



July 2007

The NY State Poison Centers

TOXICOLOGY

A Quarterly Publication • Vol. XII No. 3

LETTER

Program Announcements • •

Ruth A. Lawrence: Monthly conference: every 4 weeks on Thursdays (11 am to noon), and every 4 weeks on Tuesdays (10 am-11 am).

UNY: Our Eleventh Annual Toxicology Teaching Day will be held on November 14, 2007 at the Genesee Grand Hotel in Syracuse. Please mark your calendar!

NYC: Consultants Case Conference • The first Thursday of the Month from 2-4pm

LI: Pre-Registration is required. Please contact Mr. Denis Jao at 516-663-2650 to register. Both Telephone and Televideo broadcasts will be available.

Target Audience: Physicians, Pharmacists, Nurses, Nurse Practitioners, Physician-Assistants, Laboratory technicians, EMS staff, medical/nursing/pharmacy students and other healthcare professionals.

Location: New Life Conference Rooms B&C
Winthrop-University Hospital
259 First Street, Mineola, Long Island, New York 11501
Times for ALL Conferences are: 12:15 PM-1:45 PM

Sept 26, 2007

TOPIC: Volatile Substance Abuse Involving 1,1-difluoroethane ("Dust Off").

Speaker: Joseph Avella, MS, FTS-ABFT

Sidney B. Weinburg Center for Forensic Sciences, Suffolk County Health Department, NY

Nov 7, 2007

TOPIC: Update of Common Poisonings and Treatments

Speaker: Michael McGuigan, MD, FACMT, FAAP

Professor of Emergency Medicine, State University of New York at Stony Brook, Medical Consultant Long Island Regional Poison Center at Winthrop University Hospital,

Dec 5, 2007

TOPIC: Food Poisoning

Speaker: Daniel Kuhles, MD, MPH

Clinical Instructor, State University of New York at Stony Brook, Department of Preventive Medicine.

Assistant Director, Division of Disease Control Nassau County Department of Health

Please call administrative telephone numbers for more information.

A "Duster" Inhalational Exposure with Drugs Leads to Death

Contributed by: Henna Rahi, PharmD. Candidate, St. John's University, T Caraccio, PharmD., ABAT, Long Island Regional Poison and Drug Information Center at Winthrop University Hospital, Mineola, NY

Case Report:

A 23-year-old male patient was brought to the emergency department (ED) by emergency medical services after being found on a train platform unresponsive. A witness had observed the patient inhaling a commercial duster product containing a fluorinated hydrocarbon. The patient was pulseless at the scene and upon arrival to the ED.

What is "duster" and what are the inherent toxicities associated with inhaling these products?

A "duster" is a compressed liquid containing single or multiple hydrocarbon containing substances. These hydrocarbons are utilized as a propellant aerosol of gas that is used to remove dust from various surfaces. There are many known hydrocarbon containing household products that are used in various forms as a means of chemical recreation.

Continued on page 4

Toxicology Advice Centers • •

Administrative Phone Numbers - To obtain a consult in your area, call 1.800.222.1222.

Western New York Poison Center (WNY)

716.878.7871 • <http://wnypoison.org>

Ruth A. Lawrence NY Poison Center (FL)

585.273.4155 • www.FingerLakesPoison.org

Upstate New York Poison Center (UNY)

315.464.7078 • www.upstatepoison.org

New York City Poison Control Center (NYC)

212.447.8152

Long Island Poison & Drug Info Center (LI)

516.663.4574 • www.LIRPDIC.org

Toothpaste Imported From China May Contain Diethylene Glycol

6/13/2007 Gold City Enterprise LLC of Hallandale, Florida initiated a nationwide recall of toothpaste made in China because the products may contain the poisonous chemical diethylene glycol (DEG), a substance used in antifreeze and as a solvent.

Unapproved Guaifenesin Timed-Release Drug Products

05/25/2007 FDA informed consumers and healthcare professionals of its intent to take action against companies that market unapproved timed-release dosage form of guaifenesin products, a substance commonly used in medicines to relieve cough and cold symptoms by stimulating removal of mucous from the lungs.

Exjade (deferasirox) Tablets For Oral Suspension

05/22/2007 Novartis and FDA notified healthcare professionals of changes to the WARNINGS and ADVERSE REACTIONS sections of the product labeling for Exjade, a drug used to treat chronic iron overload due to blood transfusions (transfusional hemosiderosis) in patients 2 years of age and older. Cases of acute renal failure, some with a fatal outcome, have been reported following the post marketing use of Exjade.

Avandia (rosiglitazone)

05/21/2007 FDA informed healthcare professionals of a potential safety issue related to Avandia (rosiglitazone). An on-going analysis of safety data for the treatment of type 2 diabetes mellitus using Avandia showed differing rates of ischemic cardiovascular events including heart attack or heart-related adverse events, some fatal, relative to other drugs used to treat diabetes mellitus.

Caffeine Citrated, Powder, Purified

05/21/2007 Spectrum and FDA informed healthcare professionals of a nationwide recall of 3 lots (TS0225, UK0821, and V11203) of Caffeine Citrated, Powder, Purified. The product was recalled because of complaints about potential sub potency.

NBTY Shark Cartilage Capsules

06/06/07 Action Labs recalled its Sentinel brand of Shark Cartilage capsules manufactured by NBTY in 2005 because the product may be contaminated with Salmonella.

OxyContin, Illegal Promotion by Manufacturer May Cause Health Risks for Consumers

05/10/2007 FDA informed healthcare professionals of criminal charges and civil liabilities brought against Purdue Frederick in connection with several illegal schemes to promote, market and sell OxyContin, a powerful prescription pain reliever that the company produces.

True Man and Energy Max Products

05/10/2007 FDA informed consumers and healthcare professionals regarding the dangers associated with the pur-

chase or use of True Man or Energy Max products promoted and sold as dietary supplements throughout the United States. Both products, promoted as sexual enhancement products and as treatment for erectile dysfunction (ED), are illegal drug products that contain potentially harmful, undeclared ingredients.

Glycerin compounded products

05/07/2007 FDA warned pharmaceutical manufacturers, suppliers, drug repackers, and healthcare professionals who compound medications using glycerin of the importance of assuring that the glycerin used is not contaminated with diethylene glycol (DEG), a known poison used in antifreeze and as a solvent.

Antidepressant Medication Products

05/02/2007 FDA notified healthcare professionals that the Agency proposed that makers of all antidepressant medications update the existing black box warning on the prescribing information for their products to include warnings about the increased risks of suicidal thinking and behavior in young adults ages 18 to 24 years old during the first one to two months of treatment.

Colchicine Compounded Injectable Products

05/02/2007 ApothéCure and FDA notified all healthcare professionals of recent deaths associated with the use of compounded injectable Colchicine 0.5mg/ml, 4ml vials, lot number 20070122@26.

Warning About Counterfeit Drugs From Multiple Internet Sellers

05/01/2007 FDA informed consumers and healthcare professionals regarding the dangers associated with buying prescription drugs over the internet. FDA received information showing that 24 apparently related websites may be involved in the distribution of counterfeit prescription drugs.

PharmaFab Inc., manufacturer and distributor of prescription and over-the-counter drug products

04/25/2007 FDA announced the entry of a Consent Decree of Permanent Injunction against PharmaFab Inc., its subsidiary, Pfab LP, and two company officials, to stop the illegal manufacture and distribution of prescription and over-the-counter drug products.

Avastin (bevacizumab)

04/21/2007 Genentech and FDA notified healthcare professionals of important new safety information regarding tracheoesophageal (TE) fistula formation in a recent clinical study in patients with limited-stage small cell lung cancer (SCLC).

Zanaflex (tizanidine hydrochloride) Tablets and Capsules

04/11/2007 Acorda Therapeutics and FDA informed healthcare professionals of changes to the CONTRAINDICA-

Continued on page 3

FDA Safety Summaries

Continued from page 2

TIONS and WARNINGS Sections of the product labeling for Zanaflex, a drug used to treat spasticity. In pharmacokinetic studies where tizanidine was coadministered with either fluvoxamine or ciprofloxacin (CYP1A2 inhibitors), the serum concentration of tizanidine was significantly increased and potentiated its hypotensive and sedative effects.

Ziagen (abacavir sulfate) Tablets Combivir (lamivudine and zidovudine) Tablets

04/10/2007 GlaxoSmithKline and FDA informed health-care professionals of an apparent third-party tampering that resulted in the misbranding of Ziagen as Combivir and employed counterfeit labels for Combivir Tablets.

Grifulvin V (griseofulvin) Oral Suspension Griseofulvin Oral Suspension

04/10/2007 Ortho-McNeil and FDA informed health-care professionals and consumers of a nationwide recall of griseofulvin oral suspension, a prescription medication used to treat ringworm and other fungal infections. The recall was issued based on two reports of glass fragments found in bottles of the liquid formulation.

Trimethobenzamide hydrochloride Suppositories

04/06/2007 FDA notified healthcare professionals and consumers that companies must stop manufacturing and distributing unapproved suppository drug products containing trimethobenzamide hydrochloride.

Zelnorm (tegaserod maleate)

03/30/2007 FDA notified healthcare professionals and patients that Novartis has agreed to discontinue marketing Zelnorm, a drug used for the short-term treatment of women with irritable bowel syndrome with constipation and for patients younger than 65 years of age with chronic constipation. FDA analysis of safety data pooled from 29 clinical trials involving over 18,000 patients showed an excess number of serious cardiovascular adverse events, including angina, heart attacks, and stroke, in patients taking Zelnorm compared to patients given placebo.

Permax (pergolide) and generic equivalents

Posted 03/29/2007 FDA notified healthcare professionals and patients that companies that manufacture and distribute pergolide have agreed to withdraw the drug from the market. Pergolide is a dopamine agonist (DA) used with levodopa and carbidopa to manage the signs and symptoms of Parkinson's disease. Results of two new studies showed that some patients with Parkinson's disease treated with pergolide had serious damage to their heart valves when compared to patients who did not receive the drug.

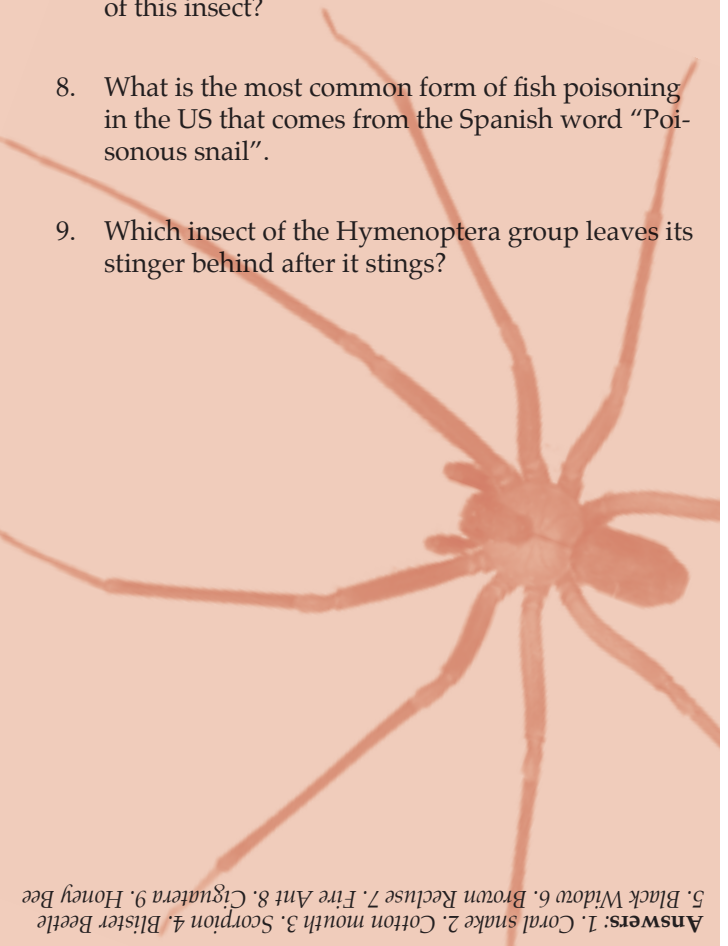
Accutane (isotretinoin)

Posted 03/28/2007 FDA notified consumers and healthcare professionals of a special webpage launched to warn about the dangers of buying isotretinoin online.

Tox Trivia ••

Insect/animal questions

1. What is the common name of the snake in North America which is toxicologically related to the Cobra?
2. What is the common name of the snake *Agkistrodon piscivorus leucostoma* that is a member of the pit viper family?
3. Which venomous animal was able to withstand the most radiation when exposed to nuclear weapons in the Sahara desert when tested by the French?
4. Which insect is Spanish Fly produced from?
5. What is the common name of the poisonous spider called *Latrodectus mactan*?
6. What is the common name of the poisonous spider called *Loxosceles*?
7. The insect of the genus *Solenopsis* can produce a vicious bite and sting. What is the common name of this insect?
8. What is the most common form of fish poisoning in the US that comes from the Spanish word "Poisonous snail".
9. Which insect of the Hymenoptera group leaves its stinger behind after it stings?



Answers: 1. Coral snake 2. Cotton mouth 3. Scorpion 4. Blister Beetle 5. Black Widow 6. Brown Recluse 7. Fire Ant 8. Ciguatera 9. Honey Bee

Some common names and associated chemical substances of those used for inhalation are listed in Table 1.

Table 1 – Examples of Commonly Abused Inhalational Hydrocarbons

Common name	Hydrocarbon
Airplane glue	Toluene
Cigarette Lighter	Butane
Duster	Difluoroethane
Spot remover	Tetrachloroethylene
Typewriter correction	Trichloroethane

Hydrocarbons, by nature are composed of carbon and hydrogen atoms generally found in either an aliphatic (straight) or aromatic (cyclic) arrangement. Expected signs of use and toxicity of the various hydrocarbons relates to several physicochemical factors, including the number of carbons in the compound, the number and types of branches, and/ or the functional groups attached to the hydrocarbon chain/ring, as well as to the route of exposure.

Acute inhalation exposure

Common to inhalational recreational use of hydrocarbons is central nervous system depression caused by enhanced inhibitory tone as well as from decreased fractional inspired oxygen during use. The method of inhalational use can be described using the terms “sniffing”, “huffing” or “bagging”. Sniffing implies nasal or oral infiltration directly from the source substance. Huffing requires pouring a liquid form of the hydrocarbon onto a cloth or like substance and holding near the mouth or nose to inspire. Finally, bagging, which leads to the most profound decreased in inspired oxygen, is when the hydrocarbon is placed in a bag and then inspired directly. Central nervous system depression is generally not life threatening, although concomitant respiratory depression may occur.

After acute use, the most consequential toxicity noted with some aromatic and in particular halogenated hydrocarbons is cardiac dysrhythmias. The mechanism appears to be related to a prolongation of ventricular repolarization manifested by a prolonged corrected QT interval. (See Figure 1) Prolongation of repolarization leads to a longer relative refractory period, which is then available for capture by early afterdepolarizations. Stimulation of the beta-1 adrenergic receptor, either endogenous or exogenous can provide a stimulus for these afterdepolarizations.

Chronic use

Most organ systems can be affected by chronic inhalational hydrocarbon use. Organ system involvement may be specific to the hydrocarbon used. For example, chronic use of chloroform and tetrachloroethylene results in hepatotoxicity, while n-hexane results in peripheral neuropathy and toluene results in renal tubular acidosis.

Other

Rarely, acute use can result in pulmonary toxicity if the hydrocarbon in inadvertently aspirated. Pulmonary aspiration inactivated the surfactant necessary to maintain the integrity of the alveoli. Secondary inflammation may result in impaired oxygenation and decreased lung compliance as seen in the respiratory distress syndrome. Here central nervous system depression is more prolonged and a manifestation of hypoxemia. Skin contact may result in defatting dermatitis, due to dissolution of dermal oils.

What initial management should be provided for a patient with an inhalational hydrocarbon exposure?

- 1) ABC's: Airway breathing and circulation. Remove the patient from the exposure into a fresh air environment. Patients should be provided 100% oxygenation and intravenous fluids at a minimum, but care is no different that other patients arriving to the emergency department.
- 2) Disability: Altered mental status. The patient should be assessed rapidly for hypoglycemia.
- 3) Supportive Care:
 - a. Stable patients should receive a careful history and physical examination. Symptoms of altered mental status should decline over time.
 - b. Unstable patients should receive resuscitation efforts. An exception is that patients exhibiting dysrhythmia or prolonged Qtc duration may benefit from the addition of a beta adrenergic antagonist. As these agents reduce cardiac ionotropy which may further compromise cardiac output, using a short-acting agent such as esmolol may be preferable.
 - c. Patients presenting with signs of hydrocarbon aspiration should receive aggressive supportive pulmonary care including use of high positive end expiratory pressure therapy when required.
- 4) Laboratory Studies:
 - a. ECG – for dysrhythmias and to measure QTc interval duration
 - b. BMP, LFTs – alterations in acid/base balance, renal or hepatic function
 - c. CT/MRI brain – for persistent neurologic findings.

Why may beta adrenergic antagonists be beneficial for QTc prolongation?

Prolongation of cardiac repolarization when seen after inhalational hydrocarbon abuse is caused by inhibition of the rapid component of the delayed rectifier potassium current (Ikr). Functionally, this drug/toxin related change

is similar to congenital causes of delayed repolarization in that there is a delayed time in each action potential in which an early after-depolarization (stimulus for another action potential during the relatively refractory period) can occur. When this occurs a consequence may be the development of a non-perfusing cardiac dysrhythmia, torsades de pointes. Inhibition of the beta-1 adrenergic receptor activity may provide benefit by decreasing the potential for a stimulus to occur during the relatively refractory period by blunting endogenous adrenalin or exogenous sources of norepinephrine or epinephrine activity.

Are there any therapeutic measures for signs of other end organ acute or chronic toxicity?

Hepatotoxicity – Patients presenting with hydrocarbon related hepatotoxicity should be treated using N-acetylcysteine as some animal models and human case series indicate that it may mitigate toxicity.

Nephrotoxicity – (e.g., renal tubular acidosis with hypokalemia after toluene abuse) These patients should be treated supportively with careful supplementation of potassium as needed.

Neurotoxicity – Peripheral neurotoxicity is typically manifested as an axonopathy, which should be treated supportively and may resolve over time. Leukoencephalopathy, due to destruction of the central nervous system white matter, has no known therapy and is not known to be reversible.

What is the Data with Duster containing Difluoroethane toxicity?

There are four cases resulting in mortality associated with possible difluoroethane exposure. In two of the cases, the patients died in motor vehicle accidents. In the first case, a surviving passenger stated that the patient was inhaling a difluoroethane duster prior to losing control of the car. In the second, two passengers of a car died when their vehicle crossed over the median of a four lane highway; their blood levels showed difluoroethane and the can of the aerosolized airbrush propellant was found in vehicle. In a third case, a man was found dead on the floor next to his computer with an empty can and another nearly full can of a difluoroethane duster. Inhalation of the difluoroethane was the cause of death. The fourth case involved a man found dead after repeated exposure to difluoroethane. The cause of death was determined to be fatal arrhythmia due to intoxication with difluoroethane.

The table at the top of the next column illustrates tissue concentrations of difluoroethane in two of fatal cases of difluoroethane exposure published in the literature:

TISSUE	POST-MORTEM DIFLUORETHANE CONCENTRATION	
	<i>Xiong Et Al</i>	<i>Avella J Et Al</i>
Femoral Blood	83.5 mg/L	136.3 mg/L
Brain	43.8 mg/kg	117.5 mg/kg
Lung	91.1 mg/kg	60.3 mg/kg
Liver	92.7 mg/kg	87.6 mg/kg
Kidney	24.3 mg/kg	-
Muscle	80.5 mg/kg	-
Adipose	29.8 mg/kg	235.7 mg/kg
Pulmonary Blood	141.1 mg/L	-
Aortic Blood	122.7 mg/L	-
Vitreous	-	25.1 mg/L

Laboratory and Hospital Course

Initial management consisted of intubation, successful resuscitation and stabilization with supportive care. The patient remained unresponsive and was transferred to the cardiac care unit. In the CCU, the patient displayed intermittent spontaneous respirations while on the ventilator but continued to be unresponsive despite titration of sedation.

	Level	Range
Sodium	142	138-145 mEq/L
Potassium	3.6*	3.7-5.2 mEq/L
Chloride	106	103-112 mEq/L
CO ₂	19.8*	22-33 mEq/L
Glucose	268*	73-107 mEq/L
BUN	18	5-21 mg/dl
Creatinine	1.7*	0.4-1.2 mg/dl
Anion Gap	16.2	8-12 mg/dl
PT	12.0	10-13.8 sec
PTT	<20*	21.9-42 sec
INR	0.99	0.7-1.2
Bilirubin	0.14*	0.3-1.1 mg/dl
AST	30	0-41 IU/L
ALT	37	0-45 IU/L
Calcium	9.0	8.6-10 mg/dl

*= out of normal range

His troponin-I level was not detectible. [put troponin in table?] An arterial blood gas performed ten hours after presentation revealed: pH, 7.245; pCO₂, 50.4; pO₂, 568; HCO₃, 21.1; O₂ saturation 100%. The toxicology laboratory results were negative for acetaminophen, salicylates and ethanol. A rapid toxicology screen was positive for opiates and PCP, but negative for other drugs of abuse.

SPI CORNER: PRODUCT RECALLS

Contributed by: T. Michele Caliva, RN CSPI, Upstate New York Poison Center, Syracuse, NY

In this fast paced information age consumers receive product recall information at an amazing rate. In fact, they may often receive information before those of us in health care settings are made aware of it. While much of this information is useful, some - particularly reports regarding product recalls - can be unduly alarming.

What is the role of the Poison Center when a product is recalled and how can a Poison Center support local emergency departments and health practitioners through the inevitable influx of callers and patient visits?

Poison Centers can assist health care providers in a variety of ways such as handling questions from the general public, providing health care providers with the most current treatment guidelines, collecting data for departments of health, and managing media inquiries.

During the recent peanut butter scare, Poison Centers not only provided information on lot numbers and symptoms of salmonella poisoning, but they also provided reassurance to callers who were asymptomatic although frightened that they might be affected.

During last summer's spinach e-coli recall Poison Centers played a critical role by collecting information on the number of calls, the areas from which the calls were originating, and by tracking callers' symptoms and outcomes.

It is not unusual for a Poison Center to receive calls from the media during a recall - such as the current concern over toothpaste contaminated with diethylene glycol. The Poison Center staff is often able to use these opportunities to quell fears and dispel myths. These interviews provide a forum for the dissemination of correct information on the seriousness of the recall and hopefully prevent unnecessary emergency department visits.

Poison Centers can also support health care providers during recalls by providing front line staff with the most current recall information, updates on anticipated symptoms, management recommendations, observation guidelines and discharge instructions.

In the case of a serious situation such a botulism exposure, the Poison Center staff will work with the DOH and the CDC in obtaining botulinum antitoxin. In any exposure that requires an antidote the Poison Center staff can facilitate the prompt transfer of an antidote from one facility to another.

Reaching out to the public during a crisis such as a recall is vital. Reducing the panic and providing the general public with clear directions and guidance is essential. Health Care Providers can rely on the ready infrastructure and experience of Poison Center's staff in managing public inquiries and exposures. This should help reduce the stress and workload of health care providers, minimize unnecessary ED visits and help to facilitate the prompt treatment of patients if indicated.

A "Duster" Inhalational Exposure...

Continued from page 5

The patient developed a pneumonia, presumably secondary to aspiration, which was treated with antibiotics. The patient's cardiac enzymes became elevated on the second day of admission with a peak CPK of 1464 and a troponin level of 2.96. Over the next few weeks, the patient's condition did not improve, and he never regained consciousness. The family decided to issue a DNR order and the patient was extubated and terminally weaned. Over the next few days, the patient's condition rapidly deteriorated and he expired on the 20th day post admission from a cardiopulmonary arrest.

Select References

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- Williams DR. Cole SJ. Ventricular fibrillation following butane gas inhalation. *Resuscitation.* 1998; 37(1):43-5.



Contributed by: Jamie Nelsen, Pharm.D., Director Drug Information, Upstate NY Poison Center, Syracuse, NY

Question: What is the mechanism for N-acetylcysteine elevating INR? Is this elevation consequential?

Answer:

Background

N-acetylcysteine (NAC) is used to prevent acetaminophen-induced hepatotoxicity. One marker of acute liver injury is hemostatic dysfunction (elevated PT) resulting from an inability to synthesize clotting factors. NAC has been associated with decreased activity of several vitamin K dependent clotting factors both in vitro and in healthy human volunteers.(1) In patients being evaluated for acute liver dysfunction secondary to acetaminophen (APAP) toxicity, changes in clotting activity secondary to NAC administration may result in an unreliable estimation of real hepatic injury.

NAC & Anticoagulation

Knudsen et al.(1) prospectively evaluated the prothrombin time in ten healthy volunteers following the IV administration of NAC. Serial blood draws were performed at 0, 3, 6, 8, 12, 16, 24, 32, 38, 48, 72, and 120 hours. The activities of factors II, VII, IX, and X decreased significantly within one hour of administration of NAC. In all instances this was followed by an increase in factor activity. Factor II and IX activities returned to baseline by six hours following infusion while factor VII activity returned to baseline at 38 hours. Factor X activity was sustained at ~70-80% of baseline values until normalizing at 72-120 hours.

Several case reports have described prolongation of the prothrombin time in patients being treated with intravenous NAC without other evidence of hepatotoxicity.(2,3,4,5) Lucena et al.(4) retrospectively evaluated 18 patients who received IV NAC for APAP toxicity. All patients had an AST and ALT concentrations of <30 U/l and < 40 U/l, respectively. After initiation of NAC, the prothrombin time increased by 21% (range, 4.8-53.4%) relative to baseline ($p < 0.0001$). This decrease was evident within a median time of 14h (range 2-46 h). By the end of NAC therapy, all prothrombin times had approached baseline values. These findings are consistent with other reports. Schmidt et al.(3) retrospectively evaluated the records of 87 patients admitted for APAP toxicity and having received IV NAC. At 7.7 h after initiation of IV NAC therapy, prothrombin time had increased by 33% (0.29-0.38%). This effect, similar to the aforementioned report, was more pronounced with the start of therapy and diminished with time.

The basis for this adverse effect is not well defined although two mechanisms have been proposed. Vitamin K

dependent proteins are homologous multi-domain proteins that share a unique 'Gla' domain. It is proposed that NAC affects the structure/ function of these proteins either via denitrosylation of the protein or reduction of the exposed disulphide bonds.(1) The effect appears to be dose dependent and would account for the relative restoration in clotting activity following administration of the initial bolus recommended in patients receiving NAC secondary to APAP poisoning.

The bioavailability of NAC following oral administration is approximately 10-30%.(6) It is unknown to what degree, if any, the prothrombin time may be increased following oral NAC therapy.

Summary

In conclusion, it appears that NAC prolongs the prothrombin time following IV administration. This affect is dose related and is most pronounced following the initial bolus recommended to treat APAP poisoned patients. An initial increase in prothrombin time of up to ~33% of baseline value may be expected. Although there is significant interpatient variation, NAC's effect on the prothrombin time is diminished with ongoing therapy and in most instances has normalized by the end of therapy.

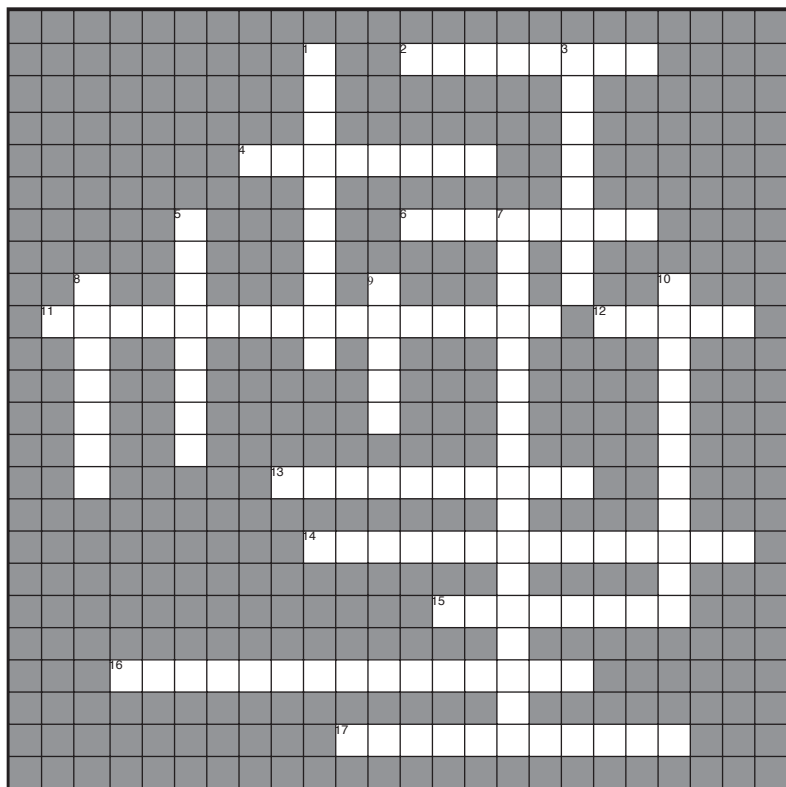
When evaluating a patient for acetaminophen-induced liver failure, it is extremely important to consider other parameters besides the prothrombin time. Poor prognostic markers in patients with APAP-induced liver failure include:(6) pH < 7.3 after fluid and hemodynamic resuscitation OR the combination of PT > 100s, creatinine > 3.3 mg/dL, and grade III/IV encephalopathy. In addition a serum phosphate concentration > 3.75 mg/dL 48-72h following exposure and an APACHE score > 15 in isolated APAP ingestions may also be indicative of poor outcome without transplantation.(6) Since NAC is only expected to mildly elevate the PT (~1/3 of baseline), this adverse effect should not be consequential in the overall assessment of the APAP poisoned patient.

References

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3. *Lancet*. 2002;360:1151-2.
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TOXICOLOGY CROSSWORD

POISON GASES



ANSWERS: 1. Salivation 2. Smallpox 3. Phosgene 4. Avian Flu 5. Chlorine 6. Phosgene 7. Sodium Thiocyanate 8. Cyanide 9. Sarin 10. Pralidoxime 11. Hydroxycobalamin 12. Kurds 13. Descending 14. Pyridostigmine 15. Chlorine 16. Dimethylsulfate 17. Hematemesis

ACROSS

2. Potential biowarfare agent causing a cluster of similarly appearing pustule lesions with rapidly rising fever
4. Common name of H5N1 is a sub type virus
6. Smells like freshly cut grass
11. Chemical name new cyanide antidote
12. Ethnic group who suffered the effects of a poisonous gas used by Saddam Hussein's forces
13. Direction of Botox® related paralysis
14. Bromide Drug given to US troops in the Persian Gulf War to mitigate nerve gas exposure
15. Cannon shells were filled with this during the American Civil War
16. Chemical name of "D Stoff" or "Rationite" was used as a war gas
17. 3 "H" critical gastrointestinal effects of pneumonic plague include: Hemorrhagic diarrhea, Hemoptysis and ___.

DOWN

1. Oral cholinergic caused by organophosphate nerve agent SARIN
3. Poison gas used against the Allies in WWII
5. Irritant gas can causing non cardiogenic pulmonary edema
7. Antidote traditionally used for cyanide poisoning
8. Chemical used in suicides during the closing days of WWII
9. Name of the poison gas that Saddam Hussein's army used in the 1980's
10. Nerve Agent Antidote Kit (NAAK) contains atropine and ___.