

Swell Job

Inflammation is one of the human body's best defences; it can also be one of its most formidable enemies. **Nina Agrawal** has the story

Inflammation has become a bit of a dirty word. We blame it for a number of diseases. We try to eat foods that fight it. We take medication to tamp down the pain it causes.

But inflammation, when it functions normally, is a natural and helpful response by the body to protect us. It's the alarm that sounds when we are infected with a virus, and what helps bones heal in the days and weeks after breaking an ankle.

It's only when it sticks around for too long—or appears when there's no threat—that inflammation can become harmful. The “good” and “bad” kinds of inflammation share some characteristics, but a major difference lies in how long each lasts.

Take a person who accidentally cuts his hand with a knife while washing dishes, for instance. Bacteria on the skin or the knife can get into the tissue underneath, where cells recognise the invaders as foreign and send out chemical messengers. This kicks off the inflammatory response.

The messengers tell nearby blood vessels to dilate and become more permeable, making it easier for blood, fluid and immune cells to flow to the area.

This causes the hallmark symptoms of inflammation: swelling, redness, heat and pain. The person might feel tenderness around the wound, or an instinctive reluctance to use that part of the body—which protects the area from further injury.

White blood cells arrive to eat up the bacteria. Pus is a sign that those white blood cells did their job and died. Then more white blood cells come in to clean up the damage and debris and to help the tissue heal.

The inflammatory process begins quickly—for a cut, within hours. Typically, the inflammation clears up within a week or two. By that time, the redness and swelling would have gone down, a scab would have formed and the surrounding skin would look close to normal.

This type of acute inflammation happens with all sorts



of injuries and threats: a cut, a burn, a respiratory virus, food poisoning. But if some part of this process goes wrong, it can cause inflammation that lasts for months or even years.

Chronic inflammation is associated with a wide range of conditions, including asthma, obesity, Covid, dementia, heart disease and cancer.

Sometimes, that can happen if the body forgets to send the signals that tamp down inflammation after the threat is gone. In other cases, the original threat doesn't entirely disappear. There are even times when the body responds to a threat that isn't there.

Consider inflammatory bowel disease: scientists aren't sure what causes every case but think it often begins when a person's immune system responds to a perceived threat in the gut, like bacteria.

The same inflammatory re-

sponse we saw with the cut begins: white blood cells arrive and send out a call for backup. When the immune system is working normally, the white blood cells and chemical messengers arrive to control the bacteria, repair the damage and restore the gut to its normal state.

In atherosclerosis, which is a type of chronic inflammation, plaque slowly develops and blocks coronary arteries

But sometimes the bacteria persist and the inflammatory response can't get them under control—or the immune system overreacts to a harmless or absent threat. Then immune cells and pro-inflammatory messen-

gers keep coming, damaging the gut lining as they attempt to kill microbes.

That makes it possible for bacteria and toxins to leak out from the gut into surrounding tissue. This provokes even more inflammation, leading to a vicious circle.

This process can cause symptoms like abdominal pain, ulcers or diarrhoea.

Over time, chronic inflammation can result in irreversible damage to tissue. In the case of inflammatory bowel disease, scar tissue can form as the body tries to heal the colon. Or, white blood cells may clump together to try to wall off damage. Both issues can make it harder for the colon to do its job.

With asthma, another chronic inflammatory disease, the walls of the airways stiffen and thicken over time, reducing air flow.

Chronic inflammation isn't necessarily static: it might flare up in response to a trigger, like

when a person with rheumatoid arthritis is more physically active. This can make symptoms, such as joint stiffness or fatigue, worse for weeks.

And unlike acute inflammation, which often brings a swift influx of cells and inflammatory proteins, chronic inflammation can happen at low levels over time. In atherosclerosis, for example, plaque slowly develops and hardens in the arteries.

Scientists don't fully understand what sets off the initial inflammation in many diseases. They have hypothesised that it could be bacteria, as in the case of inflammatory bowel disease; or something from the diet or environment, as might happen with pollen or air pollutants. Or it could be something harmless that the immune system perceives as harmful, as happens with autoimmune conditions like rheumatoid arthritis, when the body mistakenly attacks its own joints.

NYTNS