Can Hepatitis C be Cured? Virology 101

October 12, 2015 By Lucinda K. Porter RN

One big change in the hepatitis C world is we have finally put to rest the issue of whether hepatitis C is curable or not. At least I thought we had until I saw a recent Facebook post that says hepatitis C isn't curable. Today's blog is for those of you who are still arguing about this, for those of you who are on the fence, and for the rest of us who want to argue about this.

Can we kill a virus, like an antibiotic can destroy bacteria?

To answer this, let's examine basic virology (the study of viruses). The word virus comes from the Latin word poison. There are various theories as to how viruses came into being, but no one knows for sure. We do know that viruses have been around forever.

The largest viruses are the size of the smallest bacteria. Former U.S. Surgeon General, C. Everett Koop said that if you placed 200, 000 hep C viruses end-to-end, it would be less than a centimeter long.

Viruses have a simple structure. The core contains a nucleic acid, either DNA or RNA. Nucleic acids carry genetic information. Surrounding the nucleic acid is a protein coat, called a capsid. Some viruses have another coat covering the capsid known as an envelope. Viruses have different shapes and some envelopes are covered with spikes.

Viruses are not completely alive in that they cannot survive on their own - they need to reside in another cell in order to live and reproduce. These cells are called host cells. Once a virus infects a host cell, it takes control of that cell. Viruses are like hijackers or parasites.

Even though a virus is an unwelcome intruder, the host cell assists the virus by making more copies of the virus. This is called replication. Imagine an intruder who doesn't just steal your valuables but uses the electricity in the house to clone itself and manufacture zillions of more intruders. These clones go out and break into more houses, and so on.

Viruses are specialized and they look for the cell that has what they need in order to live and replicate. The term for this is tropism. Using intruders as an example, if an intruder could only open bank vaults or car locks, then that is where the intruder would go. Viruses look for cells that have the kind of lock that they can open.

Once a virus matches up and attaches to a cell, it can either enter the cell directly or insert its genetic material into the cell. It's the difference between an intruder going into your house or reaching through a window to steal your wallet. Either way, viruses use the cell's own machinery in order to replicate. The virus takes over the cell's own DNA or RNA, forcing it to make more copies of the virus. The virus may kill the cell or it could just hang out there and damage it while it uses the cell to replicate. In the meantime, new copies of the virus are unleashed.

Enough already, are you ever going to talk about hepatitis C?

Some viruses use DNA to replicate and some use RNA. Hepatitis C virus (HCV) is an enveloped RNA virus that was identified in 1989. Hepatitis B is a DNA type. Hepatitis A is an RNA viruses but not even in the same family as hepatitis C is.

HCV targets hepatocytes (liver cells). The virus enters the hepatocyte and uses the cell's RNA to

replicate. It makes about a trillion copies a day. Not only is it a fast replicator, HCV mutates, changing the genetic material slightly during the replication process. This helps HCV escape detection by the immune system. It’s similar to wearing disguises to fool the police. Since HCV replicates rapidly, it also mutates rapidly.

So, can we cure hep C? Yes. If the virus can’t replicate, it cannot live. The new direct-acting antivirals (DAAs) prevent hepatitis C from replicating, and in doing so, HCV dies.

So, why would someone say that hepatitis C can’t be cured? I don’t know, but here are my guesses:

1. HCV treatment doesn’t cure everyone all the time. DAAs are a tremendous improvement, but they aren’t perfect (yet).
2. If you have cirrhosis, curing HCV infection does not mean you are cured of cirrhosis. In some cases, cirrhosis is reversed, but that is the exception rather than the rule.

The word dormant is confusing. News stories report that hep C lies dormant for years, and then suddenly people find themselves with cirrhosis. This isn’t really what happens. The virus isn’t dormant, it is just that the liver doesn’t complain, while hep C is slowly causing fibrosis. The disease may appear to be dormant, but the actual virus is not.

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