CATS AND CHROMOSOMES





COOL CATS

With cats being the second most popular type of pet in America, and over 95 million cats living in households in the United States, it's clear that many people would consider themselves fans of cats. Have you ever noticed the differences among these popular pets?

PERPLEXING PAWS

GROUP 1

CIVITY











GROUP 2











The mutation for polydactyly in cats is the result of a substitution mutation where an adenine nucleotide is substituted for guanine. This causes a change in the codon from AGA, which codes for the Arginine (ARG) protein, to GGA, which codes for the Glycine (GLY) protein.

This substitution mutation doesn't directly code for polydactyly. Instead, it is part of a noncoding sequence, which causes misexpression of certain developmental genes. This means that as the organism develops, before birth, developmental abnormalities will occur. In polydactyl cats, there is no specific number of extra digits that may occur. Instead, the abnormal expression of digits occurs as a result of a signaling molecule called Sonic Hedgehog (SHH).

In any developing kitten embryo, there is a signaling molecule for where digits are to form on each paw. Kittens with SHH will have additional locations on each paw where digits are signaled to develop. Therefore, as a result of the mutation, more locations on each paw are told to form a toe, leading to a kitten with extra toes, a polydactyl cat.



The same mutation can be found in other organisms and has been tested specifically in mice and humans. With mice, like with cats, the mutation of polydactyly wasn't detrimental to the organism. Unlike the cats, however, it wasn't advantageous either. In humans, polydactyly is debilitating with individuals having little to no ability to use their hand or foot due to the extra digits. This demonstrates how each species traits are specific to just that species.

Think about two different species of lizard, one that is green and one that is black. If these two species were living in the same environment, the coloration of one species could be beneficial (good for camouflage) while the other is detrimental

(doesn't allow for camouflage). Now, take

just a single species of lizard, a green species, and put it in two different environments – a rain forest and a volcanic island. While the green lizard would camouflage in the rain forest, it would show up easily on a volcanic island. This means that its coloration can be both advantageous and detrimental based on where it is found.



ACTIVITY 2 | CATS AND CHROMOSOMES | 19

REGENERATION: An example is when a sea star regrows an arm that is removed.

VEGETATIVE PROPAGATION: There are three types – cuttings, layering, and grafting – each of which results in a new organism that is genetically identical to the parent.



Sexual Reproduction

While asexual reproduction only requires one parent, sexual reproduction requires two parents. Because there are two parents, genetic diversity is higher in the overall population.

Sexual reproduction is a mode of reproduction in which offspring form from the union of gametes. **Gametes** are the male or female germ cells that unite with each other to produce a zygote. These gametes are sperm and egg, which are produced through a process called meiosis.





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