BANNER POISON AND DRUG INFORMATION CENTER

ANNUAL REPORT 2023

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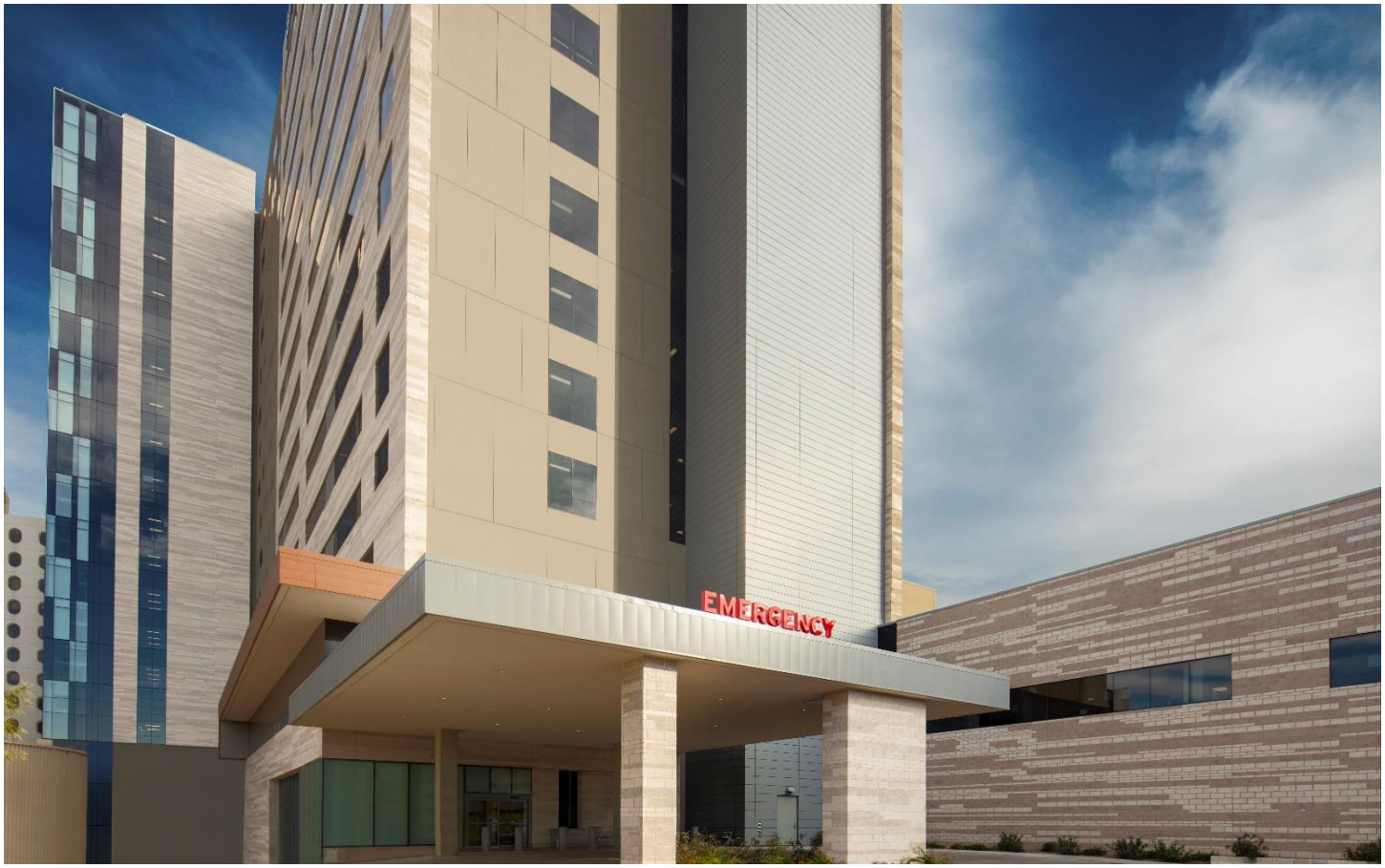
ON THE COVER

The tarantula-hawk wasp (*Pepsis grossa*) is a large black wasp with orange wings that is distributed commonly in the deserts of the southwest, from Kansas to California. Also referred to as stinging spider wasps, or solitary wasps in the *Hymenoptera* order, like other bees and wasps, and in the *Pompilidae* family, tarantula-hawk wasps belong to a large group of insects that prey on spiders and other insects for reproductive purposes. Only the female stings and paralyzes its prey, a tarantula in the case of the tarantula-hawk wasp, dragging it across to a burrow where an egg is deposited on the spider before sealing the burrow. When the larva hatches it consumes the paralyzed spider before pupating and emerging from burrow as adult. Depending on the species of stinging wasp and prey, paralysis can last from 15 minutes to 8 months. The best characterized toxins found in the venom of stinging wasps are α- and β-pompildotoxin. The actions of these toxins appear to be related to their ability to induce stimulation of presynaptic motor neurons, resulting in overexcitation and subsequent delayed inactivation of voltage-gated sodium channels. Though paralysis has not been described after envenomations in humans, the sting of the tarantula-hawk wasp is described as "blinding, fierce, and shockingly electric" pain. Tarantula-hawk wasp stings rate a 4 on the 0-4 Schmidt sting pain index developed by entomologist Jason Schmidt, formerly of the Carl Hayden Bee Research Center in Tucson, AZ, to rate and describe the pain caused by *Hymenoptera* envenomations.

OUR POISON CONTROL CENTER



The Banner Poison and Drug Information Center (BPDIC) was established in 1979 by Donald B. Kunkel, MD, and is accredited by the American Association of Poison Control Centers (AAPCC). Originally named Samaritan Regional Poison Center, BPDIC was located at St. Luke's Medical Center in downtown Phoenix but relocated to Good Samaritan Regional Medical Center, now Banner - University Medical Center Phoenix (B-UMCP) in 1987. BDPIC is one of two poison centers in Arizona and part of the nationwide system of 55 centers in the U.S.

The Banner Poison and Drug Information Center provides free, 24-hour service for the estimated 4.65 million residents, patients, and healthcare providers of Maricopa County and received over 48,000 calls in 2023. Additionally, the staff at BPDIC made approximately 89,000 outgoing, or follow-up calls. The remaining 14 counties in Arizona are managed by the staff of the Arizona Poison and Drug Information Center (APDIC) in Tucson.

The Center for Toxicology and Pharmacology Education and Research (CTPER) was formed through a partnership between Arizona's two poison control centers, researchers, and medical toxicologists. The Center aims to provide expertise, education, and essential research in the field of medical toxicology as well as encourage a stronger awareness of proper medication safety and disaster preparedness.

2023 SUMMARY

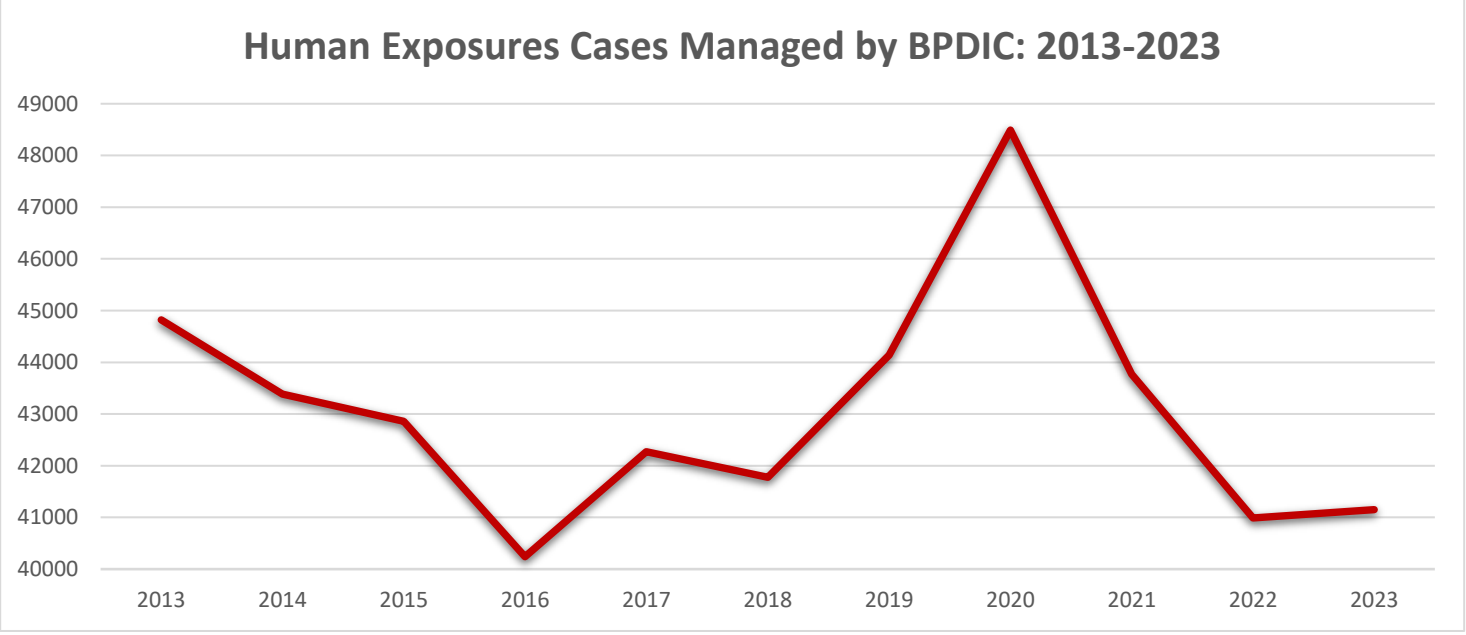
BPDIC answers all types of calls from every county within Arizona, as well as many other U.S. states. Each call answered typically generates a case which can be divided into 2 general categories: **exposure** or **information**. Exposure cases are those that include the interaction of a substance and a patient. An information case is just that, a call regarding drug or product information without a patient and/or exposure scenario. Exposure cases can be further subdivided into **intentional**, **unintentional**, **misuse**, or **abuse**. BPDIC also provides limited information on animal exposure calls. Information cases can be subdivided into **drug**, **environmental**, **medical**, **occupational**, **poison prevention**, **teratogenicity**, **substance abuse**, and **administrative information**. Of note, COVID-related calls fall under the medical information category.

BPDIC generated a total of **49,039 cases** in 2023, which was a **decrease of 3837** (~9%) cases compared to 2022. Despite the overall decrease in call volume, human exposure calls **increased by 963 cases**. BPDIC followed up **89,983** times on those 49,039 cases. Outgoing calls are made to ensure continuity of care, adherence to optimal therapy, and outcome resolution.

2023 Cases Broken Down by Call Type:

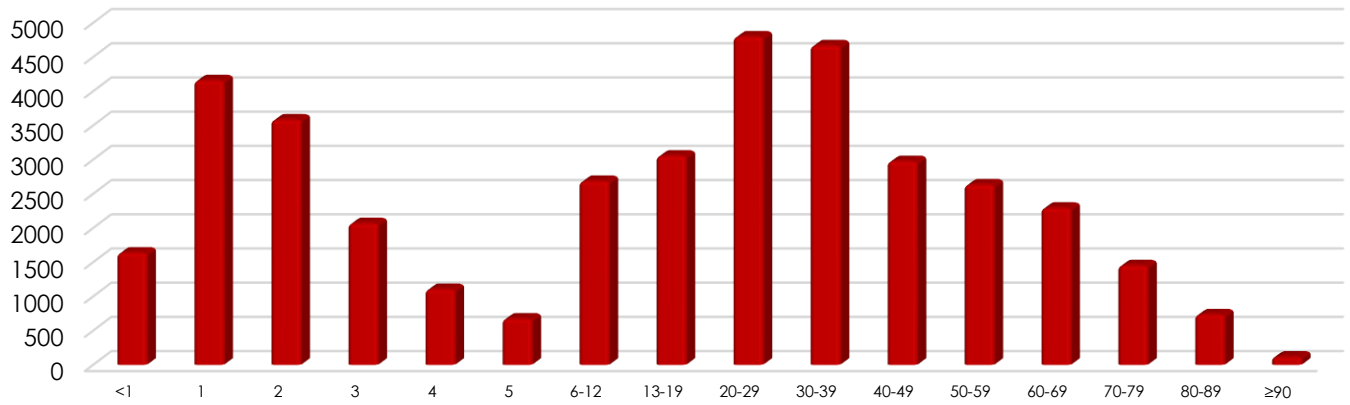
84%	Human Exposure	(41,150)	0.9%	Poison Information	(470)
3.9%	Drug Information	(1,933)	0.4%	Caller Referral	(205)
2.8%	Other Information	(1,367)	0.3%	Prevention/Safety	(134)
2.8%	Medical Information	(1,367)	0.1%	Occupational	(52)
2.2%	Animal Exposure	(1,058)	<0.1%	Substance Abuse	(48)
1.8%	Environmental	(906)	<0.1%	Administrative	(27)
1.3%	Drug Identification	(646)	<0.1%	Teratogenicity	(9)

BPDIC has seen fluctuations in call volume over the past decade with an overall decrease from 2011 through 2016, an increase from 2016 to 2020, and a subsequent decrease since 2020.

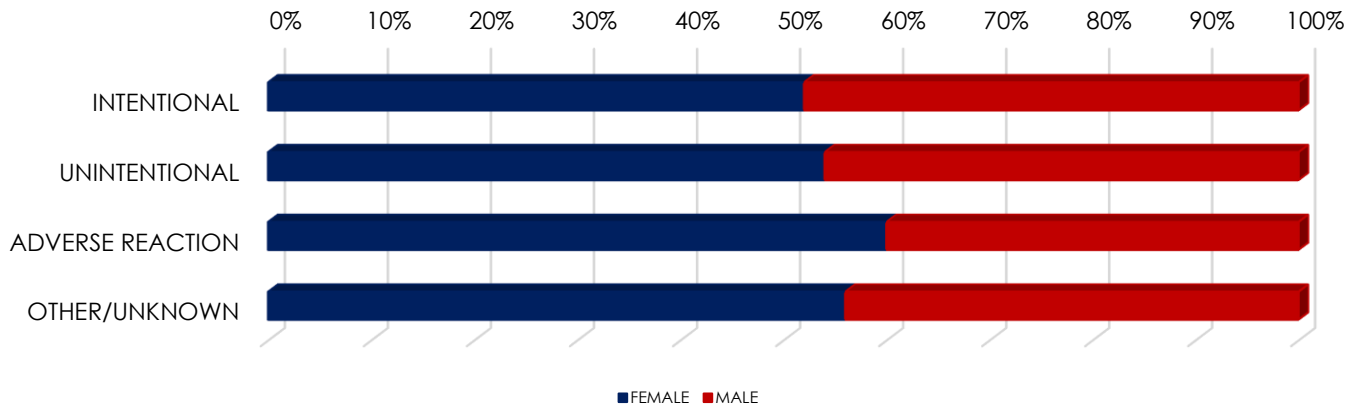


CALL DISTRUBUTION

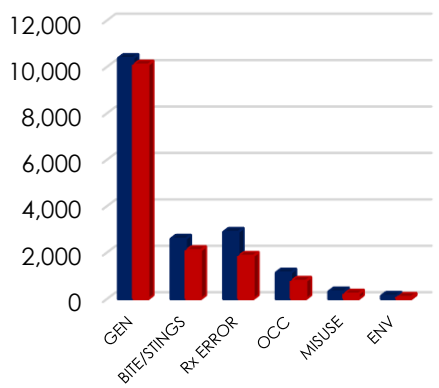
Case Distribution by Patient Age (years)



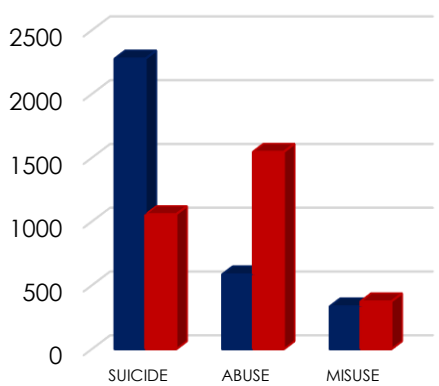
Case Distribution by Gender and Exposure Reason



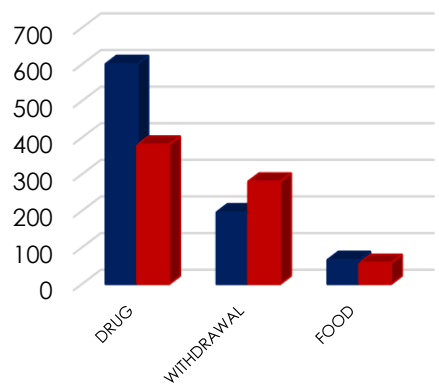
UNINTENTIONAL



INTENTIONAL



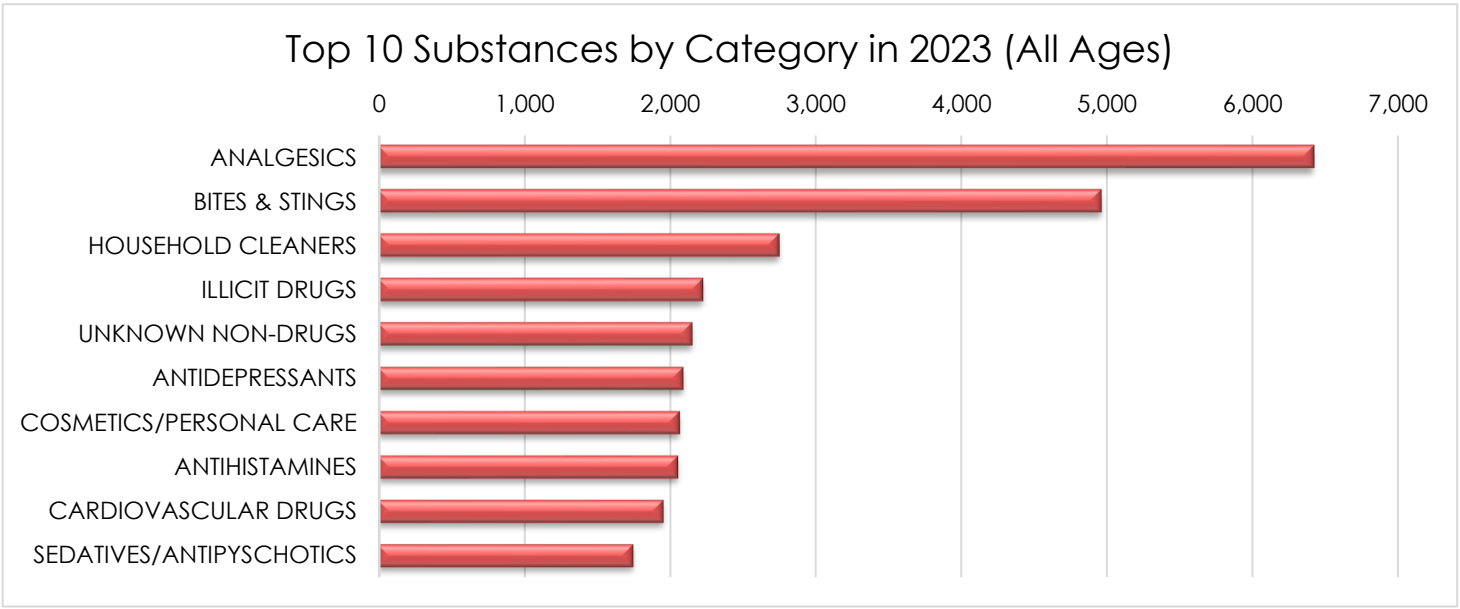
ADR & WITHDRAWAL

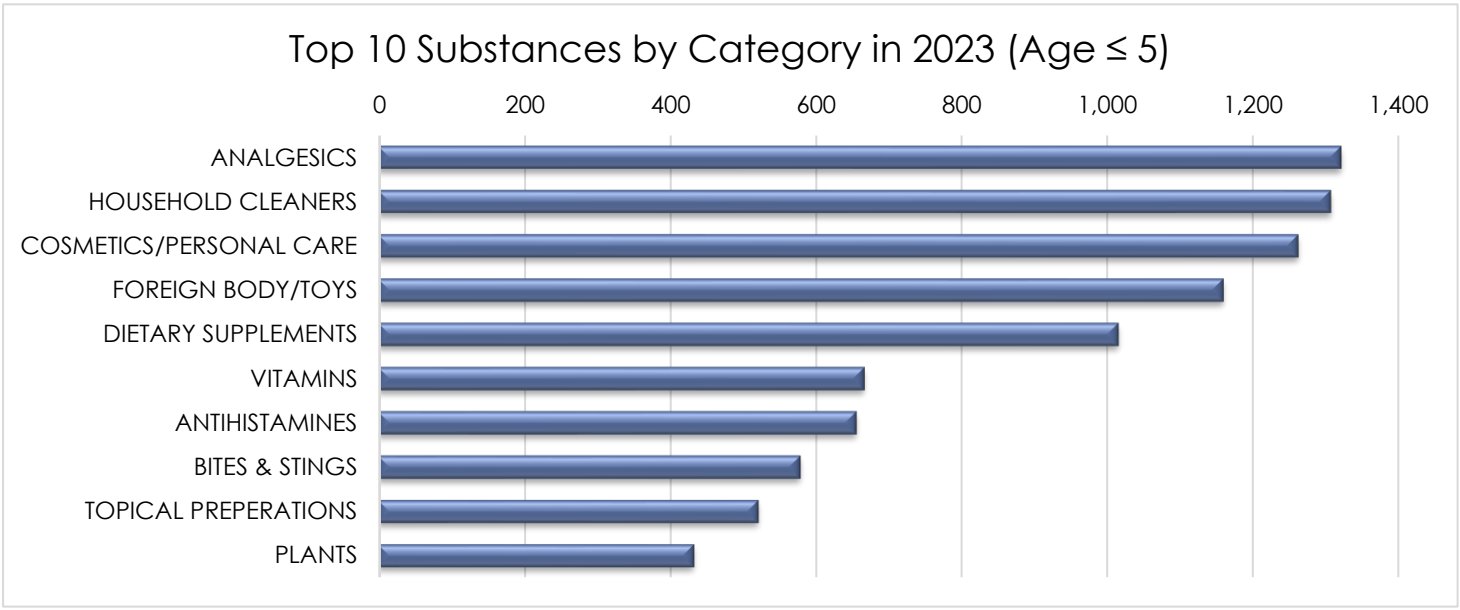


FEMALE MALE

Intentional Exposures Reasons: suspected suicide, misuse, and abuse
Unintentional Exposure Reasons: general (GEN), environmental (ENV), occupational (OCC), therapeutic error, misuse, bite/stings
Adverse Reaction (ADR) Reasons: drug, food
Other Exposure Reasons: contamination/tampering, malicious, and withdrawal

SUBSTANCE SUMMARY

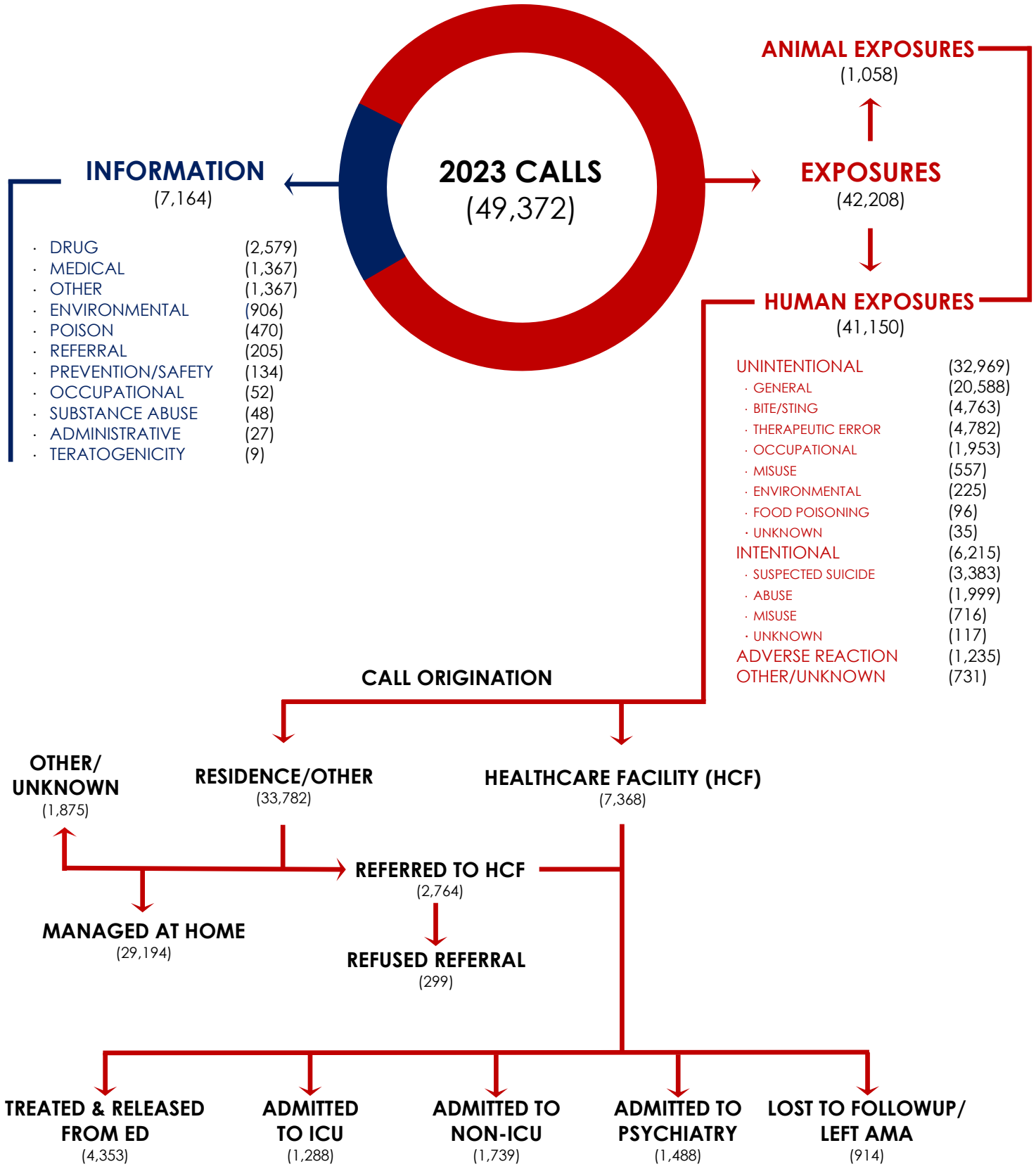




BPDIC saw a 22% decrease in cases involving bites and stings, from 6,049 in 2022 to 4,953 in 2023. Cases involving analgesics increased ~11% from 5,783 in 2022 to 6,413 in 2023. Illicit substances increased ~30% in 2023, from 1,575 cases to 2,218 in 2023. 2023 cases involving the remaining top-10 substance categories for all ages have remained mostly stable compared to previous years.

The various substance categories involved in pediatric exposures has remained relatively consistent over the past several years, with their year over year order being the only change. In 2023, cases involving **analgesics remained the top substance category for children under 6**. As has been published in numerous articles over the past several years, most of these exposures are preventable. Children explore their environment by tasting and touching what they can get their hands on. They will also mimic behaviors seen by others in the home. If a substance is within their sight and reach, there exists the opportunity for preventable unintentional pediatric exposures. One of the core tenets of all U.S. Poison Centers is to continuously provide poison prevention education and outreach to the public.

PATIENT MANAGEMENT

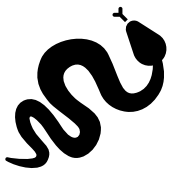


ENVENOMATIONS

Arizona is home to a large variety of venomous insects, arachnids, chilopodas, and reptiles. BPDIC specializes in the treatment of envenomations by snakes, spiders, scorpions, and bees as well as conducts research with rattlesnake antivenoms.

During the winter months, rattlesnakes enter a period of brumation where they shelter below ground. This can be in dens, tree stumps or around your home in rock piles, crawlspaces, or beneath wood or debris piles. They become less active during brumation but can emerge any month of the year if necessary. They are most active during the warmer months, with June through September, corresponding to our busiest months for envenomation-related calls.

Of the 40-50 scorpion species distributed throughout Arizona, only the Arizona Bark Scorpion (*Centruroides sculpturatus*) produces a severe enough sting to potentially require hospitalization and administration of the antivenom. The Arizona Bark Scorpion is active all throughout the year, but more so during the warmer summer months.



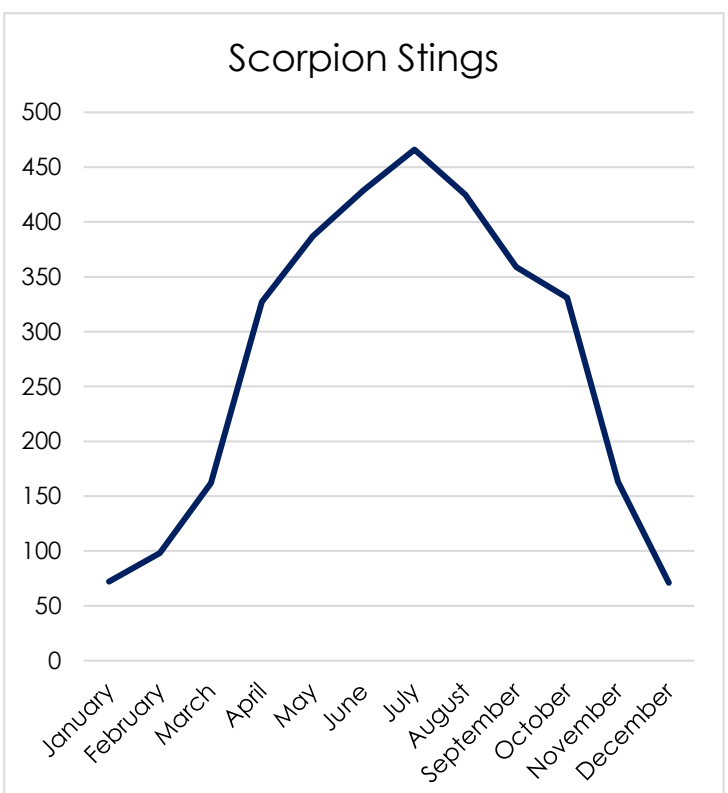
118 Snake Bites

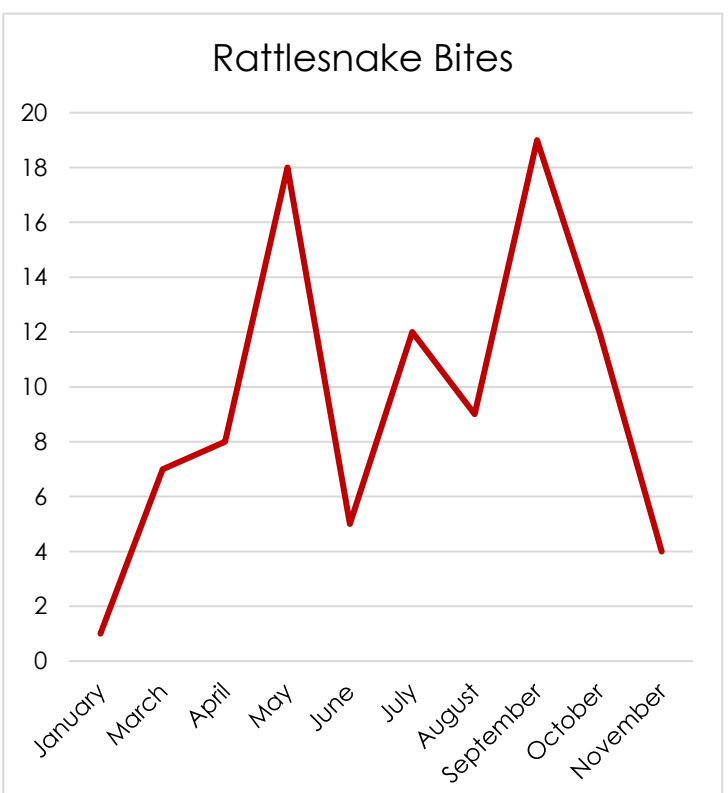
3,290 Scorpion Stings

336 Spider Bites

171 Bee Stings

574 Rabies Exposures





CLINICAL TOXICOLOGY

In 2021, Banner Poison and Drug Information Center, in collaboration with the Departments of Medical Toxicology and Inpatient Pharmacy at Banner - University Medical Center Phoenix (B-UMCP), established a Clinical Toxicology and Emergency Medicine (CTEM) Fellowship training program for pharmacists. The CTEM fellowship is one of 10 fellowship training programs available to pharmacists in clinical toxicology in the U.S.

Each applicant accepted into the 24-month long CTEM fellowship rotates primarily through the Poison Center, Medical Toxicology, Emergency Medicine, Critical Care and B-UMCP, with elective rotations in Pediatrics, Pharmacogenomics, Addiction Medicine, and Industrial and Occupational Toxicology. Collectively, the core rotation selection serves to provide the fellow a robust clinical and practical experience to develop the expertise to skillfully understand a wide spectrum of complex toxicologic emergencies and address the evidence-based therapeutic interventions necessary for a successful outcome.

Additionally, the CTEM fellow serves as a primary preceptor to the numerous rotating pharmacy students and residents through the Toxicology and Poison Control Center service at B-UMCP. The overall CTEM curriculum prepares the fellow for the successful accreditation for and completion of the American Board of Applied Toxicology certification exam.

Information

Application

Our current CTEM fellow, Kaitlin Ryan, PharmD, BCCCP, continued her curriculum in 2023. Kaitlin earned her Doctor of Pharmacy from the University of Chicago in 2015 and began work as a clinical pharmacist at Aurora St. Luke's Outpatient Pharmacy, Centegra Hospital, and Children's Wisconsin. She also spent time as a Certified Specialist in Poison Information at the Wisconsin Poison Center. Kaitlin is Board Certified in Critical Care Pharmacy. Upon successful completion of the remainder of the program, Kaitlyn will credential to sit for board examination in toxicology by the American Board of Applied Toxicology.

MEDICAL TOXICOLOGY

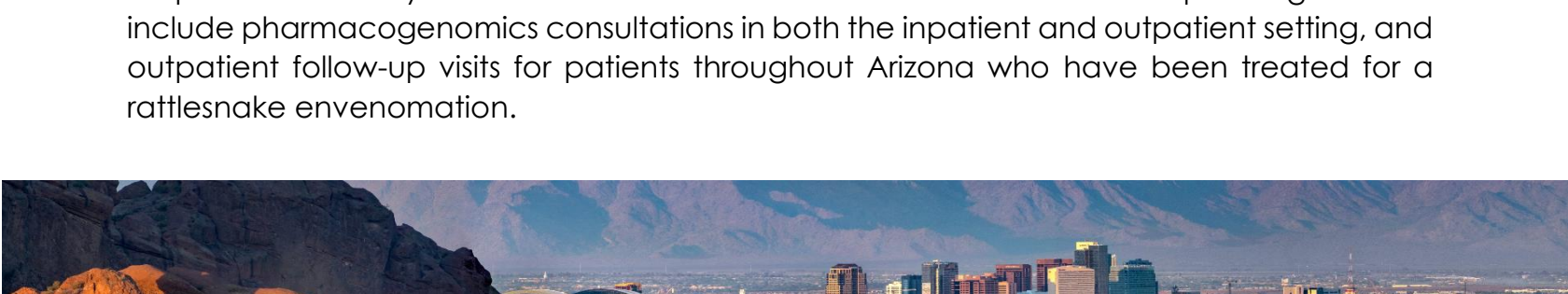
The Department of Medical Toxicology at Banner - University Medical Center Phoenix (B-UMCP) established a 24-month Medical Toxicology fellowship programs for physicians in 1983. The program is sponsored by the University of Arizona College of Medicine - Phoenix and received accreditation by the Accrediting Council of Graduate Medical Education (ACGME) in 2000. To date, the program has successfully trained over 60 physicians in the subspecialty of Medical Toxicology. Many of the programs' graduates have stayed on to become faculty at the Department of Medical Toxicology at B-UMCP.

The fellowship program currently has 5 fellows on an alternating annual enrollment of 2 or 3 new fellows and provides admitting and consulting services for patients at both B-UMCP. The Department of Medical Toxicology at B-UMCP is one of only two toxicology services in the country to offer both primary admit and consult services. As one of the busiest inpatient toxicology services in the U.S., the Department of Medical Toxicology sees over 1,800 patients annually at B-UMCP.

The Medical Toxicology rotations serves to provide a robust clinical experience for physicians in the management of poisoned patients, pharmacogenomics, and addiction medicine.

MEDICAL TOXICOLOGY FELLOWSHIP

The Department of Medical Toxicology continues to expand services to improve care for patients in both the inpatient and outpatient settings. Services for patients with substance use disorders include management of intoxication and withdrawal syndromes, as well as initiation of medications such as buprenorphine and methadone, with connection to outpatient recovery and medication maintenance resources. Other expanding services include pharmacogenomics consultations in both the inpatient and outpatient setting, and outpatient follow-up visits for patients throughout Arizona who have been treated for a rattlesnake envenomation.



The Arizona Opioid Assistance and Referral (OAR) Line is a joint effort between the Arizona Department of Health Services and the Arizona Poison & Drug Information System (Banner and University of Arizona Tucson poison centers). Launched in March 2018 in response to the Arizona Opioid Epidemic Act, the OAR Line was the nation's first real-time comprehensive information hotline for patients seeking resources for opioid-related issues and healthcare providers requesting consultation for complex patients with pain and opioid use disorder. The OAR Line is a free, confidential, 24/7, service available to all healthcare providers and the general public across Arizona and always staffed by registered nurses and pharmacists with physician back-up.

As part of this work, the Banner Poison and Drug Information Center has partnered with Magellan to reach out to their clients at risk for potential adverse drug effects related to opioids and other prescribed medications (e.g., >50 MME opioids and/or benzodiazepines). The OAR Line contacts and follows these patients to assist with services (e.g., case management) and medication regimens. This has been expanded to reach out to members that have had an inpatient admission or ED admission related to opioids (i.e. naloxone rescue, overdose) to ensure they are connected to services if needed.

MCDPH Epidemiology

Maricopa County Department of Public Health's Epidemiology division has started contacting individuals treated in local Emergency Departments for opioid-related illnesses (e.g., naloxone rescue). During their interview of these patients the OAR Line services are offered. If accepted by the patient, their information is sent by the epidemiologists to the OAR Line for follow-up calls and further resources.

OARLINE.COM

oarline
Opioid Assistance Referral Line

POISON CENTER OUTREACH

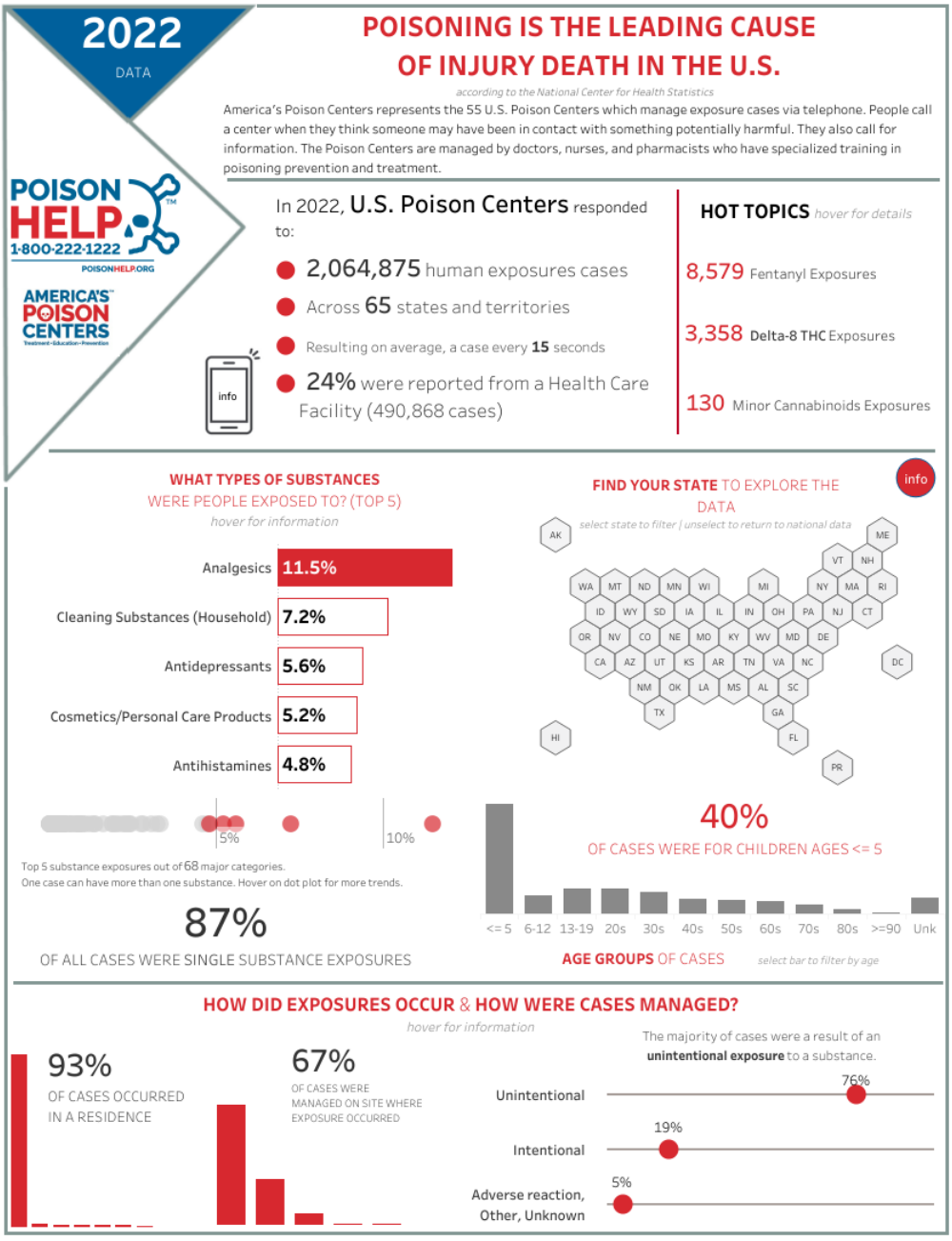
BPDIC actively participates in educating Maricopa County residents and health care professionals in poison prevention and safety, as well as the management of poisoned patients. Public education focuses on current, high-risk poisonings and utilization through participation in community health fairs, professional organizations, and continuing medical education presentations.

BPDIC is involved in **training EMS, pharmacy, nursing, and medical students**, as well as medical and pharmacy **residents and fellows** through lectures or longitudinal rotations. An annual toxicology conference is offered every spring, which attracts national attendance from healthcare professionals seeking continuing education in toxicology.

Medical direction and **on-call physician support** for the poison center is provided by Board-certified Toxicologists from the Department of Medical Toxicology at Banner - University Medical Center Phoenix. The **Department of Medical Toxicology** operates one of the busiest inpatient and outpatient clinic toxicology services in the United States, **caring for more than 1,800 patients annually**. Affiliations include the University of Arizona College of Medicine-Phoenix, Phoenix Children's Hospital, Maricopa Medical Center (now Valleywise Health Medical Center) and the Center for Toxicology and Pharmacology Education and Research. Medical Toxicology is a recognized subspecialty by the Accrediting Council for Graduate Medical Education and is co-sponsored by the American Board of Emergency Medicine, American Board of Preventive Medicine, and American Board of Pediatrics. A 24-month fellowship is offered to physicians who have completed a residency.

Additionally, BPDIC staff regularly provide information for various print and broadcast news outlets. In 2023, **339 news placements were viewed over 9 million times**. These news articles span an array of toxicology, community health, and poison prevention topics and were hosted on major news websites, television, radio shows, and print.

The **National Poison Data System** (NPDS) is the data warehouse for the nation's 55 poison centers. Each poison center submits de-identified case data (based on each human exposure call) to NPDS. This case information is uploaded to NPDS in near real time (about every 9.5 minutes), making NPDS one of the few operational systems of its kind. This allows for both spatial and temporal case volume and case-based surveillance possible for the purpose to early detection of potential emerging public health threats. Data is compared to historical trends and generates system alerts when anomalies are detected. A dedicated team of physician and pharmacist toxicologists across the country analyze these anomalies to determine if an emerging public health threat exists.



NPDS™ NATIONAL POISON DATA SYSTEM FROM AMERICA'S POISON CENTERS

AMERICA'S POISON CENTERS AAPCC ACCREDITED ™

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SELECTED JOURNAL ARTICLES & POSTERS

Jason MD, **Spyres MB**. et al Toxicology Investigators Consortium FACT Study Group. Identification of Bradycardia Following Remdesivir Administration Through the US Food and Drug Administration American College of Medical Toxicology COVID-19 Toxic Pharmacovigilance Project. JAMA Netw Open. 2023 Feb 1:(6(2):e2255815. Doi 10.1001/jamanetworkopen.2022.55815

Lewis B, **Brooks D**, **Dion C**, Schwebach C Toxicokinetics of metformin overdose treated with CVVHDF.Am J Emerg Med. 2023 Mar 2:S0735-6757(23)00113-4. doi: 10.1016/j.ajem.2023.02.038. PMID: 36932001

Spungen H, Burton J, Schenkel S, et al: Completeness and Spin of medRxiv Preprint and Associated Published Abstracts of COVID-19 Randomized Clinical Trials JAMA. 2023 Apr 18;329(15):1310-1312. doi: 10.1001/jama.2023.1784. PMID: 37071105

Roland M, **Kuhn BR**, **Ryan K**. What's a CHEMPACK?"- An interdisciplinary effort to educate and train healthcare providers and first responders before a large-scale community event. Poster presentation at the North American Congress of Clinical Toxicology conference in Montreal, Canada. Oct 2023

Ryan K, **Kuhn BR**. Unintentional Pediatric Ingestion of Brexpiprazole. Poster presentation at the North American Congress of Clinical Toxicology conference in Montreal, Canada. Oct 2023

Raling-Young D, **Kuhn BR**. Characterization of Unintentional Pediatric Exposures to Novel Psychiatric Medications Approved Since 2011. Poster presentation at the North American Congress of Clinical Toxicology conference in Montreal, Canada. Oct 2023

Dart RC, Mullins ME, Matoushek T, **Ruha AM**, Burns MM, Simone K, Beuhler MC, Heard KJ, Mazer-Amirshahi M, Stork CM, Varney SM, Funk AR, Cantrell LF, Cole JB, Banner W, Stolbach AI, Hendrickson RG, Lucyk SN, Sivilotti MLA, Su MK, Nelson LS, Rumack BH. Management of Acetaminophen Poisoning in the US and Canada: A Consensus Statement. JAMA Netw Open. 2023 Aug 1;6(8):e2327739. doi: 10.1001/jamanetworkopen.2023.27739. Erratum in: JAMA Netw Open. 2023 Sep 5;6(9):e2337926. doi: 10.1001/jamanetworkopen.2023.37926. PMID: 37552484

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FOR FURTHER INFORMATON REGARDING ANY DATA PRESENTED IN THIS REPORT, REQUESTS FOR A LECTURE/EDUCATION SERIES, OR POISON CENTER EDUCATIONAL MATERIALS, PLEASE CONTACT

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