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Pasta Genetics

Mendelian Inheritance of Fanconi Anemia and HLA type

Teacher Answers

Acknowledgements

The technique used in this activity is based on Pasta Genetics, Developed by Megan Brown and Maureen Munn, The GENETICS Project, University of Washington.

The activity itself is based on genotype information found in Verlinsky, V et al, 2001, Preimplantation Diagnosis for Fanconi Anemia Combined with HLA Matching, JAMA: 285, 3130-3133.

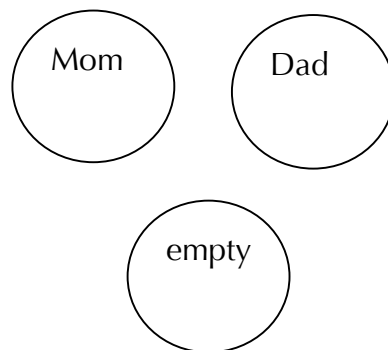
Note: the Nash family is not identified in the above paper, so although we discussing the case of the Nash family in today's workshop, the genotype information may not be that of the Nash family.

Introduction

In this activity you will use colored pasta to represent human chromosomes carrying the HLA type and FANCC genes. You will be given the pasta representing the parents and then be asked to create several possible embryos and determine whether any of them could be a suitable donor for the affected child.

Setup

You will receive two dishes of pasta, one dish represents the mother, the other the father. Arrange the dishes as shown below.



The spiral shaped pasta represents chromosome 6 that carries the HLA genes

Red represents –HLA-B35, HLA-A1 (mom)

Yellow represents – HLA-B44, HLA-A2 (mom)

Green represents – HLA-B35, HLA-A26 (dad)

Blue represents – HLAB41, HLA-A3 (dad)

The bowtie shaped pasta represents chromosome 9 that has the FANCC gene
Yellow represents the normal allele
Blue represents the ivs4+4 mutant allele
Each parent has one of each

Questions

The affected child's HLA type is HLA-B44, HLA-A2; HLA-B35, HLA-A26.

The affected child has FA.

What colors and shapes of pasta would represent the child's chromosomes 6 and 9?

Spiral – yellow and green

Bowtie – blue and blue

What colors and shapes of pasta would represent chromosomes 6 and 9 of an HLA matched donor without FA? (Note: list all possible combinations that would be FA-free and an HLA match).

Spiral – yellow and green

Bowtie – yellow and blue

Or

Spiral – yellow and green

Bowtie – yellow and yellow

Procedure

Remember that in meiosis, one copy of chromosome 6 and one copy of chromosome 9 are placed into each gamete. The gametes then unite to form a fertilized egg with two copies of chromosome 6 and two copies of chromosome 9, one from each parent.

You will now use the affected child's parents simulated DNA to generate simulated embryos.

1. Locate the dish representing the mom. Place your hand here. Close your eyes. Without looking, pick up one spiral shaped pasta and one bowtie pasta and put it in the dish representing the embryo.
2. Then locate the dish representing the dad. Without looking, pick out one spiral shaped pasta and one bowtie pasta and put it in the dish representing the embryo.