Message from the Tonic Media Network Editorial Committee*

Welcome to another edition of *Practice Connect* – your personal, practice and patient focussed newsletter with up-to-date news and information.

How worried should we be about microplastics?

Microplastics are small particles of plastics under 5mm in size. Some are tiny (less than 0.1 of a micrometre) and are often referred to as nanoplastics. In general, the smaller the particle, the more worried experts tend to be because that's when they can be absorbed into the bloodstream and potentially enter organs like the lungs, heart and brain. You might also have heard of nurdles.

They're plastic pellets used in manufacturing processes. Microbeads are plastic particles used in exfoliants and abrasives. Then there are microfibres of plastic often shed from synthetic fabrics.

What you hear about most though are microplastic particles from packaging, bottles and containers, which can pollute the environment when they break down, especially at sea and one way or other get into the water supply or food chain.

<u>Are we really consuming a credit card a week?</u>

The uncomfortable reality is that we're all exposed to microplastics and have them to a varying extent in our bodies. However, sometimes the headlines have been misleading. One study which is often quoted, estimated that we consume one credit card equivalent of plastics every week. The problem with that study is they made a major miscalculation. It turns out to be a credit card every 23 thousand years. That doesn't mean though that you can relax about whether microplastics are doing you harm. For that you need to take into account the shape and size of particles and what they're made of.

<u>Having absorbed microplastics can we get rid of them?</u>

Nanoparticles are more likely to be filtered from the blood by the kidneys and expelled in your urine. Studies have shown that our urine can contain microplastics. Larger particles while still tiny, may be trapped in our bodies.

So here are the concerns about the microplastics that hang around. One is that as foreign material, they trigger our immune system and cause inflammation in the blood or wherever they land. Inflammation is best described as like a poorly targeted artillery barrage by the immune system and because of that there can be collateral damage to our arteries, brain tissues and other organs, speeding up the ageing process and perhaps accelerating problems like atherosclerosis which is the process which can eventually block arteries. The other process that's thought to be triggered is oxidative stress - also related to organ damage and accelerated ageing.

Harms?

The research into the human effects of microplastics has focussed on fertility, the digestive system, the lungs, heart and brain.

Fertility

The theoretical concern is what's called endocrine disruption – the potential to affect how our hormones control egg and sperm production. The evidence that this actually happens is currently not strong despite microplastics being found in the fluids carrying eggs and sperm.

Heart and arteries

The way atherosclerosis blocks arteries is by the accumulation of what's called plaque which ruptures causing a blood clot and sudden blockage and then a heart attack or stroke. There have been studies which have found higher than average levels of microplastics in the artery plaque of people who've had a stroke or heart attack. Whether that's a reflection of diet and lifestyle or a real risk in itself isn't known.

Brain

The evidence is solid that brains today have more microplastics in them than previous generations and it looks as though people with dementia have higher than average levels. Again, it's not known whether the particles play any role in cause.

So what should we do?

Bottom line is that we all have microplastics in our bodies. The research isn't conclusive about the harms, but the potential is real. What some researchers in the field are doing in their own lives is minimising their exposure by trying to avoid plastic containers, packaging and exposure in cooking from non-stick surfaces and plastic chopping boards. That's not easy. Glass containers are more expensive, and they break and are hard to use in kids' lunchboxes. Cast iron cookware can also be pricey. But I must say that's what I'm doing even though it's impossible to avoid microplastics.

What's needed is environmental control and ways of minimising their use in manufacturing.

Further information

Ingested microplastics: Do humans eat one credit card per week?: ScienceDirect

How safe are tattoos – really?

Apparently one in four Australians has a tattoo. Not sure how reliable that number is but anecdotally you now see a lot more people with tattoos. Anything from fine line artwork to dense tattoos covering large areas. There's a long history of tattoos going back thousands of years with various meanings attached to them from status to occupation and military experience.

Why do tattoos stay put?

This is important to know because it could go to the issue of potential for harm. Tattoos involve ink and other substances – which I'll come to later – being injected into the dermis (the layer under the skin). This causes damage and scarring with white blood cells called macrophages which specialise in chomping up foreign material coming into the area, taking up the ink and seem to become paralysed or die with the ink either still inside them or released into the tissues.

Then the immune system seems to 'wall-off' the tattoo. Those two phenomena seem to be key to the permanence of tattoos. However, some ink particles do escape, usually into the lymph nodes which drain the inked area and many tattoos become fuzzy over the years because the immune system eats away at them.

What's in tattoo ink?

These products are poorly regulated. There are dyes of various colours and chemistry; alcohols to prevent infection and other chemicals like glycerol to thicken the fluid. There are also contaminants and a study of tattoo inks in the United States found that often you can't trust the ingredient list on the packet. The concerns are that an additive or adulterant such as polyethylene glycol (PEG) could damage the kidneys. Carcinogens such as polycyclic aromatic hydrocarbons are also found in tattoo inks and there are also worries about the risk of either cancer or the ink misleading pathologists looking at tissue samples.

Potential harms

Infection is always a risk such as from blood borne viruses or bacterial infection from the wound. Tattoo parlours usually take safety precautions but if you're puncturing the skin multiple times, the risk never totally disappears. You can get an allergic reaction especially to red dyes, sometimes years after the tattoo was created. Kidney damage due to PEG is possible but rare.

A study of twins with and without tattoos in Denmark suggested a small increase in the risk of skin cancer and lymphomas, especially for large, densely inked tattoos. There's also the potential for misdiagnosis. One case study of a man with a chest tattoo got the doctors worried about breast cancer when there was none and ink particles in lymph nodes can lead doctors to think that a melanoma has spread when it hasn't.

The bottom line with tattoos is to be careful. Choose a tattoo artist who takes pride in cleanliness.

Maybe avoid large, dense tattoos.

Further information

How safe are tattoos – really?: UCSF Synapse

What's in my ink: an analysis of commercial tattoo ink on the US market: National Library of Medicine

Which arm is best for vaccination?

A new study from the Garvan and Kirby Institutes in Sydney has looked at whether it makes a difference which arm gets your booster shot i.e. subsequent vaccinations to the first one.
It turns out the immune response is much more effective if the second shot is given into the same arm.

The researchers studied mice then verified their findings in humans and published in the prestigious journal Cell.

What appears to happen is that after the first immunisation, macrophages (see How safe are tattoos – really? story) gather in the local lymph nodes carrying the history of the vaccine with them and pass on the immune message to special memory cells which line up at the surface of that node. When the second immunisation is given, the macrophages are ready for action – primed to respond to the vaccine from the previous dose. They then pass on the message to the memory white blood cells which then throw the switch to producing the antibodies to whatever virus the vaccine is designed to combat.

The trial in humans was done using the COVID-19 vaccine. The main difference was the speed of antibody production. In the end it didn't matter which arm was injected because eventually the antibody levels were the same. However, the response was much faster in the same arm group.

This matters when there's a lot of viruses around as is the case with both COVID and flu or if you're in the middle of an outbreak.

It's usually not too difficult to remember which arm you were jabbed in last. Most of us have vaccinations in our non-dominant arm (left arm for right handers and vice versa).

Diabetes drug for knee osteoarthritis?

Metformin is a commonly used drug in people with type 2 diabetes. It's cheap and safe. But it's also known to have effects on the immune system dampening inflammation and maybe even on the brain affecting pain perception.

It's also known that people with knee osteoarthritis tend to be overweight or obese and have some of the metabolic abnormalities that go along with diabetes.

That's why a group of Melbourne researchers did a six-month trial of metformin compared to placebo in overweight and obese people with knee osteoarthritis.

The people who received the metformin had noticeable reductions in pain and stiffness. Some had side effects such as abdominal discomfort and diarrhoea, but nobody stopped the medication because of side effects.

The lead researcher, Professor Flavia Ciccutini believes that metformin along with exercise and muscle strengthening, could significantly help people, and delay or avoid the need for a knee replacement.

Further information

Metformin for Knee Osteoarthritis in Patients with Overweight or Obesity: JAMA Network
Metformin as a potential disease-modifying drug in osteoarthritis: a systematic review of pre-clinical and human studies: National Library of Medicine

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