IOWA POISON CONTROL CENTER

Poison HOTLINE

1-800-222-1222

February 2021

Did you know ……

March 21 – 27, 2021 is National Poison Prevention Week (NPPW).

Three quick and easy ways to get involved in poison prevention during NPPW:

- Order a FREE poison prevention packet for your home.
- Order and display the 2021 NPPW poster. All poison prevention materials are free, including stickers, magnets and brochures in English and Spanish.
- Request the NPPW Partner Toolkit with social media messages and images that can be copied and pasted. Or simply consider sharing the IPCC's Facebook and Twitter messages during NPPW.

Call the IPCC Education Office at 712-279-3717 to get involved this NPPW.

POISON Help® 1-800-222-1222

Toxicokinetics≠Pharmacokinetics

"What's the drug's half-life?" and "How long should we watch the patient?" are two very common questions asked of the nurses and pharmacists at the Poison Center by healthcare providers who are treating an overdose patient. Those who have asked these questions likely heard similar responses: "Half-lives don't hold true in an overdose" and "At least [X] hours or as long as the patient is symptomatic."

What's different in an overdose? **Pharmacokinetic** half-lives are used for therapeutic dosing of a drug. An overdose's **toxicokinetics** are very different because the dose can be *many* times larger than a therapeutic dose.

The first step in kinetics is **absorption**. In an OD, the decreased rate of dissolution and degree and speed of absorption can slow how quickly the drug reaches systemic circulation. Bezoars, a mass of ingested drug that clumps together, are common with aspirin and iron tablets and slow absorption. With a bezoar, serum levels rise and fall as it disintegrates. Certain drug classes, like opioids and anticholinergics, slow absorption by slowing GI motility.

The second kinetic step is **distribution**. Overdoses can slow down drug transporter activity in the GI tract. Liver enzymes that normally metabolize a significant portion of a drug before it gets to the systemic circulation (the first pass effect) can become saturated so more drug reaches the bloodstream. Some drugs undergo enterohepatic recirculation and others can cause significant drug-drug interactions. Alterations in protein binding can lead to toxicity as therapeutic agents that become unbound from proteins.

The third kinetic step is **metabolism**. CYP enzymes can be inhibited or induced potentially leading to toxicity. Normal metabolic pathways can be saturated by a significant overdose, leading to formation of toxic metabolites that are of minimal concern in therapeutic dosing.

The final kinetic step is **excretion**. Most drug elimination is dependent on drug concentration – a certain percent of the drug is eliminated over a certain time frame (the half-life). In an OD, elimination reaches maximum capacity and a fixed amount of drug is eliminated over the same time frame.

There are many factors to consider in an overdose, including several not discussed here: volume of distribution, urine and serum pH, and chronicity of exposure. While the initial questions are straight forward, their answers simply are not.

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