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Hello and welcome to the Health Hits podcast.

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I'm your host Tom Fisher, and in the last episode we covered chickenpox, that common viral infection, usually caught in childhood.

It can be pretty miserable but the real kicker is that it never really goes away, and comes back to life as a painful, burning, blistering rash.

The condition we're talking about is shingles. We'll go over what is actually happening and why, and what we can do when it does strike.

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So lets quickly recap chickenpox for a moment.

It's a viral infection that we usually catch as children. It travels to the lungs, hitches a ride to the skin and causes that generalised rash we are all familiar with.

The immune system recognises the virus and then makes immune cells, called antibodies, against it.

These antibodies chow down on the virus particles in the same way that the 1980 videogame character Pac-Man chows down on blue ghosts.

And for most viruses that would be the end them, game over.

The virus would be dead and the immune system would continue to circulate antibodies, ready to instantly kill the virus if it ever saw it again.

But just like a ghost in Pac-Man, the chickenpox virus, varicella zoster, is unusually sneaky. Its from a family of viruses called herpesviruses and that name comes from the Greek word herpein which means "to creep".

Its reference to the fact that the body can't fully kill the viruses, only suppress them, and they creep along undetected for however long and then seem to come back to life.

In the case of the varicella zoster virus that causes chickenpox, what happens is that some of the virus gets into the nerves. Specifically the sensory nerves – these are the ones that travel from the skin to the spinal cord, and usually transmit signals such as pain or touch.

At the end of a chickenpox infection the virus travels up these sensory nerves all the way to their roots in the spinal cord. The virus can hide here in the nerve roots undetected for years or even decades.

We don't really understand why but at some future time the virus reactivates and follows the nerve back down again from the spinal cord to the skin. This often occurs when we are unwell with some other illness and our immune system is distracted, or perhaps so much time has passed that the number of chickenpox-specific antibodies in the bloodstream has dropped below some critical level.

As the virus travels back down the sensory nerve it irritates it, creating unusual signals. The brain can struggle to interpret these signals so it can be felt as anything from burning to stinging to electric shocks.

When the virus reactivates it usually does so in only one nerve root.

And this gives us an opportunity to talk about some very interesting anatomical phenomenon.

We've talked about the nervous system before, and its obviously super complicated.

But for the purpose of understanding what happens in shingles its relatively simple.

Nerve endings in the skin are like the leaves on a tree. Signals travel down small nerves or branches, which are then gathered together into larger nerves. These larger nerves are like the main branches of a tree and attach directly to the trunk.

If we think of the tree trunk as being like the spinal cord, then where the main branches meet the trunk is essentially where the nerve roots are. And its at these points that the varicella zoster virus hides away from the immune system.

The area of skin that corresponds to each nerve root was first mapped by English neurologist Henry Head in 1900. He illustrated a body and covered it in what looks like zebra stripes to demonstrate this, and called the stripes dermatomes.

Each dermatome stripe or level corresponds to a nerve root in the spine.

Sensation of the skin at the neck uses a nerve root in the neck, and as you move down the spine you see that the roots supply correspondingly lower and lower horizontal dermatomes.

Near the bottom of the spine is called the lumbar spine, and this level supplies most of the sensation of the legs.

The dermatomes here start to do something strange and are no longer horizontal but actually become vertical.

And then what's really interesting is that the few nerves from the sacral spine, which is below the lumbar spine, actually supply the back of the legs and back up to the bottom and the privates.

And this makes no sense when you look at a classical anatomical diagram of a human. But then if you remember that we evolved from apes and we used to go around on all fours, suddenly it make a lot more sense.

Imagine a side on view of person leaning forwards to pick up a crate of beer, legs straight, arms straight, torso horizontal to the ground.

With the body in this position you can then take cross sections from head down to bottom that match up perfectly with the dermatomal levels discovered by Henry Head.

It's a reminder that no matter how clever our evolution, we still conform to a template that we share even with an earthworm.

So why is this important? Well when we talk about shingles we talk about the rash presenting in a dermatomal distribution, ie -the rash appears in a stripe. On the torso it would be a horizontal stripe, on the leg or arm it would be vertical.

The nerve roots come in pairs, one on the left and one and the right, and since the virus usually only reactivates in one root, we find that one of the textbook features of shingles is that the rash doesn't cross the midline.

And knowing that is very helpful in making a diagnosis because depending on how early someone presents, they may just describe a patch of painful skin, a slightly red non-specific area or later on the full blown blistering rash. You couldn't mistake the full blown rash, but the early stages can look like all sorts of other things, so the dermatomal distribution on one side, that doesn't cross the midline can help nail the diagnosis down.

The reactivated virus causes the immune system to reactivate and it only takes a week or two to suppress it again. In healthy people it will clear without treatment, but in 10% of cases they are left with a chronic pain that results from the nerve irritation, called post herpetic neuralgia.

And so most people are given an antiviral drug to treat shingles because it speeds up clearance of the rash, and also reduces the risk of this chronic pain condition developing.

In the UK we usually use an antiviral drug called aciclovir.

It was created in the 1970s by a pharmaceutical company called Burroughs Wellcome, This was an American company, established in London in the 1880s, which later merged with Glaxo in the 90s and then SmithKline Beecham in 2000 to form what is now the pharma giant GlaxoSmithKline.

Aciclovir is effective against the herpesvirus family which includes the varicella zoster virus with is responsible for chickenpox and shingles, the genital herpes and coldsore virus, as well as cytomegalovirus and the Epstein-Barr virus which causes glandular fever.

It works by preventing the virus from copying it DNA, and so prevent it from replicating and spreading, but it doesn't affect the copying of our own DNA.

There are a few minor side effects listed in the literature but aciclovir is interesting because over years of practice this is one of only a few drugs that I've never had a patient come back in complaining of side effects.

The final thing to talk about is the shingles vaccine.

After an episode of shingles your immune system is up and running at full speed again. Those Pac-Man antibodies are roaming around looking for virus to gobble down. But there is a way to boost the immune system without having to wait for a flare of shingles, and that's with the shingles vaccine.

You heard me argue for the chickenpox vaccine in the last episode, and the shingles vaccine is very similar. It contains an inactivated version of the varicella zoster virus and so stimulates the immune system to make more antibodies. These then stay in the circulation for 5 years or more and ensure that the virus hiding away in the nerve roots is kept suppressed.

In the UK this is offered to everyone when they turn 70, but there is also a catchup programme in place to try and catch most people in their 70s.

Shingles is not particularly harmful for most people. But it can cause chronic pain in 1 in 10 people who aren't treated with antivirals. In addition a flare up in a root that supplies the forehead and eyes can result in blistering rash on the eye which can scar and lead to blindness. And in a person with a weakened immune system the virus can run out of control and even be fatal in 0.1% of over 70s.

And so shingles vaccination to reduce the risk of a flare up is definitely a good idea, however, my arguments from last time still stand that if we prevent infection in the first place with the chickenpox vaccine then you can't get the later flares of shingles.

For more information on the issues we've discussed in this show you can find a resources library on my site www.HealthHits.info and ask questions or leave suggestions for future topics on twitter or facebook by searching @healthhitspod.

Thank you so much listening and join me again for another episode of Health Hits.