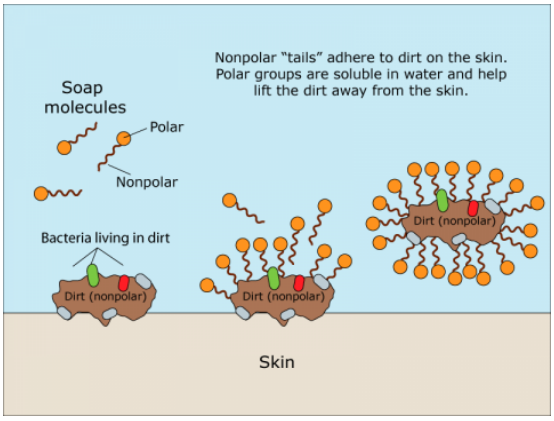
AWESOME stories

Soap Meets Coronavirus SARS-CoV-2



Our skin is an attractive place for viruses to take-up residence. How do we get the viruses off our skin?

Dr. Pall Thordarson explains what actually happens when soap and water (particularly warm water) meet the coronavirus now called SARS-CoV-2. It's an amazing process which takes place in about 20 seconds.

> *Why does soap work so well on the SARS-CoV-2, the coronavirus and indeed most viruses? Because it is a self-assembled nanoparticle in which the weakest link is the lipid (fatty) bilayer.*
>
> *The soap dissolves the fat membrane and the virus falls apart like a house of cards and "dies," or rather, we should say it becomes inactive as viruses aren't really alive. Viruses can be active outside the body for hours, even days.*

What is the structure of the virus? What are its key parts?

> *... Most viruses consist of three key building blocks: RNA, proteins and lipids.*
>
> *The RNA is the viral genetic material - it is very similar to DNA. The proteins have several roles including breaking into the target cell, assist with virus replication and basically to be a key building block (like a brick in a house) in the whole virus structure.*
>
> *The lipids then form a coat around the virus, both for protection and to assist with its spread and cellular invasion. The RNA, proteins and lipids self-assemble to form the virus. Critically, there are no strong "covalent" bonds holding these units together.*
>
> *Instead the viral self-assembly is based on weak "non-covalent" interactions between the proteins, RNA and lipids. Together these act together like a Velcro so it is very hard to break up the self-assembled viral particle. Still, we can do it (e.g. with soap!)*

How does soap help us to penetrate, then break-apart the virus?

> *Soap contains fat-like substances knowns as amphiphiles, some structurally very similar to the lipids in the virus membrane. The soap molecules "compete" with the lipids in the virus membrane.*
>
> *The soap molecules also compete with a lot other non-covalent bonds that help the proteins, RNA and the lipids to stick together. The soap is effectively "dissolving" the glue that holds the virus together. Add to that all the water.*
>
> *The soap also outcompetes the interactions between the virus and the skin surface. Soon the viruses get detached and fall apart like a house of cards due to the combined action of the soap and water. The virus is gone!*

Although cold water works, warm water is more effective. Why is that? Because warmer molecules move about more aggressively than colder molecules ... meaning ... they are working harder to loosen the virus' chemical bonds and sweep away the bad stuff from our hands.

Credits:

Image from Dr. Pall Thordarson's two-part tweet series on the effectiveness of soap in breaking-down a virus called SARS-CoV-2 which leads to a disease known as COVID-19. Drawing originating 9 January 2017 at "Science in the News," Harvard University, by Michael Gerhardt (copyright, if any, not noted).

See Alignments to State and Common Core standards for this story online at:
http://www.awesomestories.com/asset/AcademicAlignment/Soap-Meets-Coronavirus-SARS-CoV-2

See Learning Tasks for this story online at:
http://www.awesomestories.com/asset/AcademicActivities/Soap-Meets-Coronavirus-SARS-CoV-2