

Be A Molecular Detective

Learning Objectives

- Introduction to some basic concepts of population genetics.
- Introduction to concepts of population diversity and genetic variation (polymorphisms).
- Inheritance of autosomal recessive conditions in an isolated population.
- This worksheet was designed for extension students.

Answers

1. This is a true story, the answer is that a shipwreck left sailor(s) stranded in this isolated community.
2. Haemochromatosis = $1/8 \times 1/8 \times 1/4 = 1/256$
 Cystic fibrosis = $1/22 \times 1/22 \times 1/4 = 1/1936$
 β -thalassaemia = $1/12 \times 1/12 \times 1/4 = 1/576$

All three conditions = $1/256 \times 1/1936 \times 1/576 = 1/285,474,816$ (ie quite unlikely!)

3. This population is isolated, therefore over successive generations more people will inherit similar genes and the frequency of these conditions in the population will rise. For more details of this phenomenon refer to any textbook on population genetics and look for the terms "Hardy-Weinberg equilibrium", "founder effect" and "genetic drift".
4. To begin, you would devise a simple PCR test so that you could easily look at samples and determine the differences in the alleles. As a researcher you would have access to online genetic databases that may provide you with population information on this polymorphism. Also you may request access to DNA samples from particular populations, for example Iceland will make samples available for research/commercial purposes. Alternatively you could set up your own study to track down this polymorphism. Obviously the problem with any of these kinds of studies today is that there are no "pure-bred" populations due to mass migrations and globalisation. However we are keen to receive your students' suggestions! See you at www.genecrc.org - go to the "contacts" page and email the Education Officer.

Resources

Reference Sheets E and F