Clinical Toxicology Education in the United States

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Classifications

- Medical
- Pharmacy
- Nursing

Subdivisions
- Undergraduate
- Postgraduate
- Continuing Education
Undergraduate Medical

- Standards for Accreditation of Medical Education Programs (AAMC, LCME)
  - 130 weeks of instruction
  - Only pharmacology & therapeutics
  - Hours of instruction
  - Clinical rotations (?)

- Society for Academic Emergency Medicine (SAEM)
  - Emergency medicine model
  - Toxicology in 2\textsuperscript{nd} and 4\textsuperscript{th} years
SAEM Undergraduate EM Model

- Second Year Goals - pathophysiology, and pharmacology of common toxicologic and environmental emergencies
  - Acetaminophen
  - Alcohol
  - Salicylate
  - Cyanide
  - Tricyclic antidepressant toxicities

- Fourth Year Goals – 4 week EM rotation
  - Drug overdose
  - Toxic exposure

Burdick et al, Acad Emerg Med 1998;5:1105-10
Association of American Medical Colleges

- Liaison Committee on Medical Education (October 2004)
- Standards for Accreditation of Medical Education Programs Leading to the M.D. Degree
- 130 weeks of instruction
- “pharmacology and therapeutics”
- Pediatrics
- Emergency Medicine
Program Requirements for Residency Education (ACGME)

- **Emergency Medicine**
  - Model of the Clinical Practice of Emergency Medicine
  - "Toxicologic disorders"

- **Pediatrics**
  - Emergency and Acute Illness Experience
    - 2 months EM, 2 months other
    - "Poisonings and ingestion"

- **Preventative Medicine**
  - General - Environmental health
  - Occupational Medicine - Toxicology
2003 Clinical Practice Model - Emergency Medicine

- Collaboration of ABEM, ACEP, CORD, EMRA, RRC-EM, SAEM

- Components
  - Assessment of patient acuity
  - Tasks to provide emergency medical care

- Listing
  - Common conditions
  - Symptoms
  - Disease presentations
2003 Clinical Practice Model - Emergency Medicine

- Developing future medical school and residency curricula
- Certification examination specifications
- Continuing education objectives
- Research agendas
- Residency program review requirements
- Other documents for function of EM
Patient Acuity Levels
- Critical
- Emergent
- Lower Acuity

Toxic effects of caustic (C,E)

Liver Alcoholic (E)

Bites and Envenomations (C,E,L)

Radiation (C,E)

Biologic Weapons (C,E)

Tick-borne (E)

Dystonic Reactions (E, L)

Addictive Behavior (L)

Toxic Effects of Gases Vapors (C,E,L)

17.0 Toxicologic Disorders
Postgraduate Medical Toxicology Rotations

- 134 Emergency Medicine residencies
  - Required 57%
  - Elective 17%
  - Both 3%
  - Unknown 22%

- Duration
  - 1 month 63%
  - ½ month 7%
  - Unknown 28%
Medical Toxicology Fellowship

- Clinical specialty (ABMS)
  - Monitoring, prevention, evaluation and treatment of injury and illness due to occupational and environmental exposures, pharmaceutical agents, as well as unintentional and intentional poisoning in all age groups.

- Requirements
  - Completion of ACGME-accredited residency
  - 24 months in length
  - Associated ACGME-accredited residency program
    - Emergency Medicine
    - Preventative Medicine
    - Pediatrics
Program Curriculum

- ACGME Competencies
- Core content (developed 1994, revised 2003)
- Clinical Experience
  - 12 months bed-side clinical care
  - Workplace and environmental exposures
- Regional Poison Center affiliation
- Planned educational conferences
- Pharmacology, pharmacokinetics and DI
- Maintain primary board specialization
- Communication and teaching experience
Medical Toxicology Major Core Content (2003)

- Medical Toxicology Core Content Task Force
  - Medical Toxicology Sub-board
  - Medical toxicology fellowship directors
  - American College of Medical Toxicology
  - Medical Directors Committee, AAPCC

1.0 Principles of Toxicology

2.0 Toxins and Toxicants
- 2.1 Drugs
- 2.2 Industrial, Household, and Environmental Toxicants
- 2.3 Natural Products
- 2.4 Warfare, Terrorism, and Riot Control Agents

3.0 Therapeutics

4.0 Assessment and Population Health

5.0 Analytical and Forensic Toxicology

Current Status

- 27 Medical Toxicology Fellowship programs
  - ACGME accredited
  - 21 emergency medicine
  - 4 preventative medicine
  - No pediatric programs
  - 3 inactive
Medical Undergraduate Education

- Limited

- Standards for Accreditation of Medical Education Programs
  - Addresses only pharmacology and therapeutics
  - No specific mention of toxicology
Undergraduate Emergency Medicine model

- toxicology in the 2\textsuperscript{nd} and 4\textsuperscript{th} years
- Estimated of 2 - 4 hours during pharmacology
- Clinical rotation sometimes available.
Postgraduate Medical Education

- Residency and fellowship programs
- Residency programs that specifically address clinical toxicology
  - Emergency Medicine
  - Pediatrics
  - Preventative Medicine
Require didactics and clinical information be provided on toxicology

41 of the 49 toxicologic disorders ranked Critical (e.g. life-threatening)
SAEM Emergency Medicine Model for Clinical Practice

- Model curriculum
- Emergency Medicine residency programs
  - Contain a certain specified number of hours of didactic content
  - 4 week toxicology rotation
    - Required (60%)
    - Optional (20%)
Pediatric Residency

- Require poisonings and ingestion
- Covered in the 4 months of emergency and acute illness experience.
- No requirement for subspecialty training
- Elective toxicology rotation
Preventative Medicine Core

Content Requirements

- Occupational Medicine and Environmental
  - Specify competency in toxicology
  - Hazardous outbreaks
Medical Toxicology Fellowship Programs

- Medical Toxicology an ABMS subspecialty in
  - Emergency Medicine
  - Preventative Medicine
  - Pediatrics

- ACGME accredited programs
  - 21 emergency medicine
  - 4 preventative medicine
  - No pediatric programs
ACGME
Medical Toxicology Fellowships

- Emergency Medicine
- Preventative Medicine
- Candidates must complete an ACGME-approved residency
- 24 month programs
  - Affiliated with an ACGME-accredited residency in
    - Emergency Medicine
    - Preventative Medicine
    - Pediatrics
  - Faculty certification in Medical Toxicology (or equivalent)
  - Association with a regional poison center
ACGME Medical Toxicology Fellowships

- Key curriculum elements
  - Planned educational conferences
  - Clinical experience
    - Acute
    - Occupational/environmental
  - Education on pharmacokinetics and drug interactions
  - Progressive teaching responsibilities
Pharmacy Undergraduate Education

- ACPE Revised Standards and Guidelines
  - Toxicology listed
    - Pharmaceutical Sciences
    - Not in the Clinical Sciences
- No centralized listing of course work
  - Surveyed all 91 colleges of pharmacy
  - Dean or surrogate
  - ABAT Diplomates
  - SurveyMonkey web-based tool
  - 60/92 responded (65%)
Survey Questions

- Offer standalone course in clinical toxicology?
  - Required or elective
  - What professional year
  - Hours of instruction

- Offer in other courses
  - Which ones
  - Hours of instruction

- Experiential rotations
  - Location
  - Required or elective
  - Length
Pharmacy
Undergraduate Education

- Standalone course
  - 57% offer
  - Required by 39%
  - P3 year (70%)
  - 2 semester/quarter hours
  - 30 hours of instruction

- Integrate into other courses (62%)
  - Average 22 hours (2-160 hrs)
  - Who teaches?

Diagram:
- Ther: 38%
- Other: 16%
- DI: 9%
- OTC: 12%
- P'coll: 25%
Experiential Practice Rotations

- Last year of the PharmD curriculum
- Elective (35/37, 95%)
  - Required in 3 schools
- Length (n=36)
  - 4 weeks (53%)
  - 5 weeks (25%)
  - 6 weeks (19%)

n = 59
Pharmacy Postgraduate Education

- Residencies
  - 7 available (4 CT, 2 CT/EM, 1 EM)
  - Not accredited
- Training in a poison center
- American Board of Applied Toxicology
  - Doctoral trained pharmacists
    - Clinical toxicology residency, or
    - Sustained involvement
  - Credentialing process
  - Board certified by examination
Nursing Undergraduate Education

- Not well developed
- No specific courses in nursing curriculum
  - Typically in pharmacology
- Limited experiential time in a poison center
  - 4 to 8 hours
  - Familiarize with poison center services
Nursing Postgraduate Education

- No formal training programs
- Extensive training programs in poison control centers
  - Specialists in Poison Information
- AAPCC Regional Certification Guidelines
  - Requires completion of a training program approved by their medical director
- AAPCC training resources
  - Orientation Manual
  - Staff Development Tool
  - Toxicology References Resource Guide
Continuing Education

- Multidisciplinary
- Locally by individual poison centers servicing their catchment areas
- Nationally by AACT, ACMT and AAPCC, through the NACCT
- Other conferences (SCCM, ACMT, ASHP, ACCP)