STEM Connections

Drug Design

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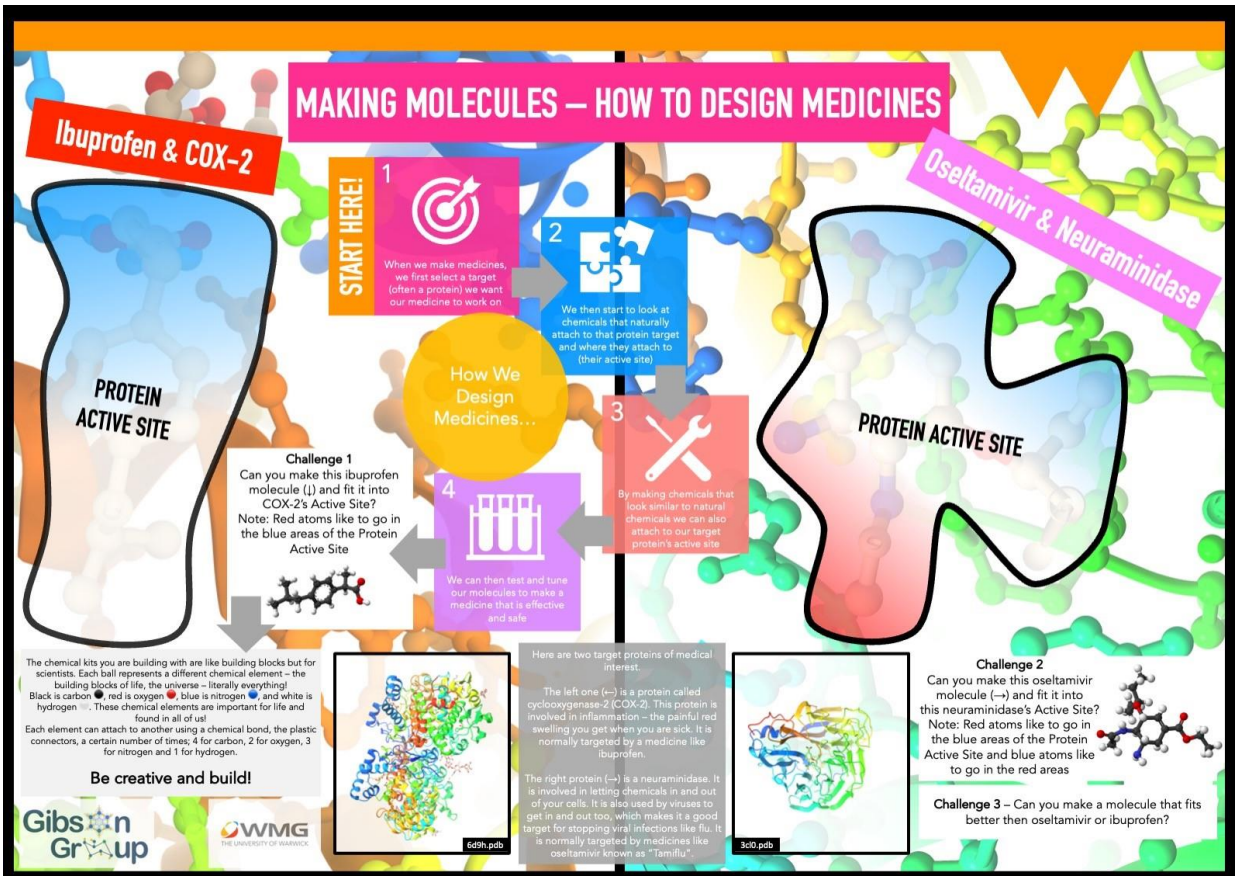
How are medicines designed

When we as scientists first make medicines, we first select a target (often a protein) we want our medicine to work on. Then, we start to look at chemicals that naturally attract that protein target and where they attract to. By making chemicals that look similar to natural chemicals we can also attract to our target protein's active site. We can then test and tune our molecules to make a medicine that is effective and safe.



How to make your own molecules

Suitable year group: Year 5, Year 6, Year 7, Year 8 and Year 9

Learning Objectives:

- To understand chemical symbols and formulas for elements. (KS2)
- To understand periodic table with ability to identify physical and chemical properties of different elements. (KS3)
- To practice and create molecular structure with use of different types of bonds (e.g. single or double bonds). (KS3)
- To be able to convert molecular formulas into molecular structure. (KS3)
- To understand the structure of cells and the function of active sites. (KS3)

Materials required:

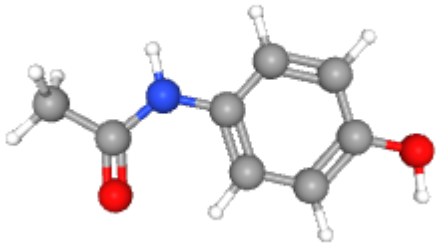
- Dry spaghetti/ cocktail sticks to represent the bonds
- Different coloured sweets/pom pom balls/clay/play dough to represent the atoms

Estimated time: 20 minutes

Step by step instructions:

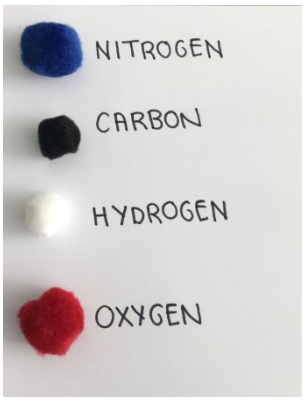
1. Go onto PubChem (nih.gov) and search for a compound e.g. aspirin, ibuprofen. Have a look at medication at home and look up the different compounds that make it up.

2. Scroll down to the structure section of the page where you can find the 3D structure of the compound. The pictures on the right are an example of paracetamol.

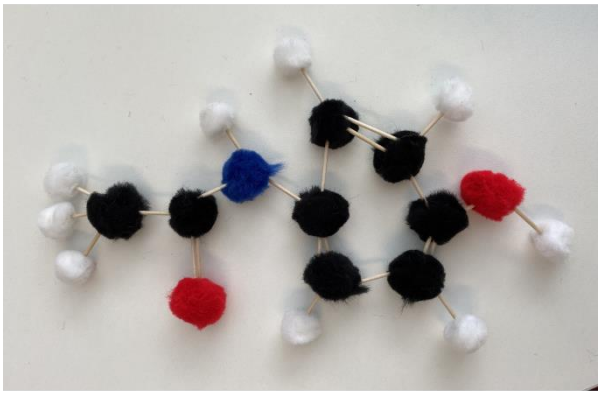


3. Each colour represents a different atom.
   The standard colour system:
   - Blue – nitrogen
   - Red – oxygen
   - Grey – carbon
   - White – hydrogen

   Use the different coloured materials for the atoms you have available for each different type of atom



4. Put the molecule together, taking care to use the correct amount of bonds based on the diagram



5. Have a look at other compounds that you can find and read more about what they are used for.

Ideas to explore the concept further

- Where can you find these compounds? (e.g. medicine)
- How can you make the model of the molecules stronger?