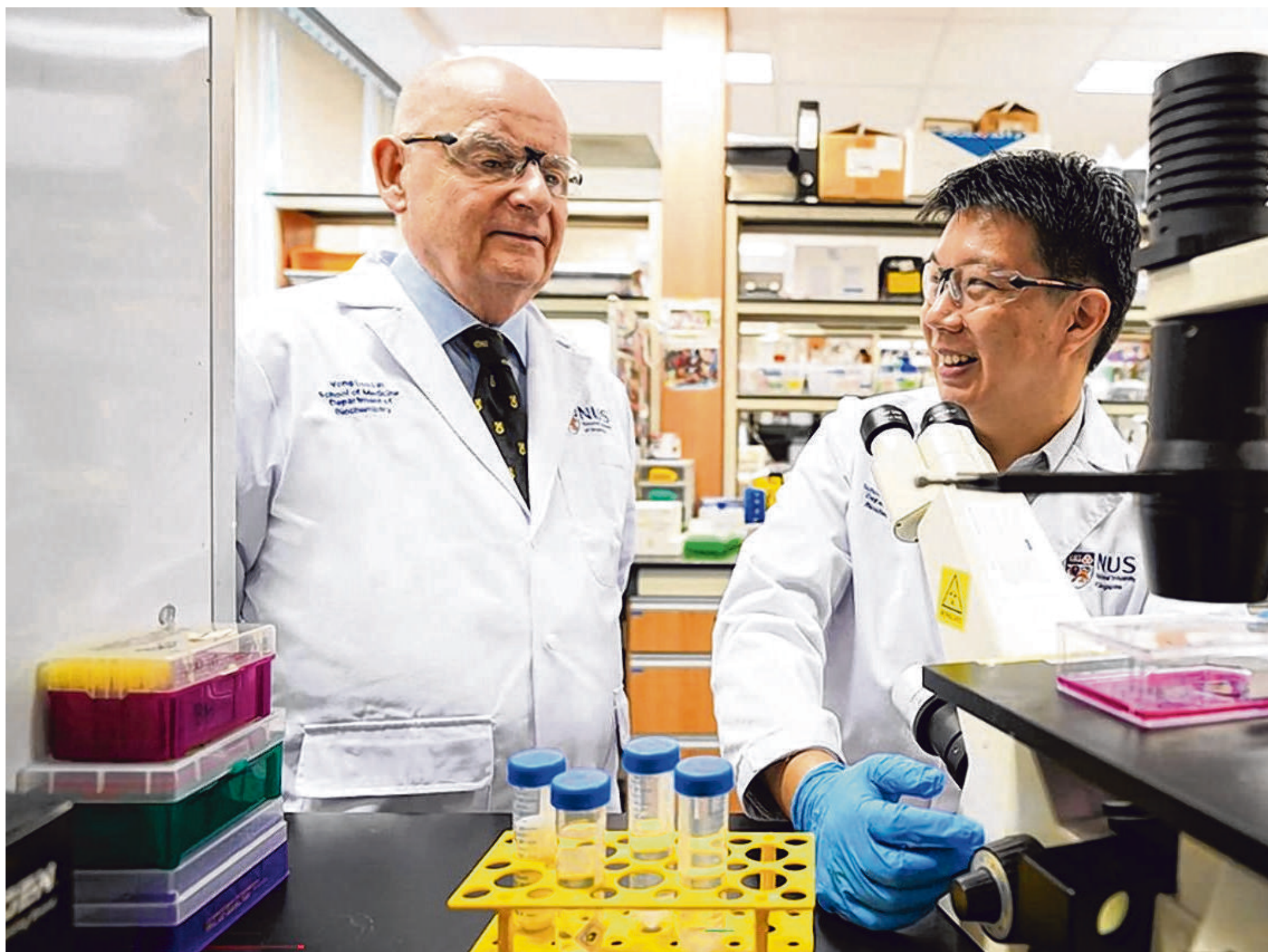


Science

Researchers here have already found that increased consumption of mushrooms, such as golden, oyster, shiitake and white button mushrooms, correlates with a reduced risk of mild cognitive impairment in senior Singaporeans... Having low levels of ergothioneine is also associated with a number of other age-related diseases such as frailty, cardiovascular disease and macular degeneration, said Prof Barry Halliwell.

Prof Barry Halliwell, from the Department of Biochemistry at NUS' Yong Loo Lin School of Medicine, and Dr Irwin Cheah, a senior research fellow, are collaborating with researchers from the National University Health System to conduct a clinical trial on ergothioneine's potential in preventing or delaying cognitive impairment and dementia. PHOTO: NUS



Trial to find out if mushroom compound can avert mental decline

Low levels of ergothioneine in blood found to correlate with more risk of cognitive issues

Joyce Teo
Senior Health Correspondent

A group of Singapore scientists has restarted a clinical trial to look at whether supplementing one's diet with ergothioneine – a compound found mainly in mushrooms – can help prevent or delay cognitive impairment and dementia.

The trial comes after they found that low levels of ergothioneine in the blood correlate with an increased risk of developing cognitive issues.

The scientists come from two teams – one is led by Professor Barry Halliwell from the Department of Biochemistry at the National University of Singapore's (NUS) Yong Loo Lin School of Medicine and the other by Associate Professor Christopher Chen and Dr Mitchell Lai from the Memory, Ageing and Cognition Centre, which comes under the National University Health System.

They had followed 470 senior subjects for five years, and found that the participants with the lowest blood levels of ergothioneine

declined faster cognitively than those with higher levels of the compound.

Before this study, it was known only that individuals with lower levels of ergothioneine had poorer cognitive performance.

"Ergothioneine levels in people who were cognitively healthy are a predictor of who's going to develop cognitive impairment," said Prof Halliwell.

"In other words, if you were healthy, and your level was low, your risk of developing cognitive impairment was much, much greater."

The findings point to the possibility of using a simple blood test to detect ergothioneine levels to identify senior people at risk of developing cognitive impairment and dementia, he said.

Dr Irwin Cheah, a senior research fellow from the NUS Department of Biochemistry, who is part of the team, said the researchers aim to recruit 106 subjects over the age of 60 and with mild cognitive impairment to study the impact of ergothioneine supplementation. They have signed up 20 people so far.

Prof Halliwell said his team had started the ergothioneine study more than two years ago, but it was halted due to Covid-19. As some participants have since dropped out, the recruitment process started anew.

Participants will get 25 milligrams of ergothioneine three times a week on a placebo, said Dr Cheah. Five mg of ergothioneine is roughly the amount you can get from eating a small bowl of fresh

mushrooms, he said.

He added that they have previously measured the levels of ergothioneine in a range of canned mushroom soups, and found that those soups contain very low levels of ergothioneine, likely because the mushroom content is not very high.

Participants in the study will undergo cognitive tests, blood tests and possibly brain scans to check for changes in the brain.

Ergothioneine cannot be made in the body, and is derived from dietary sources, mainly from mushrooms. A variety of foods, including garlic, tempeh and pepper, contain the compound, but in smaller amounts, he said.

"It's actually possible that ergothioneine is an undiscovered vitamin," he added.

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Prof Halliwell started researching ergothioneine years ago. His earlier work demonstrated the potent antioxidant properties of ergothioneine and, later, its ability to protect cells from a range of different forms of stress and toxins.

In 2016, his team showed that people with mild cognitive impairment had lower ergothioneine blood levels, but that was in a small group of 25 subjects. This was later verified in a much larger group.

Having low levels of ergothioneine is also associated with a number of other age-related diseases such as frailty, cardiovascular disease and macular degeneration, so the compound may have a more general role in maintaining health, said Prof Halliwell.

In the near future, the team plans to apply for a grant to look at the effect of ergothioneine on different diseases, he said.

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The common pseudo-orb weaver (*Fecenia protensa*) evades detection from predators by hiding in a rolled leaf shelter. The leaves are collected by the spider, stitched along its seams, and then suspended on the web. PHOTO: JOSEPH KOH

DECEIVE OR BE DEVOURED

Book details survival tactics of 790 spider species found in S'pore

Gena Soh

If you come across a spider web in a nature park, with a suspicious looking leaf folded and lodged like debris in its hub, you might want to peer into its leafy chamber.

You might find a common pseudo-orb weaver lurking there, said Mr Joseph Koh, retired ambassador and honorary research associate of the National Parks Board's (NParks) National Biodiversity Centre.

Of the spider that goes by the scientific name *Fecenia protensa*, Mr Koh, who is best-known as Singapore's "Spiderman", said: "The leaves you can find on these webs are found by the spiders and brought back to their webs."

These spiders then become both architect and seamstress.

Mr Koh said: "By sewing together

the edges of the leaf, these spiders are able to create a shelter that helps them evade detection from predators – a crafty trait."

But such crafts are not the only way spiders have learnt how to evade danger.

Launched on Oct 14, the book *A Photographic Guide To Singapore Spiders*, co-authored by spider experts Koh, David Court, Chris Ang and Paul Ng, details the various tactics that spiders have fine-tuned to counter predators and attract prey.

Published by NParks as a landmark guide to 790 of the more than 900 species of spiders that have been found and recorded in the country, it serves as a follow-up to *A Guide To Common Singapore Spiders*. This first book on spiders

was published in 1989 and detailed only 102 species.

Mr Koh, senior co-author of the book, said one of the ways ama-

teurs can begin studying spiders is by observing the specific way that they deter predators, defend themselves and devour prey.

Take the horned bird dropping crab spider, for instance, which commonly disguises itself as bird droppings.

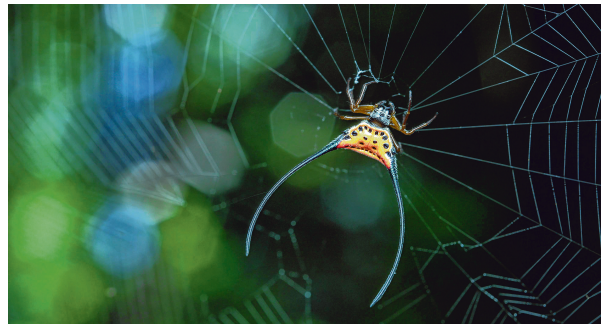
Mr Koh said: "By staying stationary on a leaf and even smelling like urine, the spider is often easily dismissed by potential predators."

"But if a fly catches a whiff of its faecal aroma and lands in front of it, the spider wastes no time to capture it."

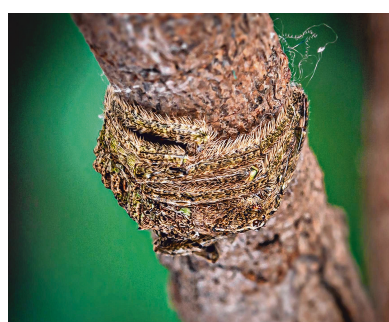
Seizing the fly with its spiny forelegs, Mr Koh said the crab spider will deliver its venomous "kiss of death".

"The tissues of the fly will then be digested into a liquid smoothie with the enzymes in its bite," he added.

While these crab spiders are



The long-horned spiny spider (*Macracantha arcuata*), which birds have learnt to avoid. PHOTO: CHRIS ANG



The *Talithybia depressa* can wrap itself around branches because its bark-textured body is flattened. PHOTO: JOSEPH KOH



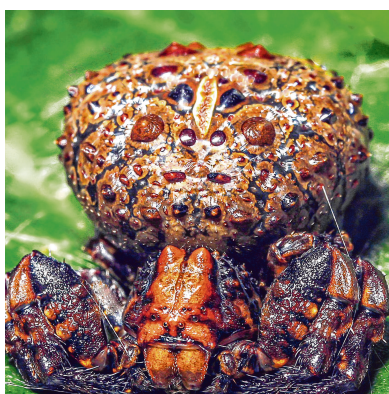
The *Hersilia deelemanae*'s colour and texture allow it to blend in with lichen-covered bark of tree trunks. PHOTO: JOSEPH KOH



The chocolate-faced crab spider (*Thomisus guanguicus*) is a sit-and-wait ambusher. PHOTO: LEONG TZI MING



The *Oxypetes lineatipes* in thicket posture spreads its forelegs to make it appear bigger and ready to strike. PHOTO: JOSEPH KOH



The horned bird dropping crab spider (*Phrynarachne tuberosa*) presents as a blob of bird faeces on a leaf surface. PHOTO: JOSEPH KOH



The suna walking-mud spider (*Cryptothelae sundaca*) masquerades as a wet lump of mud. PHOTO: JOSEPH KOH



The *Cyrtarachne conica* is suspected to mimic a snail. Many predators avoid snails as they are hard to swallow. PHOTO: JOSEPH KOH

known to "twin" their survival strategies, with its imitation of the bird droppings functioning as both an offensive and defensive strategy, some spiders are more passive and prefer to simply appear invisible or be invulnerable.

The suna walking-mud spider masquerades as a wet lump of mud, which lets it blend with the surroundings, while the long-horned spiny spider has come up with a vivid and elongated spiky "armour" to make it hard to consume.

Others are even simpler, said Mr Koh, with the humble fighting spider, a common jumping spider here, relying on its quick-footedness and good vision.

To enumerate all the different ways spiders have evolved to survive in the wild would constitute an epic, but that is precisely what keeps him interested, said Mr Koh.

"I've been studying spiders for the past 57 years and what kept me going has always been the intellectual challenge that comes with understanding their multifold differences."

"Even after discovering more than 900 species of spiders living on our little island, I still feel like there's more I need to learn about spiders, the more I don't know," he added.

And since spiders are predators sitting at the top of the food chain, there must be many more insects, other invertebrates and smaller creatures that sustain them as prey.

"To have so much more life thriving in our natural habitats... that must be something that nature lovers can celebrate in Singapore," he said.

The book costs \$50 at the Botanica Shop in the Singapore Botanic Gardens.

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ScienceTalk

HIV-infected people live no differently from others – with early and effective treatment

World Aids Day takes place on Dec 1 each year. It is an international day for people worldwide to unite in the fight against the human immunodeficiency virus (HIV) and to show support for people living with HIV. This December, **Dr Choy Chiaw Yee**, a consultant with the National HIV Programme at the National Centre for Infectious Diseases, addresses knowledge gaps about the disease and highlights what one can do to support people living with HIV.

1. THE NUMBER OF NEW INFECTIONS IS DECREASING IN SINGAPORE. WHY SHOULD I STILL BE CONCERNED ABOUT HIV?

While the number of new HIV cases reported has been decreasing since 2017, 62 per cent of people

who are newly diagnosed have late-stage HIV infection.

If not treated early, HIV can lead to a compromised immune system that increases the risk of opportunistic infections and even development of certain types of cancers. It also increases the risk of HIV trans-

mission to sexual partners.

2. WHAT SYMPTOMS SHOULD I LOOK OUT FOR?

Many people with HIV infection may not have any symptoms at all, as almost all of them will undergo a period known as clinical latency, during which they do not have any signs and symptoms even though the virus is actively replicating in their bodies.

For most people, three to 10 years will pass before their immune systems weaken to the point that they start to fall sick and show symptoms.

It is thus not reliable to look for signs and symptoms to try and determine if you have been infected with HIV. The only way to find out your HIV status is to get tested.

There are various ways to get tested for HIV infection. HIV testing is widely available at healthcare institutions, including polyclinics, private clinics, hospitals and at anonymous HIV test sites where personal particulars are not required. People can also now buy HIV self-

testing kits at the Department of Sexually Transmitted Infections Control Clinic and Action for Aids that they can use in the privacy of their own homes.

3. HOW IS HIV CONFIRMED AND TREATED?

HIV testing is the only way to diagnose HIV infection.

Anyone who is sexually active is at risk of contracting HIV and should be tested at least once in their lifetime. Those who engage in high-risk behaviour should go for regular HIV screening. These would include:

- People who exchange sex for money, or partners of such people
- People with multiple sexual partners
- People who engage in sexual activities under the influence of drugs or other substances (including partners of such people)
- People with history of intravenous drug use
- People who are seeking treatment or have been



diagnosed with any sexually transmitted infection should also be routinely screened for HIV infection at each visit for a new complaint.

HIV is treated using highly effective antiretroviral therapy (ART) and involves taking a combination of HIV medicine every day. ART is recommended for all peo-

ple who are infected with HIV, and can also reduce the risk of HIV transmission; however, it does not prevent transmission of other sexually transmitted infections (STIs).

5. PEOPLE MAY THINK HAVING HIV IS A DEATH SENTENCE. CAN ONE LIVE A NORMAL LIFE WITH HIV?

The advent of combination antire-

troviral agents has transformed HIV infection from a fatal illness in the 1980s to a chronic condition – at least not yet a curable disease – today.

With antiretroviral agents, deaths related to HIV infection have been reduced by at least 80 per cent and the risk of non-acquired immune deficiency syndrome related death by 50 per cent. Individuals living with HIV infection and who are on treatment can now live healthy lives no different from the rest of the population.

6. IS THERE A CURE FOR HIV?

Although there is currently no cure, there is highly effective treatment that can keep HIV under control and enable people living with HIV to live no differently from others.

People living with HIV who take HIV medicine exactly as prescribed can suppress their HIV viral load to an undetectable level and hence cannot transmit HIV to others sexually. This concept is known as U=U, or Undetectable = Untransmittable.

This is an important concept because it improves the lives of people living with HIV infection by reducing the shame and fear of transmission, opens up possibilities for conceiving children without alternative means of contraception, and encourages people living with HIV infection to start and stay on treatment.

The reduction in the risk of trans-

mission also brings us closer to ending the epidemic of HIV infection.

7. WHAT ARE SOME OF THE MISCONCEPTIONS ABOUT HIV?

• I can get HIV if I share food and drink with someone who has HIV.

HIV can be transmitted only through an exchange of certain body fluids, for example, semen, vaginal fluids, blood, pre-ejaculatory fluids and breast milk.

It is not transmitted by saliva. The heat from cooking the food and our stomach acids would also have destroyed the virus.

• HIV can be transmitted through a mosquito bite.

HIV is not transmitted by mosquitoes, ticks or any other insects. This is because the virus is destroyed in the stomach of mosquitoes.

In addition, the mosquito has two one-way channels when it is sucking blood, that is, the alimentary channel whereby it sucks the blood of the person it bites, and the salivary channel whereby it inoculates saliva into the person it bites. Thus, even if a mosquito bites a person who has HIV and then bites someone else, it cannot transmit HIV to the next person.

• HIV can be spread through non-sexual contact such as handshakes and hugging. HIV is not spread by shaking hands or hugging an HIV-positive person.

It cannot be spread through physical contact unless you have an open wound which comes into contact with the body fluids of an HIV-positive person who has not been effectively treated – which is extremely rare and highly unlikely in a normal social setting.

Body fluids like sweat and tears cannot transmit HIV. It is also not spread via body fluids such as urine and faeces. Hence, it is not spread through the sharing of toilet seats.

• You can get HIV from sharing a swimming pool with someone who has HIV. HIV can be transmitted only through an exchange of certain body fluids, hence, it is unlikely to be transmitted via swimming. In addition, it is a sensitive virus and is easily destroyed during the water treatment process. Hence, HIV cannot be spread via water in the swimming pool.

• HIV can be spread through air, from sneezing, coughing and through the air conditioning. HIV cannot survive for long in the air. When fluid leaves the body and is exposed to air, it dries up. As drying occurs, the virus, if present, becomes damaged, dies and is not infectious. HIV cannot be transmitted through air and droplets.

• HIV is more likely to infect certain groups of people. The risk of HIV transmission is best understood through sexual beha-

viour, rather than particular groups. The protection afforded through the use of prevention measures such as using condoms and taking pre-exposure prophylaxis benefits all who use them correctly and consistently.

8. FROM YOUR EXPERIENCE TREATING HIV PATIENTS, WHAT IS ONE WORRYING OBSERVATION? HOW CAN WE, AS A SOCIETY, BETTER SUPPORT PEOPLE LIVING WITH HIV?

Patients with HIV infection who take their medication as prescribed can suppress their viral loads, maintain their health and live no differently from others.

However, sometimes patients have difficulties being compliant with taking their medication. The most common reason often stems from the shame of stigma and discrimination they face in society, whether it is from their family, friends or colleagues.

In any illness, support from friends and family is crucial to help an individual stay on track with their treatment. If you know someone who is living with HIV, it is important to be supportive of them.

Educating yourself about HIV infection will go a long way in supporting your loved ones and reassuring them that HIV is a chronic, manageable disease. Encourage them to get treatment and remain adherent to treatment to maintain a healthy life.