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*

2. Pesticides—Insecticides: organophosphates

Organophosphate insecticides are used worldwide. They exert their toxicity through binding covalently to acetyl cholinesterase and inhibiting it. The result is a long-lasting increase in acetylcholine at all sites where it is released. Many of these drugs are extremely toxic and were developed by the military as nerve agents. Toxicity of these agents is manifested as nicotinic and muscarinic signs and symptoms. Depending on the agent, the effects can be peripheral or affect the whole body.

Reference:

Lippincott, W. (2012). Pharmacotherapeutics for advanced practice, 3rd ed. pharmacology, 5th ed.: North american edition. (5th ed., pp. 56-57, 560-365). S.l.: Wolters Kluwer Health.

B. *Food Toxicants.*

2. Sulfur dioxide (SO2) 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?

Sulphur dioxide is a chemical that is a gas at room temperature and is a toxic gas that is corrosive and blistering for the respiratory system and could cause alterations in the B1 vitamin and of some amino acids metabolism if inhaled. Although, according to the CDC ingestion of sulfur dioxide is unlikely because it is a gas at room temperature.

Sulfur dioxide is used in small amounts as a food and wine preservative. Highly sensitive asthmatic individuals can develop bronchospasm after eating foods or drinking wine preserved with sulfur dioxide or other sulfur preservatives.

With acute exposure Sulfur dioxide dissolves in the moisture on skin, eyes, and mucous membranes to form sulfurous acid, an irritant and inhibitor of mucociliary transport. Most of the inhaled sulfur dioxide is detoxified by the liver to sulfates and excreted in the urine. The bisulfite ion produced when sulfur dioxide reacts with water is likely to be the main initiator of sulphur dioxide-induced bronchoconstriction.

Chronic exposure can result in an altered sense of smell (including increased tolerance to low levels of sulfur dioxide), increased susceptibility to respiratory infections, symptoms of chronic bronchitis, and accelerated decline in pulmonary function.

All wines contain sulphur dioxide in various forms, collectively known as sulphites. Even in completely unsulphured wine it is present at concentrations of up to 10 milligrams per liter. It is in wine in a free and bound form and the amount of free form depends on the pH.

The World Health Organization fixed the daily admissible dose of SO2 to 0.7 mg per day per kg of weight. The admissible amount for a man is therefore between 42 and 56 mg per day, according to an average weight between 60 and 80 kg. If we daily drink half a bottle of wine (375 ml), we could easily absorb a higher amount of SO2. Considering the maximum total amount of SO2 consented by EU laws, i.e. 160 mg/l for red wines and 210 mg/l for white wines, SO2 amount absorbed with half a bottle of wine is 60 mg for red wines and 79 mg for white wines. (Ribereau-Gayon) If we drink half a bottle of some special wines, such as those made with dried grapes or processed with Botrytis (which could contain up to 400 mg/l sulphites), the sulphur dioxide we absorb is so much as 150 mg (which is 2.5 mg/kg for one person weighting 60 kg and 1.87 mg/kb for a person weighting 80 kg).

References:

1. CDC. (2014, October 21). ATSDR - Medical Management Guidelines (MMGs): Sulfur Dioxide. Retrieved June 13, 2015, fromhttp://www.atsdr.cdc.gov/mmg/mmg.asp?id=249&tid=46
2. More than Organic. (2015). Sulphites in wine - Natural wine. Retrieved June 13, 2015, from http://www.morethanorganic.com/sulphur-in-the-bottle
3. Radikon. (n.d.). SULPHUR DIOXIDE AND SULPHITES ARE THEY REALLY NECESSARY?. Retrieved from http://www.radikon.it/notizie/sulphur-dioxide-and-sulphites-are-they-really-necessary

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*

2. Antacids

Antacids are weak bases that react with gastric acid to form water and a salt to diminish gastric acidity. Because pepsin is inactive at pH greater than 4, antacids also reduce pepsin activity. Antacids vary widely in their chemical composition, acid-neutralizing capacity, sodium content, palatability and price. Commonly used antacids are salts of aluminum and magnesium

(aluminum hydroxide or magnesium hydroxide for example). Aluminum hydroxide tends to cause constipation whereas magnesium hydroxide tends to produce diarrhea. So preparations that combine these two compounds aid in normalizing bowel function. Some other alternatives include eating a well-balanced diet/discovering what your food sensitivities are and avoiding them, eating lots of yogurt/probiotics, and using apple cider vinegar.

Reference:
Lippincott, W. (2012). Pharmacotherapeutics for advanced practice, 3rd ed. pharmacology, 5th ed.: North american edition. (5th ed., pp. 356-357). S.l.: Wolters Kluwer Health.

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

3. Shaving Lotion: find a toxicant in the shaving lotion and discuss it

Triethanolamine, often abbreviated as TEA, is a viscous organic compound that is both a tertiaryamine and a triol and is found in shaving creams. A triol is a molecule with three alcohol groups. Triethanolamine is a strong base. Triethanolamine is used primarily as an emulsifier and surfactant. It is a common ingredient in formulations used for both industrial and consumer products. The triethanolamine neutralizes fatty acids, adjusts and buffers the pH, and solubilizes oils and other ingredients that are not completely soluble in water.

Triethanolamine is a skin and respiratory toxicant. In a number of studies thriethanolamine has caused contact allergies. Animal studies have also shown Triethanolamine can cause bladder and liver cancer, as well as cell mutation in testicles. However according to the MSDS sheet for Edge® Sensitive Skin Shave Gel says that there is no known effect for chronic toxicity. Also under the acute toxicity it says that the product is safe for intended use based on the formulation, testing results, and the long history of safe consumer use.

One website lists Dr. Bronner's Shaving Gel as a good alternative to others that might have triethanolamine. Other alternatives include classic shave creams from Pacific shaving company or Hal's deluxe or classic shave soap.

References:

1. O'Neil, MJ. The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. (13th Edition ed.). Whitehouse Station, NJ: Merck and Co., Inc. p. 1722.
2. Ashford's Dictionary of Industrial Chemicals, third edition, 2011, page 9252
3. Global Regulatory Affairs/ Product Safety. (2012, August 29). Edge® Sensitive Skin Shave Gel MSDS. Retrieved from http://www.playtexproducts.com/msds_pdf/rb/edge/112049_edge%20sensitive%20skin%20shave%20gel%202.75%20oz.pdf
4. The Sovereign Investor. (n.d.). The Three Toxins in Your Shaving Cream You Want to Avoid. Retrieved from http://thesovereigninvestor.com/sovereign-living/three-toxins-shaving-cream-want-avoid/