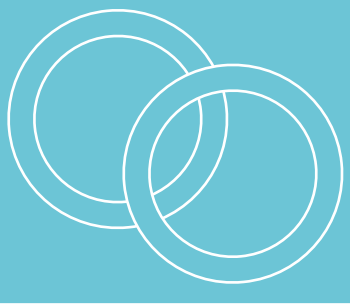

Plasmid Hoopla Game

Instructions

Background

What are plasmids?

Plasmids are circular pieces of DNA found in bacteria such as E. coli. DNA provides the instructions for making proteins that are essential for life and have many different functions within organisms. Synthetic biologists can choose short pieces of DNA - 'genes' - with useful characteristics, embed these onto plasmids, and insert the plasmids into bacteria. The bacteria will now express the chosen, useful trait!

The example used in this Plasmid Hoopla Game will be the insertion of a fluorescent GFP gene – blue, green or red. However, that's not all that the plasmid needs. Each plasmid will also require a plasmid backbone and a gene for antibiotic resistance before being ready for use.

Sticky ends:

In DNA, there are 4 bases – guanine (G), cytosine (c), adenine (A), thymine (T) – which will only bond to form specific pairs: G with C and A with T. When double-stranded DNA breaks apart, a jagged end is usually left behind. This is called a 'sticky end', because it contains overhanging, unpaired bases which allow it to bond to the sticky end of another strand of DNA if both sticky ends contain the correct, matching bases. Ligase enzyme is also needed to bind sticky ends together, while restriction enzymes are used to break such bonds

How to Play

1. Divide your players 2 or 3 different teams of 1-4 people
2. Each team requires its own table, and these tables should be positioned a few metres apart from one another, with all chairs tucked under tables or removed from the space where the game will be played
3. Place the E. coli base on another table

Instructions

4. Place a line of masking tape on the floor 3 or 4 metres away from the E. coli base. The line should be positioned roughly an equal distance from each team's table, so that no team has an unfair advantage
5. Give each team a plasmid base, some ligase enzyme (a decorated wooden skewer) a plasmid piece labelled with the name of a fluorescent protein gene
6. On the teacher's desk (or another table), place the remaining plasmid pieces – the plasmid backbones and antibiotic resistance genes in a deliberately confusing heap
7. Each teams should begin at its desk. On the count of three, the teams are allowed to rush to the teacher's desk. There, the teams search through the pile of plasmid backbones and antibiotic resistance genes, in order to find the pieces with the correct bases to pair up with the bases on the ends of their respective fluorescent proteins (G with C, A with T)
8. When they have found the correct plasmid backbone and antibiotic resistance gene, teams return to their desks and place the fluorescent protein, antibiotic resistance gene and plasmid backbone on their plasmid base, so that the correct bases are matched
9. Then, teams use their ligase enzyme to help them thread each elastic band over the pin head on the adjacent plasmid piece. The DNA has now been fully bonded!
10. Finally, teams must choose a member to rush to the masking tape line and attempt to throw their fully assembled plasmid over one of the wooden sticks on the E. coli base to transform their bacteria. The first team to succeed in doing this **wins the game!**

Made for use with the Plasmid Hoopla Game as developed by Bristol iGEM 2017