for both proposed cures is that the mutations in the FMR1 gene will continue to remain in the patient and s/he will still able to pass the disease down to their children, grandchildren, or further.

Sources of Reference

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