



A PILOT DVD PROJECT

MEIOSIS MISHAPS

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Activity 3: DAZ Mutations, The Y-Chromosome, and The ICSI Procedure

Time Frame: 2 hours (Can be performed in a typical double block period or over two consecutive single class periods)

Materials: HHMI Lecture *The Meaning of Sex* (Nov. 2001), copies of student handouts, overhead projector with teacher overhead transparencies.

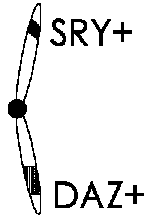
Teacher Directions:

The lesson is an analysis of mechanisms and mutations of the DAZ genes of the Y-chromosome that lead to infertility, and evaluation of the ethics of ICSI and other genetic procedures.

- Introduce the lesson by reviewing concepts of meiosis, nondisjunction, crossing over, and sex chromosomes. It is assumed that students have completed the activities on nondisjunction and the SRY gene or are familiar with their concepts
- Have students discuss the mechanisms that determine sex and gender
 - Ask students what might cause infertility
- Introduce the DAZ genes by showing DVD Lecture 4, Chapters 10-15, and Chapters 19-23
 - Have students comment on how all the genetic factors combine to determine sex
 - Ask students what results from DAZ deletions
- Use Blackline 8 *Deletion of DAZ Gene from the Y-Chromosome* as an overhead transparency to illustrate how the DAZ deletion causes infertility.
- Show DVD Lecture 4, Chapters 23-27 to introduce ICSI procedure
 - Ask students to discuss the use of ICSI as a genetic procedure for infertility
 - Ask students to recall the use of pedigree charts in following traits (review if needed)
- Place students in groups of 3-4 and distribute Blackline 9 *Student Copy of Pedigree Involving ICSI* as a worksheet. Students are to complete the pedigree charts and determine the ethics and implications of various options of the ICSI procedure. They should discuss various questions in their groups and respond on the worksheet.
 - What are our reproductive choices?
 - Should ICSI be performed?
 - Should only female children be selected?
 - Should adoption or having no children be encouraged?
 - What are the implications for families, and long-term consequences for humans?
- Have groups report and comment on their decisions to the whole class.

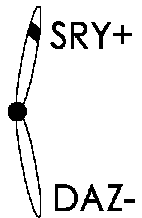
Evaluation: Students complete Blackline 9. (Use teacher copy for answers)

Extensions: Have students research and report on other medical treatments and procedures for genetic disorders, including evaluation of ethics involved.



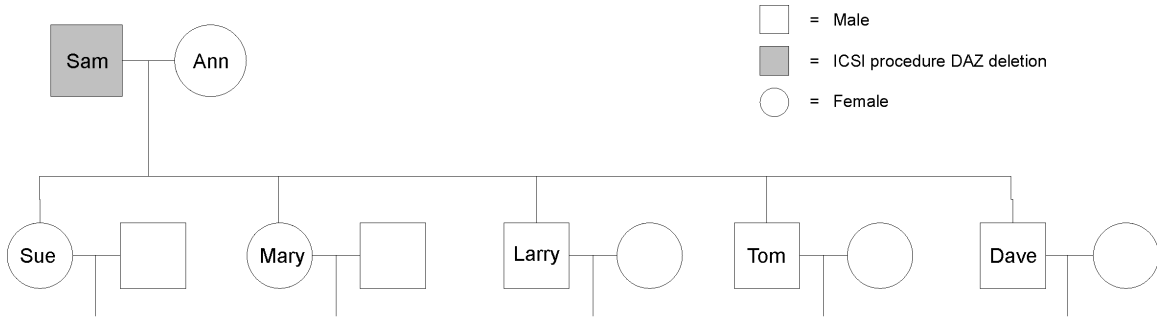
XY ♂

Male with normal sperm count

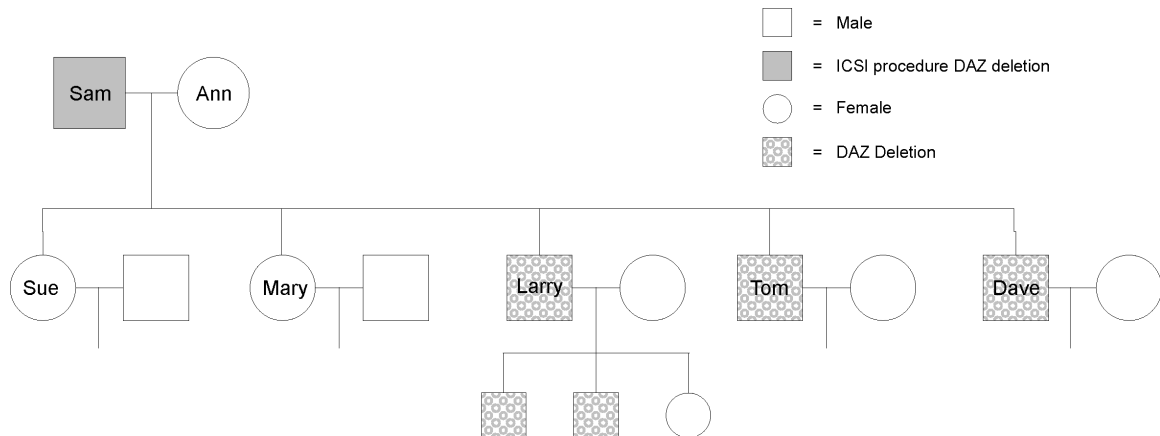


XY ♂

Male with low sperm count



1. Which of Sam and Ann's offspring have the DAZ deletion?
2. Which would not?
3. If Larry chooses to have the ICSI procedure and has 2 male and 1 female offspring, who would have the DAZ deletion? Complete the pedigree above to show this.
4. Based on these results what option would you choose:
 - To have ICSI with any possible offspring scenarios
 - To have only female offspring
 - To have no offspring
 - To adopt
 Explain your choice.
5. How is Mary and Sue's reproductive situation different from that of their brothers?
6. What are the short-term implications for Sam and Ann's family?
7. What are the long-term implications for Sam and Ann's family?
8. If the ICSI procedure became commonplace in humans, what would be the potential evolutionary implications?



9. Which of Sam and Ann's offspring have the DAZ deletion?
All of the male offspring – Larry, Tom, and Dave because they inherit their father's Y-chromosome. This is shown shaded above with corresponding notation in the key.
10. Which would not?
The female offspring because they have two X-chromosomes.
11. If Larry chooses to have the ICSI procedure and has 2 male and 1 female offspring, who would have the DAZ deletion? Complete the pedigree above to show this.
Shown above. Students should draw in Larry's potential offspring and shade accordingly. Both male offspring would inherit Larry's Y-chromosome with the DAZ deletion. His female offspring would not be affected.
12. Based on these results what option would you choose:
- To have ICSI with any possible offspring scenarios
 - To have only female offspring
 - To have no offspring
 - To adopt
- Explain your choice.
Answers will vary.
13. How is Mary and Sue's reproductive situation different from that of their brothers?
 Mary and Sue are unaffected by their father's DAZ deletion since this deletion affects only the Y-chromosome. They can have healthy sons as long as their partner has a normal Y.
14. What are the short-term implications for Sam and Ann's family?
 All male offspring will have the DAZ deletion. Their male offspring will also inherit the deletion, and so on. The ICSI procedure is the only way males will be able to reproduce since the DAZ deletion causes low sperm count. Only female offspring of Sam and Ann will be able to continue the pedigree naturally, i.e. without technological intervention.
15. What are the long-term implications for Sam and Ann's family?
 All direct male descendants of Sam will be dependent on ICSI to reproduce.
16. If the ICSI procedure became commonplace in humans, what would be the potential evolutionary implications?
 That the DAZ deleted variation would become numerous in the population implicating a possible threat to future reproduction should ICSI become inaccessible for whatever reasons.

