Allergy Division

- 2.5 years
- Start up package
  - Research technician salary
  - Budget for laboratory
    - Tissue culture hood, incubator, columns for protein separation, 2D gel electrophoresis, frequency generator for exposing cells, [oscilloscope, etc, from home]
- Awarded 2 of 12 grant applications
- 50% pay cut
“You’ll be back in Emergency Medicine within two years. Some people have it in their blood.”

Tony Harmon, MD
Emergency Physician
Washington Hospital Center
Allergy Division

• A preliminary study of the SCID-hu mouse as a model for atopy.

• In situ hematopoiesis
  – Stem cells appear in the peripheral blood during the late phase of bronchospasm in the allergic asthmatic rabbit.

• Reactive upper airways dysfunction syndrome (RUDS): A form of irritant rhinitis induced by a chemical exposure
Allergy Division

• Allergy to Crops
  – Prevalence of skin test reactivity to corn smut and other basidioshores in an agrarian district.

• Irritant sensitivity in a allergy clinic population

• Rhinolaryngoscopy findings in multiple chemical sensitivity syndrome

• Occupational allergy to gypsy moth larva exoskeleton among entomology laboratory workers.
Clinical Enigma: Sensitivity to Chemicals

- Multiple Chemical Sensitivity Syndrome
  - Chemicals of diverse classes
  - Symptoms involve multiple organ systems
  - Often acquired after acute chemical exposure

- Chemicals
  - Tobacco smoke
  - Furnace fumes
  - Perfumes, fragrances
  - Vehicle exhaust
  - Organic solvents
  - Irritant gases, SO2, Cl
  - Pesticides
  - Etc.
Opposition to Chemical Sensitivity

- No possible mechanism [clinical enigma]
- No objective evidence of disease [clinical enigma]
- Strong opinion makers
  - Close ties to commercial interests
- Position Statements
  - AMA, AAAI, CA Medical Society
  - “Patients are crazy, doctors are quacks.”
- Physicians lost their licenses
- Researchers stopped efforts to understand this disorder
- Unprecedented Attack on victims of an illness
Rhinolaryngoscopic Examination of Patients with the Multiple Chemical Sensitivity Syndrome

WILLIAM JOEL MEGGS
Department of Emergency Medicine
Division of Clinical Toxicology
CRAWFORD HARALSON CLEVELAND, JR.
Department of Medicine
Section of Allergy/Immunology
School of Medicine
East Carolina University
Greenville, NC 27858-4354

No objective evidence of disease [clinical enigma]

Biopsy with chronic inflammation, lymphocytic infiltrates

RUDS = Reactive Airways Dysfunction syndrome
National Academy of Sciences

- Subcommittee on Immunotoxicology
- Co-authored book, *Biomarkers of Immunotoxicology*
National Research Council

- Broad based participation
- Consensus reached
- Research recommendations
- Secretary
- Topic shelved

*Multiple Chemical Sensitivities*

Addendum to

*Biologic Markers in Immunotoxicology*

National Research Council
Allergy Division Reorganization

Clinical Division
Meggs & Dr. A

Research Division
Dr. B & Dr. C
Allergy Division Reorganization

Clinical Division
Meggs & A $$$$$
Research Division
B & C $$

"Your problem was that you made too much money in the clinic"

Penalize productivity.
Milk your cash cows for all you can.
Allergy Division Reorganization

Clinical Division
Meggs & A. $$$$$

Research Division
B & C O

“Your problem was that you made too much money in the clinic”

Penalize productivity.
Milk your cash cows for all you can.
Come work for me

E. Jackson Allison, III
Chair, Department of Emergency Medicine
1980-1992
“But Jack, I already work for you.”

- ME: “Dr. Allison has offered me to work part-time in the ED for X$/hour.”
- Chair: “Good! Their practice plan can pay my practice plan.”
- ME: “Perhaps we can capture some of the money for lab supplies, tech salary, etc.”
- CHAIR [angrily]: “Their practice plan will pay my practice plan and you will never see a cent of the money.”
I’m going to have me a:
Department of Emergency medicine
Emergency Medicine Residency
Air medicine service
EMS division
Research division
Etc., etc., etc.
You can do anything you want for your clinical research

E. Jackson Allison, III
Chair, Department of Emergency Medicine
1980-1992
Toxicology Fellowship

E.. Jackson Allison, III
Chair, Department of Emergency Medicine
1980-1992
Medical Toxicology

• Approved as subspecialty, 1992, 2 yr fellowship
• Dr. Allison wanted some but none existed
  – Grow our own
• Faculty development
  – Two physicians, ½ & ½, 4 years
  – Leased apartment
  – Airfare and per diem
• Toxicology Boards, 1996
Prevalence and Nature of Allergy and Chemical Sensitivity in a General Population

WILLIAM J. MEGGS
KATHLEEN A. DUNN
Department of Emergency Medicine
RICHARD M. BLOCH
Department of Psychiatry
PEGGY E. GOODMAN
Department of Emergency Medicine
East Carolina University School of Medicine
Greenville, North Carolina

ANN L. DAVIDOFF
Department of Geriatric Medicine and Gerontology
Johns Hopkins University School of Medicine
Baltimore, Maryland

<table>
<thead>
<tr>
<th>Population</th>
<th>Allergic</th>
<th></th>
<th>Not allergic</th>
<th></th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Chemically sensitive</td>
<td>172</td>
<td>16.9</td>
<td>163</td>
<td>16</td>
<td>336</td>
<td>33</td>
</tr>
<tr>
<td>Not chemically sensitive</td>
<td>186</td>
<td>18.3</td>
<td>498</td>
<td>48.9</td>
<td>685</td>
<td>67</td>
</tr>
<tr>
<td>Total</td>
<td>365</td>
<td>35</td>
<td>662</td>
<td>64</td>
<td>685</td>
<td>67</td>
</tr>
</tbody>
</table>
Table 2.—Agents Cited as Producing Symptoms of Allergy and Chemical Sensitivity

<table>
<thead>
<tr>
<th>Agent producing allergy</th>
<th>n*</th>
<th>%†</th>
<th>Agent producing chemical sensitivity</th>
<th>n*</th>
<th>%†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pollens, general</td>
<td>177</td>
<td>49</td>
<td>Perfumes</td>
<td>108</td>
<td>32</td>
</tr>
<tr>
<td>Tree pollen</td>
<td>109</td>
<td>30</td>
<td>Pesticides</td>
<td>85</td>
<td>25</td>
</tr>
<tr>
<td>Dust</td>
<td>94</td>
<td>26</td>
<td>Cigarette smoke</td>
<td>83</td>
<td>25</td>
</tr>
<tr>
<td>Grass pollen</td>
<td>91</td>
<td>25</td>
<td>Fresh paint</td>
<td>57</td>
<td>17</td>
</tr>
<tr>
<td>Ragweed pollen</td>
<td>62</td>
<td>17</td>
<td>Gasoline</td>
<td>33</td>
<td>10</td>
</tr>
<tr>
<td>Cats</td>
<td>45</td>
<td>12</td>
<td>Automobile exhaust</td>
<td>31</td>
<td>9</td>
</tr>
<tr>
<td>Dogs</td>
<td>30</td>
<td>8</td>
<td>Cigar smoke</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>Foods</td>
<td>22</td>
<td>6</td>
<td>Other</td>
<td>112</td>
<td>34</td>
</tr>
</tbody>
</table>

*Number who reported symptoms from exposure to the agent.
†Percentage of individuals reporting allergy or chemical sensitivity that also reported symptoms from the agent.

Table 9.—Allergy and Chemical Sensitivity Reported by Those Who Also Reported Asthma

<table>
<thead>
<tr>
<th>Population</th>
<th>Allergy</th>
<th>No allergy</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Chemical sensitivity</td>
<td>19</td>
<td>51</td>
<td>8</td>
</tr>
<tr>
<td>No chemical sensitivity</td>
<td>5</td>
<td>14</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>24</td>
<td>65</td>
<td>13</td>
</tr>
</tbody>
</table>
Prevalence and Nature of Allergy and Chemical Sensitivity in a General Population

WILLIAM J. MEGGS
KATHLEEN A. DUNN
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Department of Emergency Medicine
East Carolina University School of Medicine
Greenville, North Carolina

ANN E. DAVIDOFF
Department of Geriatric Medicine and Gerontology
Johns Hopkins University School of Medicine
Baltimore, Maryland

Table 1.—Frequencies of Allergy and Chemical Sensitivity in a General Population

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<th>Allergic %</th>
<th>Not allergic %</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>Chemically sensitive</td>
<td>17</td>
<td>163</td>
<td>336</td>
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<td>186</td>
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<td>685</td>
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<tr>
<td>Total</td>
<td>365</td>
<td>662</td>
<td>1027</td>
</tr>
</tbody>
</table>
# Prevalence and Nature of Allergy and Chemical Sensitivity in a General Population

WILLIAM J. MEGG
KATHLEEN A. DUNN
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<th>Allergic</th>
<th></th>
<th>Not allergic</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
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</tr>
<tr>
<td>Total</td>
<td>336</td>
<td>33</td>
<td>685</td>
<td>67</td>
</tr>
</tbody>
</table>
### Epidemiology of Chemical Sensitivity

<table>
<thead>
<tr>
<th>State</th>
<th>Prevalence</th>
<th>Seriously affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>NC</td>
<td>30%</td>
<td>4%</td>
</tr>
<tr>
<td>CA</td>
<td>15.9%</td>
<td>7%</td>
</tr>
<tr>
<td>NM</td>
<td>15%</td>
<td></td>
</tr>
<tr>
<td>GA</td>
<td>12.6%</td>
<td>4%</td>
</tr>
<tr>
<td>USA</td>
<td>11.3%</td>
<td>2.5%</td>
</tr>
<tr>
<td>Sweden</td>
<td>30%</td>
<td></td>
</tr>
</tbody>
</table>
There is no possible mechanism to explain chemical sensitivity

Research Article

Neurogenic inflammation and sensitivity to environmental chemicals.

W J Meggs
Department of Emergency Medicine, East Carolina University School of Medicine,
Greenville, NC 27858
Crossover Network

- Nerve fibers have histamine receptors
- (some) Mast cells have substance P receptors

Chemical Irritant
Sensory Nerve C-Fiber

Substance P and Other Mediators of Neurogenic Inflammation

Allergen
Mast Cell
Histamine and other Mediators of Immediate Hypersensitivity

Effector Cell (vasodilation, bronchospasm, bronchorrhea, chemotaxis ...)
Neurogenic Switching: A Hypothesis for a Mechanism for Shifting the Site of Inflammation in Allergy and Chemical Sensitivity

William J. Meggs

Department of Emergency Medicine, East Carolina University School of Medicine, Greenville, NC 27858 USA and New York City Poison Center, New York, NY 10016 USA
Neurogenic Switching

- The site of inflammation can be switched from the site of stimulation
- Occurs in both allergic and irritant airway inflammation
- May play a role in many disease processes
Irritant Rhinosinusitis: Pathological Features

- Chronic inflammation with lymphocytic infiltrates
- Glandular hyperplasia
- Basement membrane thickening
- Nerve fiber proliferation
- Desquamation of the respiratory epithelium
- Defects in tight junctions
Induction Mechanism

- Positive feedback loop
- Induction exposure produces neurogenic inflammation

High Dose Exposure

Airway Inflammation

Lose dose exposures
End Organ Sensitization

A

Respiratory epithelium
Basement membrane
Glands
Sensory nerve fibers

B

Respiratory epithelium: tight junction defects and desquamation
Basement membrane: thickening
Glands: hyperplasia
Lymphocytic infiltrates
Sensory nerve fibers: proliferation
Clinic Disaster

- Leased space from Department of Medicine
- Pay hourly overhead
- Very successful
- Go somewhere else.
End Organ Sensitization

A

- Respiratory epithelium
- Basement membrane
- Glands
- Sensory nerve fibers

B

- Respiratory epithelium: tight junction defects and desquamation
- Basement membrane: thickening
- Glands: hyperplasia, lymphocytic infiltrates
- Sensory nerve fibers: proliferation
Clinic Disaster

- Leased space from Department of Medicine
- Pay hourly overhead
- Very successful
- Go somewhere else.
Millqvist Capsaicin inhalation cough test in patients with “Sensory Hyper-reactivity”
Sanico et al.
Case of the Poisoned Candy

Verified safety & efficacy of Prussian Blue in controlled study in mice.
The Case of the Poisoned Tea

Anticholinergic Poisoning Associated with an Herbal Tea
New York City, 1994

Reported by: WJ Meggs, MD, R Weisman, PharmD, RS Hoffman, MD et al.
Lead Poisoning from Bullets

Case of the Poisoned Heroin

Scopolamine Poisoning among Heroin Users -- New York City, Newark, Philadelphia, and Baltimore, 1995 and 1996
1994 Woodstock Music Festival

- Drugs of abuse survey
- Laboratory Confirmation of Drug Use
Epidemiology of Substance Abuse at the 1994 Woodstock Music Festival

- Average age was 25 years (range 12 to 55 years)
- 54% male, 46% female
- 98% Caucasian
- 54% reported using alcohol
- 50% reported tobacco
Epidemiology of Substance Abuse at the 1994 Woodstock Music Festival

- 65% reported using at least one illicit drug at festival
- 62% reported using marijuana
- 19% reported using LSD
- 3.3% reported using Cocaine
- 2.7% reported using amphetamines
- 2.2% reported using Heroin
- 1% reported using PCP

Laboratory Confirmation of Substance Abuse at the 1994 Woodstock Music Festival

- Subjects
  - Attendees at festival
  - Need for critical treatment or evaluation
  - Medical toxicology evaluation
  - Obtainable urine specimen
Laboratory Confirmation of Substance Abuse at the 1994 Woodstock Music Festival

- 39% of samples contained ethanol
- 84% of samples contained another substance
- 74% contained THC
- 26% contained LSD
- 13% contained PCP
- 13% contained opioids


WILLIAM J. MEGGS, MD, PHD, THOMAS CZAPLIJSKI, RN, MS,
NICHOLAS BENSON, MD

*Figure 1.* Population of Pitt County, North Carolina, from 1988 to 1997.12–14

*Figure 3.* The number of ED visits at the study hospital from 1988 through 1997.
144,000
74% increase

168,421
38% increase

2011
Common Wisdom:

Emergency Department visits are increasing because people have no where else to go.
Common Wisdom:

Emergency Department visits are increasing because
People have no where else to go.

Scientific Fact:

Growth is coming in higher triage categories.
That is, Americans are older & sicker.
Figure 5. Number of visits for each of five triage categories, 1988 to 1997. Triage category I is the least urgent, while category V is the most urgent.
Follow Up Study: Enigma = Why???


Timothy Reeder, Elizabeth Locascio, Jody Tucker, Thomas Czaplijski, Nicholas Benson, William Meggs

retrospective chart review
2-week period in both 1992 & 2000 rural, tertiary medical center.
ED visits increased 28.6%
county population increased 16.1% (P < 0.005).
Average age: 35.2 yrs to 40.1 yrs (95% CI, 3.34 to 6.45).
Patients over 80 years increased by 83%,
Patients over 90 years: 138%.
Admission rate: 21.9% to 25.6% (P < 0.005).
Medicare patients: 17.9% to 23.6% (P < 0.005).
Increased age, increased acuity, limited access to primary care contributed to increased ED demand in this study.
Average age: 35.2 yrs to 40.1 yrs (95% CI, 3.34 to 6.45).
Patients over 80 years increased by 83%,
Patients over 90 years 138%.
<table>
<thead>
<tr>
<th>Past History</th>
<th>1992 (%)</th>
<th>2000 (%)</th>
<th>Chi square</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes</td>
<td>7.2</td>
<td>11.5</td>
<td>.00002*</td>
</tr>
<tr>
<td>Reactive airway disease</td>
<td>4.6</td>
<td>6.2</td>
<td>.044*</td>
</tr>
<tr>
<td>Coronary artery disease</td>
<td>10.8</td>
<td>8.6</td>
<td>.030*</td>
</tr>
<tr>
<td>Hypertension</td>
<td>11.2</td>
<td>23.1</td>
<td>&lt;.000001*</td>
</tr>
<tr>
<td>Cancer</td>
<td>2.5</td>
<td>3.8</td>
<td>.044*</td>
</tr>
<tr>
<td>HIV</td>
<td>0.5</td>
<td>0.5</td>
<td>.824</td>
</tr>
<tr>
<td>Mental illness</td>
<td>3.3</td>
<td>6.1</td>
<td>.0002*</td>
</tr>
<tr>
<td>COPD</td>
<td>2.3</td>
<td>2.2</td>
<td>.992</td>
</tr>
<tr>
<td>End-stage renal disease</td>
<td>3.0</td>
<td>2.8</td>
<td>.801</td>
</tr>
<tr>
<td>Strokes</td>
<td>2.3</td>
<td>4.2</td>
<td>.003*</td>
</tr>
<tr>
<td>Cong. heart failure</td>
<td>0.9</td>
<td>2.6</td>
<td>&lt;.000001*</td>
</tr>
</tbody>
</table>
Los Angeles county health official warns medical center overcrowding is worsening.
The Los Angeles Times (3/22/2011, Lin) "LA Now" blog reported that Dr. Mitchell H. Katz, "The new chief of Los Angeles County's public hospital system said Tuesday that overcrowding is worsening at County-USC and Harbor-UCLA medical centers -- a situation he is concerned will continue to deteriorate even after the federal healthcare reform law is implemented in 2014." Dr. Katz' statement came as "new data shows that overcrowding at County-USC, the county's flagship public hospital northeast of downtown, is worsening again after a brief improvement late last year." Last month, the wait was "12 hours and 11 minutes, up from 10 hours and 34 minutes in December."
The Inflammation Connection

Heart Disease

Gum Disease

Pre-Term Delivery

Diabetes
Obesity → Airway Inflammation
Asthma, Rhinitis, Sinusitis

Fatigue

Insomnia

Depression

INFLAMMATION
Inflam-Aging
Planned obsolescence
Inflammation is biological mechanism to degrade our bodies as we age.
The Inflammation Connection

- Diet & Nutrition
- Home & Workplace
- Life-style
- Mind-body
- Drugs: When all else fails

Favorably reviewed in New York Times & Library Journal
Hit top 100 best seller lists
The Inflammation Cure Cookbook

By

Kimberly Heidal, PHD, MHS, RD, LDN
ECU Nutrition/Dietetics Professor

William Joel Meggs, MD, PHD
Brody School of Medicine
The Inflammation Cure Cookbook

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William Joel Meggs, MD, PHD
Brody School of Medicine

Coming soon to a Bookstore & eBook
Acute Toxicity

Exposure to chlorpyrifos at doses of 1 mg/kg and 5 mg/kg daily for 3 months did not produce any acute toxic effects in Long Evans mice.

Reference Memory

There were no significant differences in reference memory at 0, 1 and 3 months between the groups.

Working Memory

At three months, there were significantly significant impairments in working memory in group III relative to Groups I and II, with p-values of 0.047 and 0.049 on two trials.
Obesogens: environmental chemicals that induce obesity


Weight gain associated with chronic exposure to chlorpyrifos in rats.

Meggs WJ, Brewer KL
Department of Emergency Medicine, Brody School of Medicine at East Carolina University, Greenville, NC 27858, USA. meggsw@ecu.edu <meggsw@ecu.edu>
Pilot studies of pressure-immobilization bandages for rattlesnake envenomations

WILLIAM JOEL MEGGS, CHRISTINE COURTNEY, DORCAS O’ROURKE, and KORI LOUISE BREWER
Department of Emergency Medicine, Brody School of Medicine, East Carolina University, Greenville, NC, USA

Figure 4. Survival to 8 hours.

Lead to recommendation for use in American Red Cross first Aid manual
American Heart Association resuscitation guidelines
Brief Reports

Sustained oxygenation without ventilation in paralyzed pigs with high-flow tracheal oxygen

William J. Meggs MD, PhD*,, Robert G. Carroll PhD,
Kori L. Breuer PhD, Jason B. Hack MD, Timothy J. Reeder MD

*Department of Emergency Medicine, Brody School of Medicine at East Carolina University, Greenville, NC 27838, USA
Department of Physiology, Brody School of Medicine at East Carolina University, Greenville, NC 27838, USA

Accepted 31 May 2005
PRESSURE-IMMOBILIZATION BANDAGES INCREASE SURVIVAL IN A PORCINE MODEL OF RATTLESNAKE ENVENOMATIONS

William J. Meggs, MD, PhD, Christine Courtney, MD, Dorcas O’Rourke, DVM, Audrey Jenkins, DVM, Kori L Brewer, PhD

Brody School of Medicine at East Carolina University
Greenville, NC, USA
Efficacy of North American Crotalid Antivenom Against the African Viper *Bitis gabonica* (Gaboon Viper)

William J. Meggs • Christopher N. Wiley • Kori L. Brewer • Jason B. Hack

Fig. 1 Time to death in hours of the control vs. treated group. The mean time to death for the control group was significantly shorter than that of the treated group (7.04±4.3 h versus 20.67±2.1 h; p=0.006)
Heparin Reverses Anaphylactoid Shock in a Porcine Model

Charles R. Heflin, MD
Kori L. Brewer, PhD
Jason B. Hack, MD
William J. Meggs, MD, PhD

From the Department of Emergency Medicine, Brody School of Medicine, East Carolina University, Greenville, NC.

Heparin is as good as conventional treatment with epinephrine & diphenhydramine in reversing anaphylactoid shock

Figure 1. Intravenous injection of calcium ionophore A23187 increased plasma histamine levels in pigs. Data represent individual pigs that received epinephrine and diphenhydramine (E+B), heparin alone, or placebo (saline).

Figure 2. Comparison of mean arterial pressure in the 3 treatment groups before injection with A23187, after injection with A23187, and after treatment.
PRESSURE-IMMOBILIZATION BANDAGES INCREASE SURVIVAL IN A PORCINE MODEL OF RATTLE SNAKE ENVENOMATIONS

Sustained oxygenation without ventilation in paralyzed pigs with high-flow tracheal oxygen

William J. Meggs MD, PhD\textsuperscript{a,*}, Robert G. Carroll PhD\textsuperscript{b}, Kori L. Brewer PhD\textsuperscript{b}, Jason B. Hack MD\textsuperscript{a}, Timothy J. Reeder MD\textsuperscript{a}

\textsuperscript{a}Department of Emergency Medicine, Brody School of Medicine at East Carolina University, Greenville, NC 27858, USA
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![Bar chart showing survival rates for treated and untreated cases.]

Figure 4. Survival to 8 hours.

Lead to recommendation for use in American Red Cross first Aid manual
American Heart Association resuscitation guidelines
Sustained oxygenation without ventilation in paralyzed pigs with high-flow tracheal oxygen

William J. Meggs MD, PhD\textsuperscript{a,*,} Robert G. Carroll PhD\textsuperscript{b},
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Accepted 31 May 2005
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William J. Meggs, MD, PhD, Christine Courtney, MD, Dorcas O’Rourke, DVM, Audrey Jenkins, DVM, Kori L Brewer, PhD

Brody School of Medicine at East Carolina University
Greenville, NC, USA
Results

- Survival to 24 hours
- Treatment group
  - 100% survival to 24 hours
- Control group
  - 0% survival to 24 hours
  - Time to death $13.68 \pm 3.42$ hours
- Chi-square p-value = 0.014
Venom Lysis syndrome

- Rattlesnake venom
- Precipitous fatalities
- Marked destruction of tissue
- Elevated potassium
- Cardiac dysrhythmias
- Similar to tumor lysis syndrome
Efficacy of North American Crotalid Antivenom Against the African Viper *Bitis gabonica* (Gaboon Viper)

William J. Meggs, Christopher N. Wiley, Kori L. Brewer, Jason B. Hack

Fig. 1 Time to death in hours of the control vs. treated group. The mean time to death for the control group was significantly shorter than that of the treated group (7.04±4.3 h versus 20.67±2.1 h; \( p = 0.006 \))
Heparin is as good as conventional treatment with epinephrine & diphenhydramine in reversing anaphylactoid shock.
A controlled trial of topical nitroglycerin in a New Zealand white rabbit model of brown recluse spider envenomation

Toxin affects two organ systems
Two distinct dose-response curves
\[ a = \% \text{ with effect } A \]
\[ b = \% \text{ with effect } B \]
\[ P(\text{A not B}) = a(1 - b) \]
\[ P(\text{B not A}) = b(1-a) \]
\[ P(\text{A and B}) = a \times b \]
Oral treatment of organophosphate poisoning in mice.

- Football stadium
- 70,000 participants
- Terrorist
- Crop duster filled with OP insecticide or nerve gas
- Who is going to stock 300,000 doses of IV/IM antidote and give 140,000++ injections?
Figure 1. Percentage survival for mice treated by oral gavage with saline, atropine, and a combination of atropine and pralidoxime.

Oral Treatment of Organophosphate Poisoning in Mice

Bradford J. Bowls, MD, Jack M. Freeman Jr., MD, James A. Luna, MD, William J. Meggs, MD, PhD
Clearance of metformin by hemofiltration in overdose.

- Metformin, drug of choice for type 2 diabetes
- Increasing overdoses
  - Therapeutic misadventure
  - Intentional overdoses by adults
  - Unintentional by small children
- Cleared by kidney machine
Emergency Department hemodialysis in a case of severe ethylene glycol poisoning.

Highest level ever recorded
Minimal Toxicity
Treatment of Wide Complex Tachycardia

ACLS newly recommended a drug called amiodarone to treat wide complex tachycardia.

Overdoses of tricyclic antidepressants cause wide complex tachycardia treated with sodium bicarbonate.

What happens if you treat a tricyclic antidepressant overdose with amiodarone?

Safety verified.
Digoxin + Calcium = Stone Heart

1920’s dog data
ACLS recommendation
Enigma: digoxin + calcium

Digoxin overdose causes elevated potassium.
Elevated potassium is treated with IV calcium.
Opps! We didn’t know the patient was on digoxin.
Safety of treating elevated potassium with calcium in digoxin overdose verified.
Clinical Enigma

Hydrofluoric Acid Poisoning

Low calcium & magnesium

Cardiac toxicity

Treat with calcium & magnesium


Limited efficacy of calcium and magnesium in a porcine model of hydrofluoric acid ingestion.

Coffey JA, Brewer KL, Carroll R, Bradfield J, Meggs WJ.

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Future

• Gulf War Illness
• Antidotes to prevent chronic neurological sequela to sarin poisoning
• Fundamental problem of physics
• 3 books on word processor
• Notebook of inventions