

Thème 1 - La Terre dans l'Univers, la vie, l'évolution du vivant
1-A – Le brassage génétique et sa contribution à la diversité génétique.

How can blue-eyed parents have brown-eyed children?

With the help of the document and of your scientific knowledge, explain why eye color is a difficult example in genetics. How can blue-eyed parents have brown-eyed children?

Eye color is much more complicated than is usually taught in high school. Researchers used to think that eye color was determined by a single gene and followed a simple inheritance pattern in which brown eyes were dominant to blue eyes. All eye color and inheritance were thought to be explained by this simple model. Except of course for the fact that it is obviously incomplete. The model cannot, for example, explain how blue-eyed parents can have a brown eyed child. Yet this can and does happen (although it isn't common).

New research shows that there are two separate genes, OCA2 and HERC2. As a consequence, there are two ways to end up with blue eyes. The reason is that the two genes need each other to work. And that the blue versions are caused by "broken" genes.

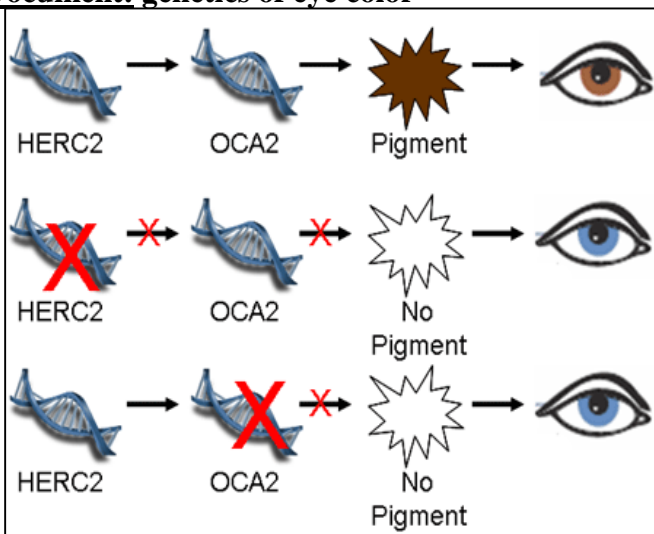
The key is that if someone makes a lot of pigment in the front part of their eye, they have brown eyes. And if they make none there, they have blue.

Part of the pigment making process involves OCA2 and HERC2. A working HERC2 is needed to turn on OCA2 and OCA2 helps to get the pigment made. They need each other to make pigment. So someone with only "broken" HERC2 genes will have blue eyes no matter what OCA2 says. This is because the working OCA2 can't be turned on, so no pigment gets made.

And the opposite is true as well. Someone with "broken" OCA2 genes will have blue eyes no matter what the HERC2 genes are.

You need a working HERC2 and a working OCA2 to have brown eyes, but you can inherit them from two different persons. So, all you blue eyed parents with brown eyed kids, stop asking those paternity questions (unless you have other reasons to be suspicious)! Brown eyed kids are a real possibility that can now be explained with real genes.

Document: genetics of eye color



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