

Carolina Quick Tips®

Disorder Detectives

Students take on the role of a cytogeneticist working in a hospital or clinic. They are given a case study and a set of patient chromosome decals and asked to arrange the chromosomes on a prepared board into a completed karyotype. Students then analyze the karyotype and diagnose their patient. Many types of chromosomal abnormalities are presented, though normal karyotypes are also represented. The activity supports 3-dimensional learning and builds toward the following:

- NGSS Scientific and Engineering Practice: Analyzing and Interpreting Data
- NGSS Core Idea: Life Science 3: Heredity: Inheritance and Variation

Materials Required

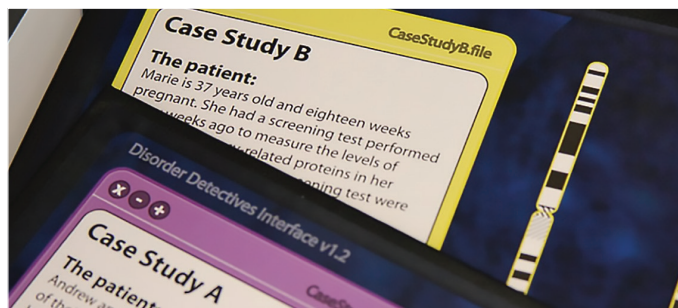
Disorder Detectives Classroom Kit (214800)

Activity Procedure

1. Obtain a Chromoscan board containing a case study and a set of patient chromosomes.
2. Read the case study found on the left side of the board.
3. On the Cytogenetics Report (on the back of this sheet), record your patient information.
4. To make the process of karyotype assembly less complex, one of each of the homologous chromosomes is already illustrated on the board. Identify the other homolog and place it on the board in the proper position.
5. Once the karyotype is complete, analyze it for chromosomal anomalies.
6. Record chromosome number, gender, and chromosomal findings on the Cytogenetics Report.
7. Determine the suggested diagnosis by looking at the “Examples of Findings Commonly Identified by Karyotyping” chart located in your student handout.

Results/Summary

Many chromosomal anomalies may be detected through karyotyping. In this activity, students examine a variety of chromosomal disorders, with diagnoses ranging from prenatal to adulthood. Prenatally, karyotyping can provide answers or a diagnosis. In postnatal cases, the results can be used to diagnose complicated syndromes. Summary discussions include limitations of G-banded



karyotyping and more modern chromosome detection methods. This kit allows teachers multiple opportunities to discuss “person first” language and common disorder misconceptions and to use the optional extension activities for student research on the disorders addressed.

Additional Information

For additional content that supplements this activity, go to <https://hudsonalpha.org/biotech-basics>. View more information, content links, and products related to this activity at www.carolina.com/takeaways.



Carolina is pleased to collaborate with the HudsonAlpha Institute for Biotechnology. A nonprofit research institute located in Huntsville, Alabama, HudsonAlpha engages the power of biotechnology to improve life. Its 4-fold mission is to improve human health and well-being, genomic research, economic development, and educational outreach. For more information about HudsonAlpha, go to www.hudsonalpha.org.

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Cytogenetics Report for G-Banded Karyotype

Select a chromosome from the cryostorage area. Sketch the chromosome, labeling the p arm, q arm, centromere, and telomere.

Chromosome type: _____ metacentric _____ submetacentric _____ acrocentric

Patient Name	Case Study ID	Age
Why is the patient being referred for karyotyping?	Source of Cells for Karyotyping _____ Blood _____ Amniocytes _____ Chorionic Villi _____ Other (specify) _____	
Total Number of Chromosomes Observed	Gender	
Chromosomal Findings _____ no observable chromosomal abnormalities _____ monosomy (chromosome # _____) _____ trisomy (chromosome # _____) _____ deletion (chromosome # _____, arm _____) _____ insertion (chromosome # _____, arm _____) _____ translocation (chromosome #s _____ and _____) _____ inversion (chromosome # _____, arm(s) _____)	Patient Diagnosis	
(Optional) On a separate sheet of paper, attach notes for patient's caregiver with additional implications of the diagnosis, including life expectancy, complications, available treatments, and support group information.		
Briefly explain how a karyotype is prepared.		
Why do you think that relatively few fetuses with chromosomal trisomies survive to birth?		
Why are microdeletions and microinsertions difficult to diagnose using karyotyping?		