Pathology 438 Final Examination Due: 15 June 2015
Spring 2015
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<u>Environmental Toxicants.</u> 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

Polyaromatic hydrocarbons (PAHs)

Exposure: air contaminated by wildfires or coal tar, grilled foods, tobacco

Absorption: lungs (aerosolized PAH), gastro-intestinal tract)food and water), skin (direct contact)

Distribution: levels detectable in most organs, especially those rich in fat. Highest levels detected in the gastrointestinal tract.

Metabolism: mixed function oxidase system is the enzyme system responsible for metabolizing PAHs, it requires NADH and NADPH to convert too polar hydroxy derivatives and arene oxides.

1) Epoxidation turns PAHs into stereoisomeric dihydrodiols
2) cytochrome P450 produces 4 stereoisomeric forms (bezo(a)pyrene-r-7,t-8-diol-t-9,10-epoxide is the most carcinogenic form)
3) true detoxification: glutathione conjugates the stereoisomeric forms

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Excretion: feces and urine

Carcinogenic: associated with increased risks of lung, skin, and bladder cancer.

<u>Bibliography:</u>

Karami, Sara, Paolo Boffetta, Paul Brennan, Patricia A. Stewart, David Zaridze, Vsevolod Matveev, Vladimir Janout, Helena Kollarova, Vladimir Bencko, Marie Navratilova, Neonila Szeszenia-Dabrowska, Dana Mates, Jan P. Gromiec, Roman Sobotka, Wong-Ho Chow, Nathaniel Rothman, and Lee E. Moore. "Renal Cancer Risk and Occupational Exposure to Polycyclic Aromatic Hydrocarbons and Plastics." *Journal of Occupational and Environmental Medicine / American College of Occupational and Environmental Medicine*. U.S. National Library of Medicine, n.d. Web. 16 June 2015. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3065187/

"Polycyclic Aromatic Hydrocarbons, Toxicology." *Polycyclic Aromatic Hydrocarbons, Toxicology*. N.p., n.d. Web. 16 June 2015. http://www.crios.be/PAHs/toxicology.htm

"Toxic Substances Portal – Polycyclic Aromatic Hydrocarbons *ATSDR*. N.p., August 28, 2014. Web. 16 June 2015. http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=121&tid=25

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.

Yellow No. 5 aka tartrazine aka E102

Sources: potato chips, jams, candy, drinks, pet food, shampoo, vitamins, medications

Banned in Austria and Norway, FDA approved.

Associations with allergies, asthma, and aspirin hypersensitivity. Hyperactivity in children,

Alternative dyes: annatto, beta carotene

Yellow No. 6 aka sunset yellow aka E110

Sources: medications (tablets, capsules), orange-flavoured foods

Banned in Norway, Finland, and Sweden. FDA approved for intake up to 3.75 mg/kg.

Associations with allergies, hyperactivity in children, increased risk of cancer

Bibliography

"Health Effects of Yellow 5 Food Coloring." *LIVESTRONG.COM*. LIVESTRONG.COM, 15 Apr. 2015. Web. 16 June 2015. http://www.livestrong.com/article/370945-health-effects-of-yellow-5-food-coloring/

"FD&C Yellow No. 6 (Inactive Ingredient) - Drugs.com." *FD&C Yellow No. 6 (Inactive Ingredient) - Drugs.com*. N.p., n.d. Web. 16 June 2015. http://www.drugs.com/inactive/fd-c-yellow-no-6-249.html

"Yellow Dye #6 Linked to Cancer, Hyperactivity, ADHD and Allergic Reactions!!!!" *Palm Coast Chiropractic Dr David Pearson DC*. N.p., n.d. Web. 16 June 2015. http://mypalmcoastchiropractor.com/blog/2011/05/29/yellow-dye-6-linked-to-cancer-hyperactivity-adhd-and-allergic-reactions/

<u>Drug-Nutrient Interactions</u>. 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.

Antacids

Antacids are typically used by individuals experiencing heartburn. Antacids neutralize hydrochloric acid in the stomach, and consequently block the absorption of vitamins and minerals that require acidity in the stomach. Hydrochloric acid is responsible for activating pepsinogen → pepsin in the stomach, hypochlorhydria (low stomach acid) therefore affects the body's ability to digest proteins. And can contribute to leaky gut. HCl is also involved in the metabolism of calcium, zinc, Vitamins B9 and B12, and iron.

Chiropractic and Alternative Therapies:

<u>Chiropractic</u> adjustments to address subluxation and support optimal homeostasis.

<u>Supplementation</u> with HCl and/or digestive enzymes.

<u>Dietary support:</u> ACV, Lemon juice, reduce protein consumption, reduce (cold) liquid consumption during meals, implementation of food combining (see attachment).

Hydrochloric acid is associated with stimulating peristalsis and the closing of the sphincters of the stomach, therefore hypochlorhydria could reduce the movement in the intestinal tract (inducing constipation) and leave the cardiac sphincter incompletely closed resulting in heartburn. For this reason, there is a common misdiagnosis of hyperchlorhydria resulting in the prescription of antacids or proton pump inhibitors further establishing the state of inadequate stomach acid.

<u>Bibliography:</u>

Katsunori, Iijima, Koike Tomoyuki, Abe Yasuhilo, and Shimosegawa Tooru. "Cutoff Serum Pepsinogen Values for Predicting Gastric Acid Secretion Status." *The Tohoku Journal of Experimental Medicine* (2014): n. pag. Web. 26 May 2014. <https://www.jstage.jst.go.jp/article/tjem/232/4/232_293/_html>.

Haas M.D., Elson M. *Staying Healthy with Nutrition.* Berkeley: Celestial Arts, 2006. Print.

Mitrea M.D.(EUR), N.D., Lilieana Sadler. *Pathology and Nutrition… A Guide for Professionals.* Canada: CSNN Publishing, 2005. Print.

Perrault, R.H.N., Danielle. *Nutritional Symptomatology: Handbook for CSNN Students, 8th Edition*. Danielle Perrault, R.H.N. Ontario: CSNN Publishing, 2009. Print.

<u>Personal Care Products</u>. 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

Lipstick: lead acetate

Lead is a cumulative toxicant, and therefore can cause poisoning through chronic or acute exposure. Approximately 143,000 deaths per year are due to lead poisoning, more commonly in developing countries.

"FDA analyzed hundreds of lipsticks on the market and found that levels of lead were too low to pose a health risk, especially considering the tiny amounts of lipstick that a consumer might ingest."

Amount of lead in cosmetics is not regulated by the FDA, but it is regulated in the colourants used in the cosmetics (maximum of 20 ppm).

Symptoms of lead poisoning in children: developmental delays, learning difficulties, irritability, loss of apetite, weight loss, sluggishness/fatigue, abdominal pain, vomiting, constipation, hearing loss.

Symptoms of lead poisoning in adults: high blood pressure, abdominal pain, constipation, joint pains, muscle pain, declines in mental function, pain/numbness/tingling, headache, memory loss, mood disorders, reduced sperm count, miscarriage.

Poisoning is determined by a blood titre of 20 mcg/dL in adults and 10 mcg/dL in children. Treatment options include chelation therapy and EDTA.

<u>Bibliography:</u>

"U.S. Food and Drug Administration." *Lead in Cosmetics*. N.p., n.d. Web. 13 June 2015. http://www.fda.gov/Cosmetics/ProductsIngredients/PotentialContaminants/ucm388820.htm

"U.S. Food and Drug Administration." *Lipstick & Lead: Questions & Answers*. N.p., n.d. Web. 13 June 2015. http://www.fda.gov/Cosmetics/ProductsIngredients/Products/ucm137224.htm

"Lead Poisoning." - *Mayo Clinic*. N.p., n.d. Web. 13 June 2015. http://www.mayoclinic.org/diseases-conditions/lead-poisoning/basics/definition/con-20035487

"Lead Poisoning." *Healthline*. N.p., n.d. Web. 13 June 2015. http://www.healthline.com/health/lead-poisoning#Overview1

"Lead Poisoning and Health." *WHO*. N.p., n.d. Web. 13 June 2015. http://www.who.int/mediacentre/factsheets/fs379/en/

FDA Analyses of Lead in Lipsticks – Initial Survey

The following results for lead content in a selection of lipsticks were obtained by scientists at the U.S. Food and Drug Administration (FDA) and reported in the *Journal of Cosmetic Science*[1]. FDA purchased lipsticks from retail stores between October and December 2007.

Sample #	Brand	Parent company	Lipstick line Shade # Shade[a]	Lot #[b]	Lead (Pb)[c] (ppm)[d]
1a	Cover Girl	Procter & Gamble	Incredifull Lipcolor 964 Maximum Red	7241S1	3.06
1b				5188S1	3.05
	Revlon	Revlon	ColorStay Lipcolor 345 Red Velvet	Composite[e]	2.91[f]
2				07298	2.38
3	Cover Girl	Procter & Gamble	Queen Collection Q580 Ruby Remix	7136	2.24
4	Body Shop	L'Oréal	Lip Colour 22 Garnet	C274EA	1.79
5	Cover Girl	Procter & Gamble	Continuous Color 435 Cherry Brandy	7228	1.76
6	L'Oréal	L'Oréal	Colour Riche 315 True Red	FD261	1.47
7	Revlon	Revlon	Super Lustrous 660 Bed of Roses	07208 1508 53	1.37
8	Maybelline	L'Oréal	Moisture Extreme F315 Cocoa Plum	WD2891	1.21
9	Revlon	Revlon	Super Lustrous 725 Love That Red	07284 1508 59	1.04
10a	L'Oréal	L'Oréal	Colour Riche 752 Classic Wine	FD064	0.79
10b				FD234	0.67
11	Clinique	Estée Lauder	Long Last FJ Merlot	AA7	0.55
12	Clinique	Estée Lauder	Long Last F9 Paprika	A87	0.48
13	Estée Lauder	Estée Lauder	Pure Color 1A3 Maraschino	B55	0.43
14	Burt's Bees	Clorox Company	Lip Shimmer g Merlot	1840701	0.33
15	Maybelline	L'Oréal	Moisture Extreme	WD3041	0.23

			E215 Midnight Red		
16	PeaceKeeper	PeaceKeeper	Lipstick g Paint Me Compassionate	h	0.17
17	Dior	LVMH	Replenishing Lipcolor 752 Red Premiere	7A01	0.15
18	Dior	LVMH	Addict Ultra-Shine 750 Shiniest Sexiness	7D01	0.12
19	M.A.C	Estée Lauder	Matte g Viva Glam I	A67	0.10
20	Avon	Avon	Ultra Color Rich U250 Cherry Jubilee	h	0.09
				Average	1.07