

Biology

Game of clones

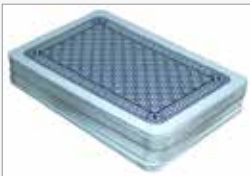
(Ireland and Denmark)

Background:

This is a role-play activity in which students act as bacterial cells. Students are dealt a set of five playing cards, and the ratio of red cards to black cards determines their ability to survive doses of antibiotic. During reproduction, a six-sided die is rolled by students to introduce mutation events (changing the number of red or black cards). The effect of antibiotic treatment on the population was observed and recorded – results showed the increase in antibiotic resistance of the bacteria over several generations.

You will need:

- ✓ 2 packs of playing cards
- ✓ Dice



- a) Students with three or more red cards are more able to survive. They stay in the group.
 - b) Students with less than three red cards are killed off by the antibiotic. These students join the rest of the class again.
3. The surviving bacteria are able to reproduce and their 'offspring' (new students added to the group) have the same genes (colour cards) as their 'parents'. However, before joining the population, each new individual can role a single die before they receive their 'genes'.



- a) If they role a 5 or a 6, they will receive one more red card to replace one of their black 'genes' (cards).
- b) If they role a 1 or a 2, they will receive a black 'gene' instead of a red 'gene' they would receive. These changes in genes are mutation events.

4. The next generation of individuals are again treated with an antibiotic and the process is repeated for as many generations as time allows, or until the antibiotic has no effect on the population any more.

Note: it might be more 'realistic' if every individual rolls the die (the chance of acquiring a mutation) and not just new individuals, but it is quicker if only new students roll the die.

So what happened?

Over a few generations, the antibiotic becomes less effective as the relative number of antibiotic resistant bacteria increases.

What next?

If the antibiotic treatment becomes ineffective, the concentration of antibiotic can be increased, so that only those 'bacteria' with four or more red cards survive. The storyboard can also include bacterial cells transferring resistance genes (by conjugation) to other bacteria in the population.

Follow these steps:

1. Ten students (bacteria cells) are given five cards each at random from one pack of cards and stand together in an area of the classroom.
2. This first generation of 'bacteria' are then 'treated with an antibiotic'.

