Coronavirus

Education in Chemistry
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Coronavirus is a new global virus. This activity looks at some of the chemistry involved in preventing its spread.

What is a coronavirus? How is it spread?

Coronavirus is a type of virus called an envelope virus. It consists of RNA enclosed in a phospholipid protein envelope. The virus self-assembles from RNA, proteins and lipids. The lipids form a protective coat around the virus. The components of the virus are held together by non-covalent interactions between the RNA, proteins and lipids.

Coronavirus is thought to spread mainly from person-to-person contact. This needs close contact – within about two metres of each other. Droplets produced when a person sneezes or coughs can land on the mouths or noses of people nearby.

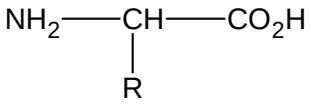
If the droplets land on a surface, the virus can survive for hours or days. If a person touches the infected surface and then touches their own mouth or nose, they will become infected.

Early studies have shown an infected person will pass on their infection to between two or three others. (This is called the reproduction number.)

Questions

1) Give four types of non-covalent interactions that could be formed within the virus.

2) The general structure of an amino acid is shown on the right. Explain how the R group in different amino acids leads to the formation of different types of non-covalent interactions.



3) Explain how the reproduction number of a virus will affect the total number of cases.

Does washing your hands help prevent the spread of coronavirus?

The structure of a soap molecule is similar to the lipids in the membrane layer of the virus. The soap molecules can surround the virus and remove it from the skin. It is also thought that soap molecules can disrupt the lipids in the membrane and can therefore 'disintegrate' the virus.

Sodium laurate is a common soap molecule. It has the formula $CH_3(CH_2)_{10}CO_2^-Na^+$

Alcohol hand sanitisers generally contain a mixture of ethanol, propan-1-ol and propan-2-ol. To be effective against the virus there needs to be an alcohol content of >60%.

Ethanol is less polar than water and so can interact better with the components of the virus. It can interact with and disrupt the lipid membrane layer of the virus. It may also cause some of the proteins in the virus to denature. Alcohol hand sanitisers are considered to be less effective than soap, partly because they do not remove any 'dirty' substance from the hand.

Anti-bacterial soaps generally contain normal soap molecules which are effective against the virus. The extra anti-bacterial components added to the formulation such as the compound triclosan have no effect against the virus. It is better to use ordinary soap.

Questions

4) Sodium laurate can be produced from coconut oil. What is the reactant needed for this reaction?

5) Explain why sodium laurate has both polar and non-polar parts.

6) Explain how soap molecules can remove grease and viruses from the skin.

7) Draw displayed structures of the alcohols present in hand sanitisers.

8) Explain why using alcohol based sanitisers on dirty hands is not effective.