



ROCKY MOUNTAIN POISON & DRUG CENTER

*Saving Lives with Answers*™

*Medical Toxicology Fellowship Program*

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## ***Introduction***

The Medical Toxicology Fellowship program at the Rocky Mountain Poison and Drug Center (RMPDC) has been training physicians since 1976. Our fellowship program has set the standard for such training and has been responsible for the education of numerous leaders in the field. The fellowship is a two-year program during which the fellow is given ample opportunities to publish and gain valuable experience in toxicology.

The fellowship is located at the RMPDC, a division of Denver Health, has been in operation since 1956, making it one of the oldest poison control centers in the nation. Our primary service area encompasses Colorado, Montana, Hawaii, Idaho and Nevada, though physician phone consultations can extend nationwide. The fellowship is operated through the Denver Health Medical Center, a Level 1 regional trauma center within Denver Health and in conjunction with its emergency Medicine Residency.

Our patient population is based primarily at Denver Health Medical Center and the University of Colorado Hospital which provide an outstanding variety of toxic exposures. In addition, fellows may consult at The Children's Hospital in Denver and other area hospitals. Fellows play a major role in providing education in toxicology to other physicians in emergency medicine, pediatrics and internal medicine departments within the Denver area as well as those who rotate with us from around the nation and the world.

## ***Accreditation***

The RMPDC toxicology fellowship program has been approved by the Accreditation Council for the Graduate Medical Examination (ACGME) effective July 1, 2000. Graduates of the fellowship are eligible to take the American Board of Medical Toxicology exam if they meet all other requirements.

Medical Toxicology is a subspecialty whose sponsoring boards include Emergency Medicine, Pediatrics and Preventive Medicine. These sponsoring boards along with the American College of Medical Toxicology have determined the ACGME accreditation requirements for Medical Toxicology programs.

Additionally, the RMPDC is certified as a regional poison center by the American Association of Poison Control Centers.

## ***Eligibility***

All applicants must be board eligible in a recognized medical specialty. This includes, but is not limited to, emergency medicine, pediatrics, internal medicine, and family practice.

## ***Application***

There are no fixed deadlines for applying to the Medical Toxicology fellowship program. We accept applications at any time, and generally extend offers to candidates by fall of each year for positions beginning in July. If we have no openings for the upcoming academic year we will consider your application for the following year.

***The application procedure is quite simple and consists of:***

1. A letter requesting consideration for a program position,
2. Three letters of recommendation including one from your residency director, and
3. Current curriculum vitae.

***Please submit applications to:***

Kennon Heard M.D.  
Medical Toxicology Fellowship Program  
Rocky Mountain Poison and Drug Center - Denver Health  
777 Bannock Street, Mail Code 0180  
Denver, CO 80204  
Kennon.Heard@rmpdc.org

## ***Goals & Responsibilities***

In keeping with the guidelines of the American Board of Medical Toxicology, the fellowship has established its primary goals for the fellows as follows:

1. Clinical skills in diagnosing and treating acute and chronic poisoning in adults and children.
2. Teaching skills at all levels.
3. The ability to conduct and interpret clinical and laboratory research.
4. Extensive knowledge of environmental and occupational toxicology.
5. Extensive knowledge of pharmacokinetics.
6. Extensive knowledge of epidemiology, biostatistics and application of preventive medicine to toxicology.
7. The ability to perform consultations with the medical community concerning a wide variety of toxicological emergencies.
8. The ability to communicate effectively with the media concerning toxicologic problems affecting the community.
9. Administrative skills as might be required in the directorship of a regional poison center.
10. Working knowledge of toxicology laboratory techniques including high-performance liquid chromatography (HPLC), Gas-liquid chromatography (GLC), thin-layer chromatography (TLC), mass spectrometry, and enzyme-multiplied immunoassay technique (EMIT).
11. The ability to utilize the laboratory appropriately in cases where adequate history is unavailable.
12. Qualification of Fellow graduates to sit for the Medical Toxicology Board Exam (Medical Toxicology Subboard of the American Board of Emergency Medicine).

### ***Responsibility of the fellowship to the fellow:***

The responsibility of the Medical Toxicology Fellowship at the RMPDC to the fellow is to provide all the opportunities necessary to ensure that the goals of the fellowship are met and that the curriculum is simultaneously structured and flexible. To this end, a seminar series given by faculty and senior fellows meets twice weekly to discuss areas defined as the core curriculum. These didactic sessions not only provide a review of topics in toxicology but also help develop more formal teaching skills of the senior fellows.

Additionally, the RMPDC staff consists of numerous health professionals with varied interests and areas of expertise who are skilled at teaching, performing research, and providing information in a concise yet thorough manner.

## *Curriculum & Courses*

*The clinical toxicology fellowship is a two-year program, each year having similar but distinguishable features.*

### **First Year—The first-year fellow is primarily responsible for:**

1. Being the primary on-call physician for the RMPDC, including telephone consultation with treating physicians, seeing patients with serious poisoning who present to Denver area hospitals, and providing physician backup for the poison information specialists. At the RMPDC, the information specialists are nurses with at least a bachelor's degree and two years of critical care experience. They, therefore, usually consult the physicians only for the more interesting or seriously ill patients.
2. Teaching residents who rotate through the poison center and assigning duties commensurate with their level of training. At the present time, emergency medicine residents from Denver Health Medical Center and other emergency medicine residencies throughout the United States as well as Fellows in Pediatric Emergency Medicine rotate through the poison center year-round.
3. Participating in daily case review conferences in which recent cases referred to the poison center are discussed by the staff.
4. Identifying areas of controversy and importance in toxicology which will become subjects of clinical or laboratory research in the fellow's second year.
5. Learning to expertly manage cases of general public concern, including mass exposure and hazardous material spills, and to write press releases and position statements when appropriate.
6. Submitting case reports or series to peer review medical journals of toxicological importance to the medical community. Numerous opportunities for publication of textbook chapters and collective reviews are also available.
7. Participating in the Poison Center Quality Assurance Program in which information provided by the poison center is reviewed. Our goal is to ensure that complete documentation and accurate advice is provided for every consult.
8. Becoming skilled in all areas identified in the section entitled "Goals of the Toxicology Fellowship." This should clearly define the first year as an exciting "learning" period.

### **Second Year—The second-year fellow is primarily responsible for:**

1. Providing backup coverage for the first-year fellow.
2. Conducting research and publishing the results in areas of interest identified in the first year. Original and comprehensive clinical or laboratory research is required.
3. Continuing the teaching responsibilities of the first year.
4. Demonstrating leadership in the training program and its activities.
5. Developing the administrative skills required to direct a regional poison center.
6. Further developing clinical skills managing the critically ill toxicology patient.
7. Continuing to develop writing skills and abilities necessary to critically review the scientific literature.

8. Leading chart and hospital rounds along with the attending.
9. Preparing to sit for the Medical Toxicology board exam at the end of the fellowship.

### *Potential Courses for Fellows*

- ***Pharmacokinetics***  
School of Pharmacy - UCHSC  
Basic course in pharmacokinetics will enable student to apply principles of pharmacokinetics to clinical practice, analysis of the literature, and research design
- ***Organ System Toxicology***  
Graduate School, Ph.D. Program in Toxicology - UCHSC  
Small class taught by graduate faculty that examines mechanisms of toxicity by organ systems. Oral presentations required on topic of choice. Contributions by toxicology fellows offer a good balance to mechanistic, basic science approach to toxicology.
- ***Clinical Epidemiology***  
School of Medicine - UCHSC  
Course designed for fellows and junior faculty that is an excellent overview of research design and epidemiology. Course enables students to critically analyze scientific literature and to understand essential elements in research design.
- ***Biostatistics***  
School of Medicine - UCHSC  
Course designed for fellows and junior faculty that is an excellent overview of statistics. Course enables the student to perform and understand essential statistical analyses.

## *Typical Schedule*

### *Sample Weekly Schedule*

<i>Monday</i>	<i>Tuesday</i>	<i>Wednesday</i>	<i>Thursday</i>	<i>Friday</i>
0900 Rounds (except 3rd Monday will be at 10:00 - see below)	0900 Rounds  1200 Didactic Lecture  1530 Last Tuesday of month P&T Committee Meeting - DH 3rd Floor Conf. Room Davis Pavilion (Pharmacy Students Only)	0800 1st, 3rd, & 5th Wed - Denver Health Emergency Medicine M & M Conference, Rita Bass  0900 Rounds  1330 Research Conference - 4th Floor Conference Room	0900 Rounds  1100 Journal Club  1200 Didactic Lecture	0800 Clinical Pharmacy conference (last Friday of month)  0900 Rounds

### *Sample Monthly Schedule*

<i>Sat</i>	<i>Monday</i>	<i>Tuesday</i>	<i>Wednesday</i>	<i>Thursday</i>	<i>Friday</i>	<i>Sun</i>
	<b>1</b> 9:00 Rounds	<b>2</b> 9:00 Rounds	<b>3</b> 8:00 M&M @ DH 9:00 Rounds 13:30 Research Conf.	<b>4</b> 9:00 Rounds 11:00 Journal Club	<b>5</b> 9:00 Rounds	<b>6</b>
<b>7</b>	<b>8</b> 9:00 Rounds	<b>9</b> 9:00 Rounds	<b>10</b> 9:00 Rounds 13:30 Research Conf.	<b>11</b> 9:00 Rounds 11:00 Journal Club	<b>12</b> 9:00 Rounds	<b>13</b>
<b>14</b>	<b>15</b> 10:00 Rounds	<b>16</b> 9:00 Rounds	<b>17</b> 8:00 M&M @ DH 9:00 Rounds 13:00 Research Conf.	<b>18</b> 9:00 Rounds 11:00 Journal Club	<b>19</b> 9:00 Rounds	<b>20</b>
<b>21</b>	<b>22</b> 9:00 Rounds	<b>23</b> 9:00 Rounds	<b>24</b> 9:00 Rounds 13:30 Research Conf.	<b>25</b> 9:00 Rounds 11:00 Journal Club	<b>26</b> 8:00 Clin Pharm Conf. 9:00 Rounds	<b>27</b>
<b>28</b>	<b>29</b> 9:00 Rounds	<b>30</b> 9:00 Rounds 15:30 P&T Committee	<b>31</b> 8:00 M&M @ DH 9:00 Rounds 13:00 Research Conf.			

## *Grants & Awards to Fellows and Faculty*

The RMPDC has a well established research program which initiates new endeavors into all areas of clinical and basic science toxicology, including epidemiology, diagnoses, management, treatment and the prevention of poisonings. Research projects are funded by private and public grants. A partial list of current projects includes:

Bogdan GM, Dart RC: A Controlled Clinical Trial of the Accuracy of Dimercaptopropane Sodium Sulfonate (DMPS) as a Diagnostic Agent for Mercury and Arsenic Body Burden. Heyl-Berlin, 1997-1999.

Bogdan GM, Dart RC: A Registry to Record the Adverse Effects and Development of Recurrence After Typical Clinical Use of Antivenin (Crotalidae) Polyvalent [Wyeth]. Therapeutic Antibodies, Inc., 1997-1998.

Bogdan GM, Dart RC: A Study to Develop a Registry of Human Exposures to DEET. PEGUS Research, 1995-1999.

Bogdan GM, Dart RC: Development of a Medical Strike Team System for the Denver, Colorado Metropolitan Region. US Dept Health & Human Services, 1997-1999.

Bogdan GM, Dart RC: Rocky Mountain Arsenal Medical Monitoring Program - Referral System. Colorado Department of Public Health & Environment, 1997-2000.

Bogdan, GM: American College of Medical Toxicology/Orphan Medical Research Award, 2000.

Bogdan, GM: Denver Metropolitan Medical Response System, Principal Investigator, Department of Health and Human Services, Department of Homeland Security, 1997 – present

Bogdan, GM: Model for Adapting Community Call Centers to Support Outpatient Healthcare and Monitoring in a Major Healthcare Crisis, Agency for Healthcare Research & Quality, 2005-2007.

Bogdan, GM: Model for Health Professionals' Cross Training for Mass Casualty Respiratory Needs, Agency for Healthcare Research & Quality, 2005-2006.

Bogdan, GM: Rocky Mountain Arsenal Medical Monitoring Program, Colorado Department of Public Health and Environment, 1997–present.

Cairns C, Dart RC, Harken A, MD. Emergency Medicine Foundation Center of Excellence Grant, 1994-1997.

Cairns, Dart & Harken: Emergency Medicine Foundation Fellowship Award.

- o Heard K, fellow, 1997-1998 - Kokan L, fellow, 1996-1997

- o Cetaruk E, fellow, 1994-1996 - McKinney P, fellow, 1991-1992

Dart RC, Aposhian HV: DMSA, DMPS, and other Orally Active Dithiol Chelators. National Institutes of Health, 1997-1999.

Dart RC, Bogdan GM: A Comparison Study of CroTAB<sup>®</sup> and Antivenin (Crotalidae) Polyvalent [Wyeth] in Severe North American Crotalid Envenomation, Therapeutic Antibodies, Inc., 1998-1999.

Dart RC, Bogdan GM: An Open-Label Safety Study of An Escalating Dosage Regimen of Affinity Purified Ovine Broad Spectrum Cyclic Antidepressant Immune Fab (TriTAB). Therapeutic Antibodies, Inc., 1997-1999.

Dart RC, Bogdan GM: An Open-Label, Parallel Comparative Study Between Two Dosing Regimens of CroTAB<sup>®</sup>. Therapeutic Antibodies, Inc., 1997-1998.

Dart RC, Bogdan GM: Analysis and Update of the 1996 Olympic Clinical Treatment Protocols for Casualties Resulting from Terrorist Incidents Involving Weapons of Mass Destruction By Consensus Review. US Dept Health & Human Services, 1998-1999.

Dart RC, Bogdan GM: Clinical Trial of a New Anti-Digoxin Fab. Therapeutic Antibodies, Inc., 1997-1999.

Dart RC, Bogdan GM: Clinical Trial of a New Antidote for Ethylene Glycol & Methanol Intoxication. Orphan Medical, Inc., 1997-1999.

Dart RC. Clinical Trial of Polyspecific Crotalid Antivenin. US Food & Drug Administration, 1993-1995.

Dart RC. Efficacy and Pharmacokinetics of Tab Anti-digoxin Fab in the Rat. Therapeutic Antibodies, Inc., 1993-1995.

Denzel D, Bogdan GM, Dart RC: Impact of a Poison Center on Insufficient Stocking of Antidotes. Orphan Medical Inc., 1998-1999.

Denzel D, Wilson V, Dart RC: Therapeutic Guidelines on Surgical and Non-Surgical Antimicrobial Prophylaxis. American Society of Health-System Pharmacists, 1995-1997.

Gomez H. Texaco Research Grant, 1992-1993.

Heard K: Geriatric Poisoning - Epidemiology and Outcome of Elderly Poisoning Patients. SAEM/CORD Geriatric Emergency Medicine Resident/Fellow Grant, 1998-1999.

Heard, K: Acute drug toxicity in elderly patients: A national study of overdoses, adverse drug reactions and poisoning. American Geriatric Society Jahnigen Career Development Scholars Award, 2002-2004.

Heard, K: Age and overdose: A national study of elderly patients admitted for poisoning. SAEM/CORD Geriatric Emergency Medicine Research Grant, 1998

Heard, K: Decreasing inappropriate drug prescribing for elderly patients in the Emergency Department by providing education and physician feedback. American Geriatric Society, Geriatric Education for Specialty Residents Award 2003-2005.

Heard, K: Do elderly patients want to participate in resuscitation studies? Emergency Medicine Foundation, SAEM Geriatric Emergency Medicine Resident/Fellow Grant, 2002.

Heard, K: Ovine immune therapy for acute verapamil toxicity. Emergency Medicine Foundation Creativity and Innovation in Emergency Medicine Grant, 2000

Heard, K: Texaco Fellowship Award. American Academy of Clinical Toxicology, 1998-1999

Heard, K: The effect of chronic antipsychotic therapy on acute cocaine poisoning. National Institute on Drug Abuse Mentored Research Grant (K-08 DA 620573), 2006-2011.

Heard, K: Tricyclic antidepressants directly impair myocardial function. Colorado ACEP Research Grant, 1998

Horowitz R. American Academy of Clinical Toxicology Research Award, 1994-1995.

Horowitz R. Emergency Medicine Foundation Career Development Award, 1994-1995.

Kuffner E, Bogdan GM, Dart RC: Safety of Acetaminophen in Alcoholic Patients. McNeil Consumer Products, 1996-1999.

O'Malley G, Dart RC: Intra-articular Envenomation Model Development in Rabbits, Department of Surgery, University of Colorado Health Sciences Center, 1997-1999.

Palmer ME, Dart RC (preceptor). Snakebite Antivenin Trials in Plants from Belize: Bioassay screen, dose response relationships, and cross-reactivity among two venoms. Emergency Medicine Foundation, 1995-1996.

## *Recent Research Projects*

The RMPDC also internally funds many research projects that are considered important in furthering the management, treatment and prevention of certain poisonings. A partial list of recent projects includes:

Calcium & Magnesium Salts as Antidotes for Fluoride Toxicity in Mice. - Heard K, Hill RE.

Development of a rat heart strip model system to examine the effects of cardiotoxic agents and develop treatments - Heard K, Hill RE.

Development of an antibody for calcium channel blocker toxicity - Kokan L.

Dose-related effects of tetrahydrozoline ingestion in children - Kuffner E.

Development of a referral dose for the management of pediatric acetaminophen ingestions - Yip L.

Toxicity and pharmacokinetics of extended release acetaminophen - Cetaruk E.

A registry to record the adverse effects and development of recurrence after typical clinical use of Antivenin (Crotalidae) Polyvalent [Wyeth] - Dart RC.

Toxicity of loratadine (Claritin) in humans - McDonald F.

Efficacy of multiple dose activated charcoal (MDAC) in tricyclic antidepressant overdosed - McDonald F.

Stability of Crotalidae Polyvalent Antivenin under field conditions - Decker W.

Efficacy of digoxin-immune Fab in the rat - Cetaruk E.

Role of myocardial preconditioning in cocaine cardiotoxicity - Cetaruk E.

Role of non-parenchymal cells in acetaminophen-induced hepatocellular injury - Horowitz R, McDonald F.

Development of a severity score for the assessment of poisonous snakebite - Dart RC, Hurlbut KM.

Analysis of nephrotoxicity in acetaminophen poisoning - Horowitz R.

Efficacy of transplacental transfer of N-acetylcysteine (NAC) in humans - Horowitz R.

Efficacy and safety of intravenous N-acetylcysteine (NAC) in acute acetaminophen overdoses - RMPC Medical Staff.

## *Alumni of Fellowship in Medical Toxicology*

W. Lynn Augenstein, MD

Director of Medical Toxicology Service and Assistant Professor of Emergency Medicine, University of Florida.

Vikhyat Bebarta, MD

Department of Emergency Medicine, Wilford Hall Hospital  
Lackland Airforce Base, San Antonio TX.

Jeffrey Brent, MD, Ph.D.

Toxicology Associates, Denver, CO.

Assistant Professor of Pediatrics and Surgery, University of Colorado Health Sciences Center, Denver, CO.

Alvin C. Bronstein, MD, FACEP

Medical Director Rocky Mountain Poison Center, Denver Health and Hospital Authority  
Assistant Professor of Surgery, University of Colorado Health Sciences Center

Keith Burkhart, MD

Assistant Professor of Medicine, Pennsylvania State University  
Medical Director, Central Pennsylvania Poison Center, Hershey, PA.

Edward Cetaruk, MD

Department of Emergency Medicine, Swedish Hospital, Denver, CO.  
Toxicology Associates, Denver, CO.  
Faculty Member, Rocky Mountain Poison and Drug Center, Denver, CO.

Frank F S Daly, MBBS, FACEM

Consultant Clinical Toxicologist, Staff Specialist Emergency Medicine, Royal Perth Hospital, Western Australia

Consultant Clinical Toxicologist, Western Australian Poisons Information Centre

Consultant Clinical Toxicologist, New South Wales Poisons Information Centre

Joao Delgado, MD

Assistant Professor of Emergency Medicine, University of Connecticut

University of Connecticut Medical Center, Farmington, CT

Medical Toxicologist, Hartford Hospital, Hartford, CT

Consultant, Connecticut Poison Control Center

Christopher DeWitt, MD

Vancouver, BC Canada

Andrew Erdman, MD

Postdoctoral Fellow in Clinical Pharmacology, Division of Clinical Pharmacology  
and Experimental Therapeutics, University of California San Francisco

Hernan Gomez, MD

Division of Emergency Medicine, University of Michigan.

Alan Hall, MD

Assistant Professor of Preventative Medicine, University Colorado Health Sciences Center, Denver, CO.  
Editor, TOMES, Micromedex Inc., Englewood, CO.

Kenyon Heard, MD

Medical Toxicology Fellowship Director, Rocky Mountain Poison and Drug Center, Denver, CO  
Department of Emergency Medicine, University of Colorado Health Sciences Center, Denver, CO.  
Faculty Member, Rocky Mountain Poison and Drug Center, Denver, CO.

Rivka Horowitz, MD, Ph.D.

Department of Emergency Medicine, Lawrence and Memorial Hospital, New London, CT.  
Consultant, Connecticut Poison Control Center, Farmington, CT.

Heath Jolliff, DO

Chair Medical Toxicology, Dept of Emergency Medicine, Ohio Health/Grant Medical Center,  
Columbus, OH

Mark Kirk, MD

Associate Professor, University of Virginia, Department of Emergency Medicine. Charlottesville, VA.

Lada Kokan, MD

Department of Emergency Medicine, University of Vancouver Medical Center, British Columbia,  
Canada.

Mark Kostic, MD

Lt. Commander, US Navy Medical Corp.  
Virginia Beach, VA

Edwin Kuffner, MD

McNeil Consumer Products. Philadelphia, PA.

Kenneth Kulig, MD

Toxicology Associates, Denver, CO.  
Assistant Professor of Pediatrics and Surgery, University of Colorado Health Sciences Center, Denver,  
CO.

Christopher Linden, MD

Professor of Medicine, University of Massachusetts, Boston, MA.

Fred McDonald, DO

Department of Pediatrics, Maricopa Medical Center, Phoenix, AZ.

Patrick McKinney, MD

*Deceased*

Gerald O'Malley, DO

Research Director, Albert Einstein Medical Center, Department of Emergency Medicine. Philadelphia,  
PA.

Robert Petersen, MD

Professor and Chair, Department of Pediatrics, University of Ottawa, Ottawa, Canada

Scott Phillips, MD, FACP, FACMT

Toxicology Associates, Denver, CO.

Associate Clinical Professor Division of Pharmacology & Toxicology Department of Medicine;  
Division of Emergency Medicine Department of Surgery, University of Colorado Health Sciences Center,  
Denver, CO.

Faculty Member, Rocky Mountain Poison and Drug Center, Denver, CO.

Betty Riggs, MD

Associate Medical Director, Wyeth Pharmaceuticals, Philadelphia, PA.

Steven A. Seifert, MD, FACMT, FACEP

Medical Director, University of New Mexico

Professor, Medical Toxicology, Department of Surgery

Section of Emergency Medicine, University of Nebraska Medical Center

Clinical Associate professor, Department of Pediatrics, Creighton University

Martin Smilkstein, MD

*Retired*

Wayne Snodgrass, MD, Ph.D.

Chair, Division of Clinical Pharmacology and Professor of Pediatrics, University of Texas Medical  
Center, Galveston, TX.

Medical Director, Southeast Texas Poison Center, Galveston, TX.

John B. Sullivan Jr., MD, Ph.D.

Associate Professor, Department of Surgery, University of Arizona, Tucson, AZ.

Director, University Physicians, Inc., Tucson, AZ.

Medical Director, Arizona Poison & Drug Information Center, Tucson, AZ.

Christian Tomaszewski, MD

Director, Toxicology Research, Carolinas Medical Center, Charlotte, NC.

Toxicologist, Carolinas Poison Center, Charlotte, NC.

Javier Waksman, MD, DABT

Assistant Clinical Professor of Medicine of Medicine, Division of Clinical Pharmacology & Toxicology,  
University of Colorado Health Sciences Center, Denver, CO

Faculty Member, Rocky Mountain Poison and Drug Center, Denver, CO