Pathology 438 Final Examination due: 15 June 2015
Spring 2015
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The electronic responses to this examination are due on Monday, 15 June 2015 at end of day (5:00 pm). Submit them to shalloran@lifewest.edu OR to smhbizness@gmail.com. You will be sent an acknowledgement receipt.

You are not allowed to consult with classmates or any individuals *other than* the instructor as you research, prepare and compose your responses to the questions posed in this examination. Lecture content (slides) and your oral presentations are on MOODLE for you to use in preparing answers, in addition to access to the LCCW library, reference books and course text books, and on-line resources. Please proofread and organize your work and assemble the exam before submitting it.

Some answers require you to include a citation of the sources you consult to formulate your response. Format your citation according to MLA or APA standards. (If you wish, you can use the built-in Word feature that formats your references: under the References tab, use Insert Citation and fill in the fields as much as possible. Later you will use Bibliography->Insert Bibliography at the point of the cursor. You might learn how to use Section Break too in order to insert bibliographies under separate answers. I have put in section breaks in this document between questions.)

By working the examination and submitting it for grading you are agreeing to work independently of all other individuals and you are certifying that all the responses and answers to the examination questions are your own work.

Within group A through C, choose ONE of any of the choices answer.
Choose between D or E, and within D, choose ONE of any of the choices

A. Environmental Toxicants. Pick one from the three class of substances below and discuss exposure (places where it might be encountered), its toxicokinetics (ADME) and toxicodynamics (acute, chronic toxicity, effects on physiology and eliciting pathologies. You are allowed to focus on one compound in the class or discuss the toxicology of the class generally

1. Polyaromatic hydrocarbons (PAHs)
2. Pesticides—Insecticides: organophosphates
3. Polychlorinated Biphenyls (PCBs)

2) Pesticides might be found predominately in food, water, and in the air.

Acute toxicity of organophosphates includes a slogan called DUMBELS=diarrhea, urination, miosis (pinpoint pupils), bronchospasm, emesis (vomiting), lacrimation (tearing), salivation. This occurs with acute toxicity. Recovery may take weeks, death can ensure if no treatment in under 24 hours. Chronic toxicity of organophosphates can include induced delayed neuropathy for

select organo's however it primarily will cause motor paralysis,it will also have a generalized malaise symptomology similar to influenza.

A specific organophosphate class are Organochlorines and in particular dichlorodiphenyltrichloroethane (DDT). It is either stimulatory or inhibitory interfereing with potassium and calcium absorption. It is poorly absorbed in the skin however, it has a long half life which has made it dangerous and is a very stable compound which is why it has been banned. It requires a Phase I dechlorination/demethylation reaction and a phase 2 glutathione reaction. Acute toxicity specifically includes the CNS with headaches, dizziness, tremors, convulsions. While chronic toxicity includes memory loss, personality changes, and low sperm count.

B. Food Toxicants.

1. Heterocyclic amines (HCAs) can form when meat is cooked often at charring temperatures. Find one compound in this class, discuss how it is formed in cooking and sources of exposure, and discuss effects of chronic toxicity, either in humans or animal studies

2. Sulfur dioxide (SO_2) is added to wine during its production. Discuss what is known about acute and chronic toxicity and other toxicodynamic features. Can wine be produced without using it? Are there are alternatives

3. Food Coloring Dyes. FD&C Blue No. 1, Red No. 40, Yellow No. 5, and Yellow No. 6 are common additives to food. Pick TWO of these and discuss what is known about the effect on health and name one alternative to using the dye, comparing financial costs and effect on health.

3_ Blue No. 1 can effect health by people with moderate asthma to have allergic reactions to the compound. It has a poor intestinal absorption only about 5% and has cause serious complications when absorbed through other modalities such as enteral feeding tubes. The recommended safety limit is 0.1 mg/day per kg body weight. It is put into the feeding solutions to track aspirates and secretions in the gastric area, and trachea. It has been found to cause metabolic acidosis and refractory shock possibly leading to death in these patients. It may cause irritation to the eyes, digestive tract, and skin, however there is no substantial research saying it has chronic health effects. Blue berries and red cabbage are good alternatives for blue food dye.

Red No. 40 can stimulate allergic reactions, and also some contaminants can be carcinogenic but that is yet to be determined. It is banned in several countries within Europe, however claimed to be safe by the FDA in America. There has been weak associations with ADHD and red no 40. This is more likely to be an environmental trigger to pre existing genetics. There are links it may cause cancer especially in the immune system. Overall the Jury is out on whether it is something we should be concerned about. Good alternatives are cherry juice, paprika, turmeric, beet juice.

C. Drug-Nutrient Interactions. Select any of the drugs or drug classes below and explain how it affects diet (nutrient absorption). Either suggest an alternative drug and/or explain how an

individual can compensate for any effect on nutrition

1. Laxatives
2. Antacids
3. Anticonvulsants

Antacids are used for heartburn/indigestion. They effect your digestion by causing indigestion and lack of absorption if they contain magnesium. They can cause poor absorption of calcium and can lead to weaker bones in some individuals. They can cause constipation with the brands that contain calcium or aluminum, and in select cases these can cause kidney stones. It can cause hypercalcemia by way of milk-akali syndrome by over absorption of types that contain calcium. Some reports have indicated that due to lower stomach acid being produced it can lead to certain proteins being improperly digested in the stomach, not only does this lead to indigestion but can also lead to allergic reactions to the indigested proteins by way of IgE sensitization. A natural solution is to use apple cider vinegar with digestion, and use a lower alkaline diet, by means of eating less protein and more veggies, and fruit. This will promote less acid production in the stomach and lead to less heartburn. It is important to avoid high sugary, and high saturated fat meals, as they will promote heartburn as well. Exercise is another key step in managing heartburn as excess stomach fat can lead to pressure on your stomach and cause acid to reflux up in the esophagus. Wear looser clothing, drink herbal tea after meals, don't lay down within 3 hours post meal. All of these will help manage heartburn effectively.

You can do either D or E below

D. Personal Care Products . Select one of the product types and the named compound usually contained in it. Discuss any facts on acute and chronic toxicity through dermal exposure, and discuss alternatives to

1. Lipstick: lead acetate
2. Antiperspirants: aluminum chlorohydrate
3. Shaving Lotion: find a toxicant in the shaving lotion and discuss it

E. Sexual dysfunction therapy. A medication for hypoactive sexual arousal disorder recently was in the news. This medication, flibanserin, is being called a "female Viagra."
(a) Discuss the effect of the drug both at clinical and molecular level
(b) Discuss alternative therapies, including those in chiropractic medicine

2) Antiperspirant aluminum cholorhydrate ($Al_2Cl(OH)_5$) is used as a coagulant within the antiperspirants and is also used in flocculation of water treatment. The exposure that gets talked about more commonly is in commercial antiperspirants. Acute toxicity could be nausea, vomiting, sweating, malaise, irritation to the skin, rash, and swelling. If exposed for a long time controversy is in the science as there are some reports that have indicated

that it may be correlated with breast cancer, Alzheimer's, and kidney dysfunction. These studies however are critiqued for being flawed literature. The amount of exposure is so minimal that is currently considered negligible. However if it is causing irritation to the skin in the armpit a different style of deodorant is recommended. Alternatives coud be using baking soda, homemade remedies online, using essential oils, showering regularly to prevent a build up(using no product). More research needs to be done to really see the effect of toxicity in the long run with aluminum chlorohydrate.

References

1)Antiperspirants Facts About Cancer, Aluminum, Alzheimer's, and More. (n.d.). Retrieved from http://www.webmd.com/skin-problems-and-treatments/features/antiperspirant-facts-safety?page=4

2)Heartburn: MedlinePlus. (n.d.). Retrieved from http://www.nlm.nih.gov/medlineplus/heartburn.html

3)Is Red Dye 40 Toxic? (n.d.). Retrieved from http://www.healthline.com/health/food-nutrition/is-red-dye-40-toxic

4)Merwat, S. N., & Spechler, S. J. (2009). Might the Use of Acid-Suppressive Medications Predispose to the Development of Eosinophilic Esophagitis? *American Journal of Gastroenterology*. doi:10.1038/ajg.2009.87

5)MSDS aluminumhydrocholrate. (n.d.). Retrieved from http://www.altivia.com/Resources/MSDS/Aluminum-Chlorohydrate-A2297-013114.pdf

6)MSDS Blue. (n.d.). Retrieved from http://quantum.esu.edu/~scady/MSDS/fdcblue1.pdf