

NUS researchers find new way to detect designer drug abuse

Cheryl Tan

Researchers from the National University of Singapore (NUS) have come up with a new way to boost surveillance for designer drug abuse, and it could be helpful for forensic teams both here and abroad.

Designer drugs, or new psychoactive substances, are often illegally created in a laboratory and are designed to mimic the effects of controlled drugs such as cocaine, cannabis, ecstasy and LSD.

These drugs are often made with different chemical structures to circumvent legislative bans. One such class of drugs is synthetic cannabinoids, which are designed to replicate the effects of cannabis.

In a research study led by Professor Eric Chan from the NUS Department of Pharmacy, three new uri-

nary biomarkers that could be used to detect the consumption of ADB-Butinaca, an emerging synthetic cannabinoid, were identified.

The study, done in collaboration with the Health Sciences Authority's Analytical Toxicology Laboratory, was published in the journal *Clinical Chemistry* on Aug 13.

ADB-Butinaca was first identified in Europe in 2019, and entered Singapore last year.

As most synthetic cannabinoids are extensively metabolised, or broken down in the body after consumption, they become virtually undetectable in urine samples, noted Prof Chan.

He added that conventional methods involve looking at the chemical structures of similar synthetic cannabinoids with known metabolites, which are then used by forensic scientists to predict the possible metabolites of new syn-



From left: Ms Moy Hooi Yan, laboratory director at the Health Sciences Authority's Analytical Toxicology Lab – Drug Abuse Testing; Professor Eric Chan of the National University of Singapore's Department of Pharmacy, who led the study; and Dr Wang Ziteng, research fellow at the NUS Department of Pharmacy. ST PHOTO: KHALID BABA

thetic cannabinoids that could show up in urine.

Metabolites are small molecules that are intermediate or end products of metabolism.

However, such a method may not necessarily be the most accurate as tweaks in the chemical structure of each new drug could affect the way it is metabolised in the body, said Prof Chan.

The three metabolites from ADB-Butinaca that have been used as reference standards for routine forensic monitoring were found to be absent or detected at lower concentrations in some urine samples of drug abusers.

"This created an impetus to identify other potential metabolites for use as urinary biomarkers for people who have consumed this partic-

ular cannabinoid," said Prof Chan. So the research team used human liver enzymes in the laboratory to break down ADB-Butinaca into its metabolites.

"Based on our knowledge of how drug metabolism works, we then performed experiments to understand how the liver and kidney handle these metabolites. From there, we determined which metabolites

are the major ones that can be used as potential biomarkers in urine," he said.

The team found that 15 metabolites were produced, of which four are abundantly excreted in urine and could be used as urinary biomarkers.

Three of them were new biomarkers while one of the metabolites also corresponded to the existing reference standard identified earlier. Although it was metabolised in small amounts by the liver, a large portion of the metabolite was excreted by the kidney into urine.

Therefore, it can also be counted as a urinary biomarker, said Prof Chan.

The other metabolites were either absent or present in very small traces in urine, due to further metabolism or excretion in faeces, he added.

Now that these four metabolites have been identified, they can be added to an existing database for drug urine tests to determine if ADB-Butinaca has been consumed.

This approach can also be used in the future to identify the correct urine biomarkers in new synthetic cannabinoids, said Prof Chan.

The team is looking to better understand how the metabolites of ADB-Butinaca and other new synthetic cannabinoids are excreted by the kidneys so that their presence in urine can be better predicted.

tansuwen@sph.com.sg