



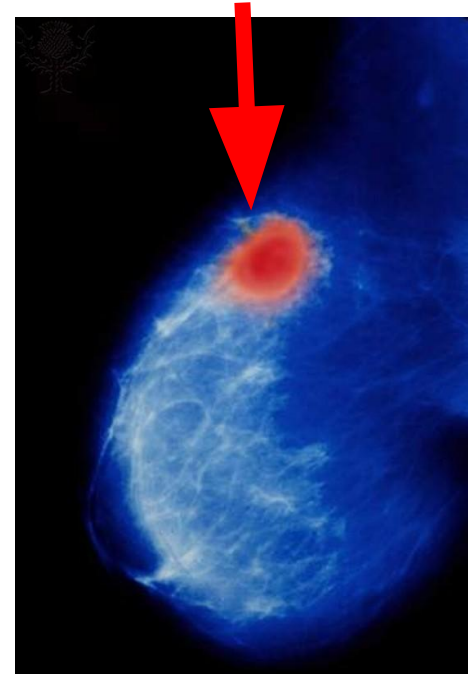
How Metals in the Environment Could Be Increasing the Risk of Breast Cancer

Summer Research Project by Kate Bohigian

Outline of Presentation

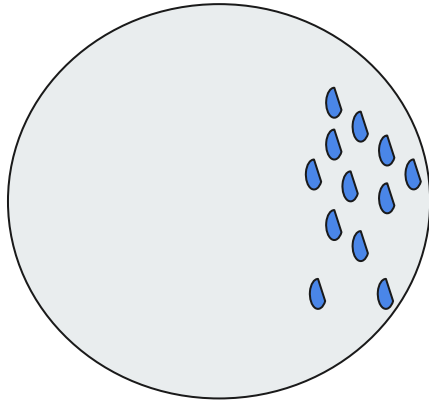
1. Overview
2. Breast Cancer: Non-Invasive vs Invasive
3. Risk Factors of Breast Cancer
4. Estrogen Receptor Positive Breast Cancer
5. Environmental Estrogens
6. Metalloestrogens
7. Metalloestrogens Bind to Estrogen Receptors
8. Cadmium (Example of a Metalloestrogen)
9. Conclusion

Breast Tumor



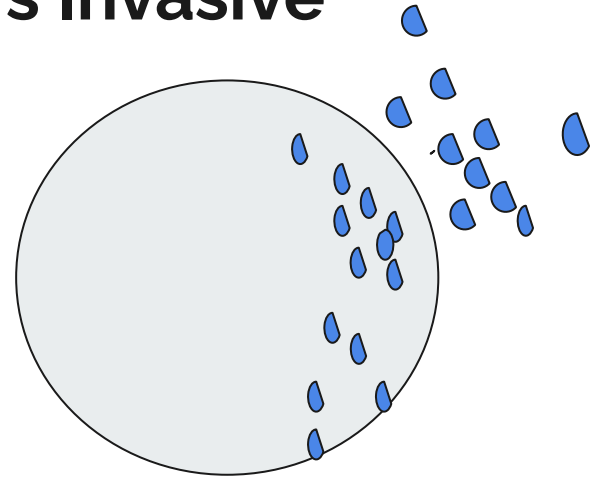


Breast Cancer: Non-Invasive vs Invasive



Non-Invasive

Cancer cells are localized in
lobule or milk duct

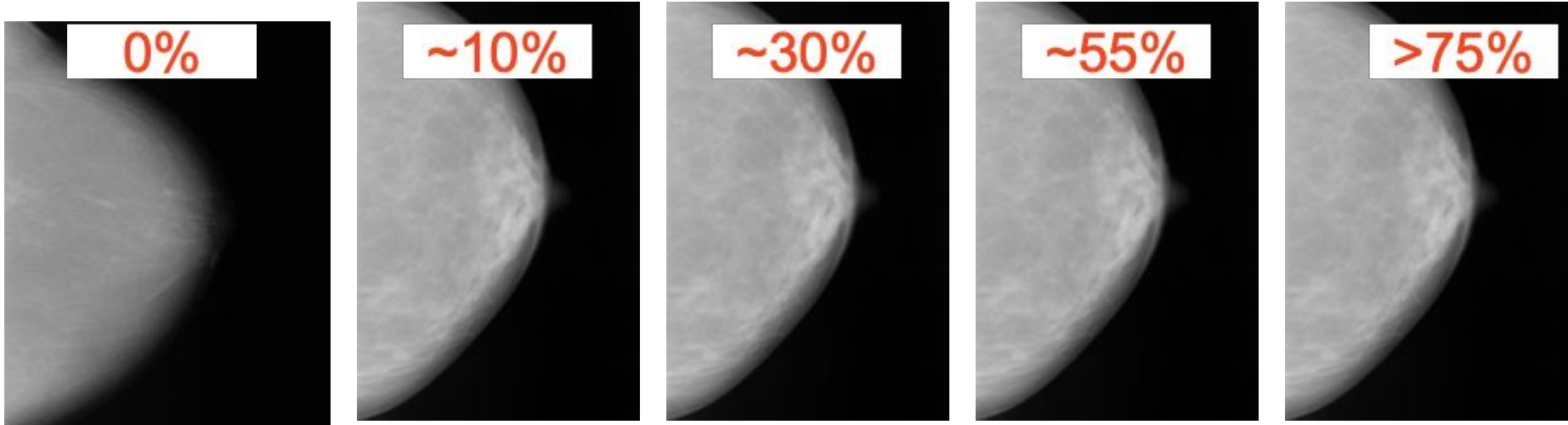


Invasive

Cancer cells have left original site

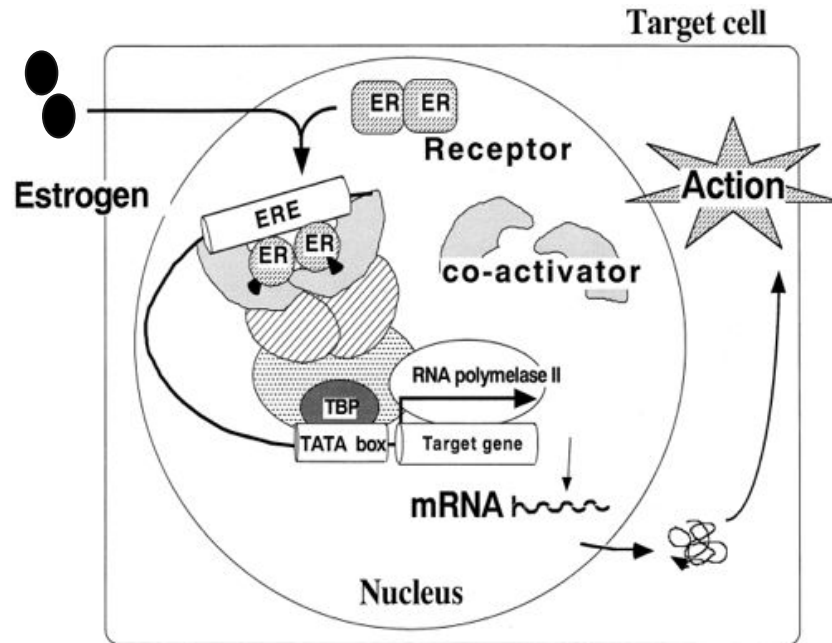
Risk Factor of Breast Cancer

Mammograms showing different densities of cells in the breast



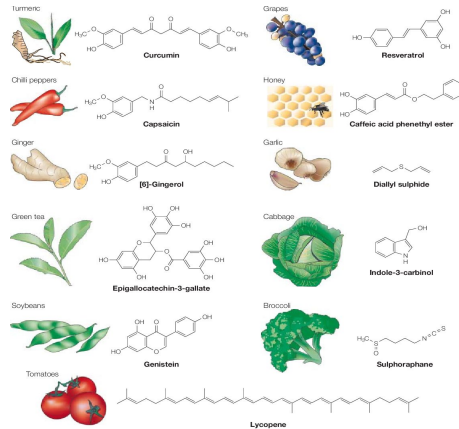
High Risk

Estrogen Receptor Positive Breast Cancer

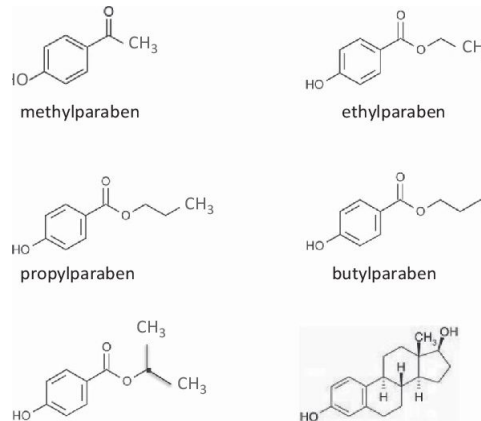


Environmental Estrogens

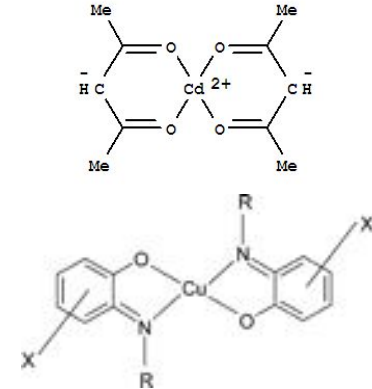
Phytoestrogens: come from food



Xenoestrogens: come from chemicals



Metalloestrogens: come from metals



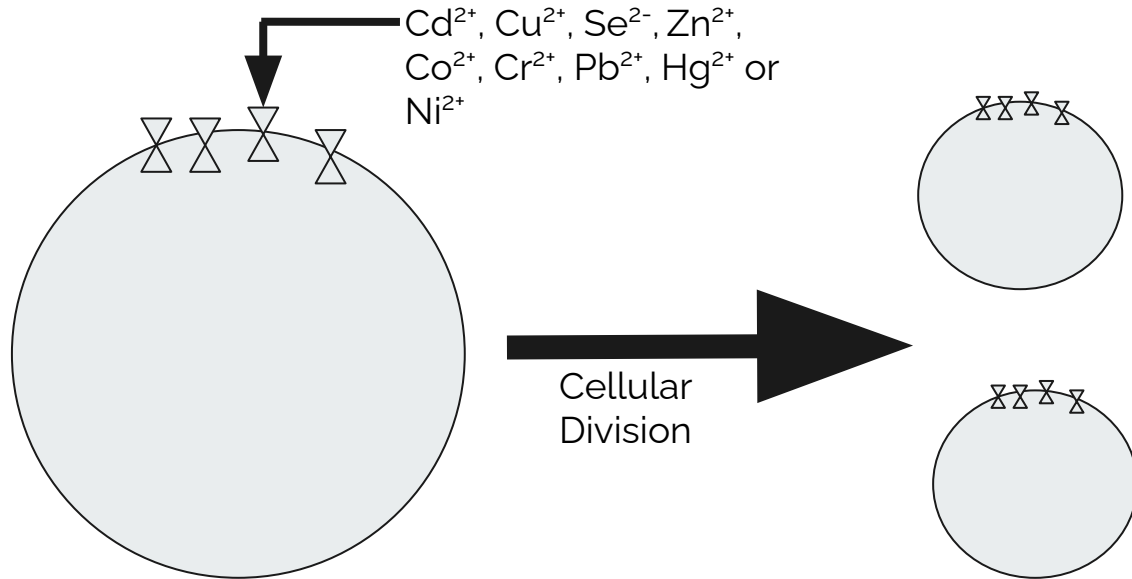
Metalloestrogens

Sources of Metalloestrogens:



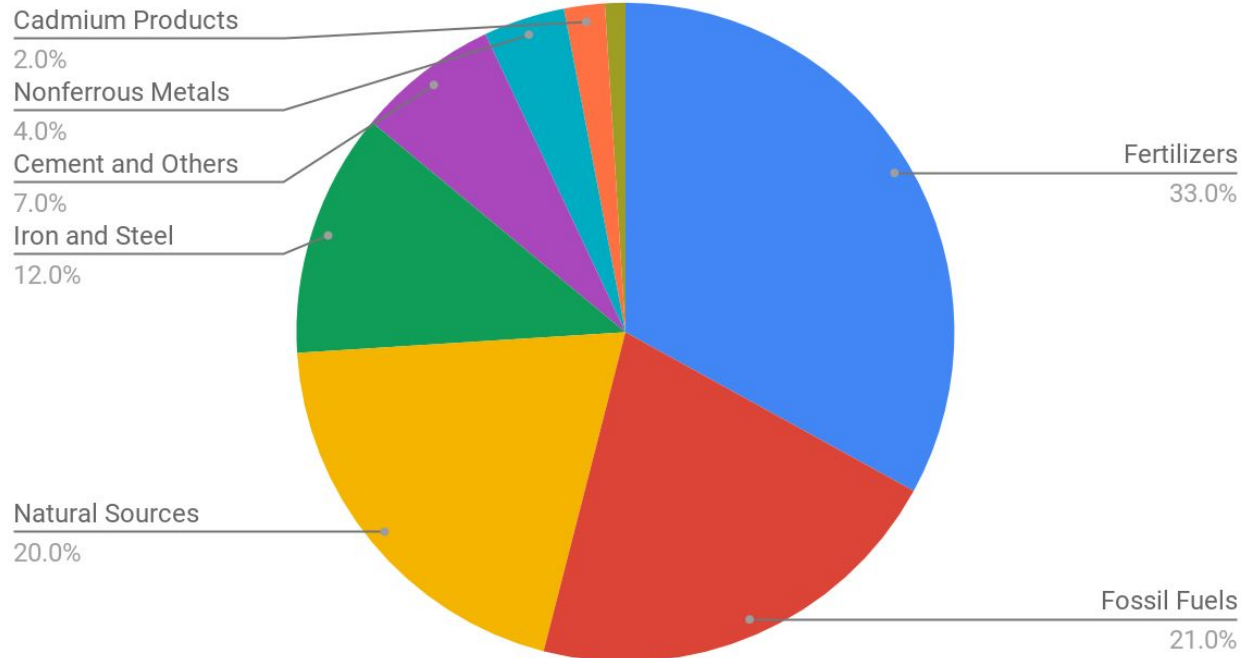
Metalloestrogens can trigger cells to become cancerous and decrease their response to medication

Metalloestrogens Bind to Estrogen Receptors



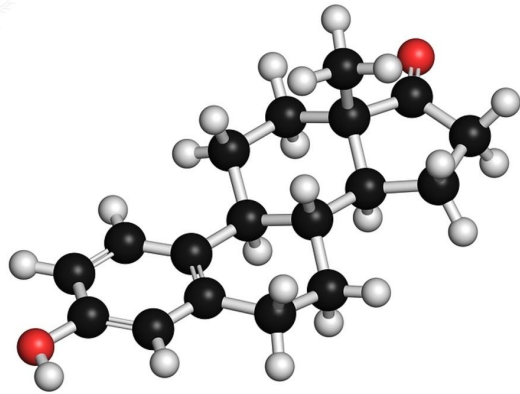
Cadmium → Estrogen → Increased Risk of Cancer

Exposure to Cadmium in Environment

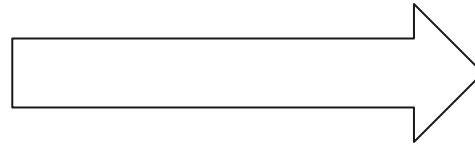




Conclusion

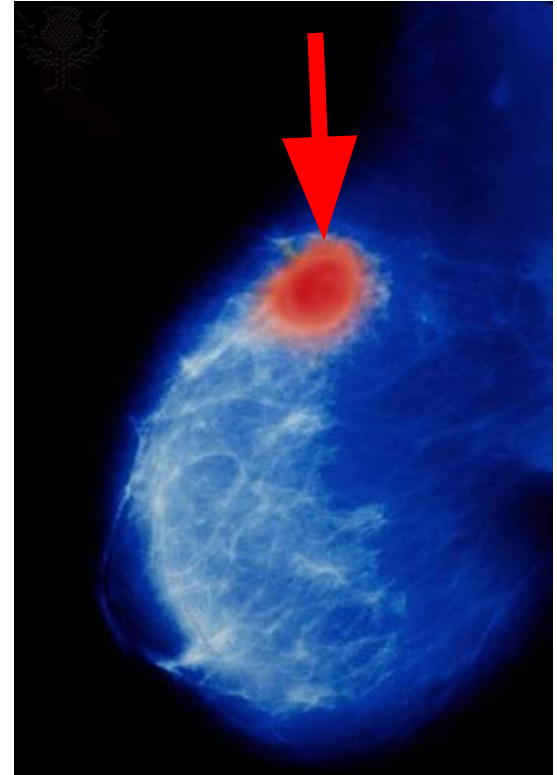


Example of Estrogen Molecule



Risk Factor

Breast Tumor





Works Cited

- Akram, Muhammad et al. "Awareness and current knowledge of breast cancer." *Biological research* vol. 50,1 33. 2 Oct. 2017, doi:10.1186/s40659-017-0140-9
- Byrne, Celia et al. "Metals and breast cancer." *Journal of mammary gland biology and neoplasia* vol. 18,1 (2013): 63-73. doi:10.1007/s10911-013-9273-9
- "Cadmium and Other Metals." *Breast Cancer Prevention Partners*, 2019, www.bcpp.org/resource/cadmium-and-other-metals/. Accessed 1 Sept. 2020.
- Florea, Ana-Maria, and Dietrich Büsselberg. "Metals and Breast Cancer: Risk Factors or Healing Agents?" *Journal of Toxicology*, vol. 2011, 24 June 2011, pp. 1-8. *Hindawi*, doi:10.1155/2011/159619. Accessed 31 Aug. 2020.
- Nichols, Hannah. "Everything You Need to Know about Estrogen." *Medical News Today*, Healthline Media UK, 12 Mar. 2020, www.medicalnewstoday.com/articles/277177#imbalance. Accessed 1 Sept. 2020.
- Romaniuk, A et al. "Heavy metals effect on breast cancer progression." *Journal of occupational medicine and toxicology (London, England)* vol. 12 32. 28 Nov. 2017, doi:10.1186/s12995-017-0178-1



Images Cited

- Breast cancer: Breast cancer. Photography. Britannica ImageQuest, Encyclopædia Britannica, 25 May 2016. quest.eb.com/search/139_1917764/1/139_1917764/cite. Accessed 31 Aug 2020.
- Estrogen: Estrone human estrogen hormone molecule. Photograph. Britannica ImageQuest, Encyclopædia Britannica, 22 Oct 2018. quest.eb.com/search/132_1563744/1/132_1563744/cite. Accessed 31 Aug 2020.
- Iwona, Kuzniarska-Biernacka, et al. "Chemical Structure of Copper(II) Complexes of Salicylideneaniline Derivatives." Research Gate, Aug. 2003, www.researchgate.net/figure/Chemical-structure-of-copperII-complexes-of-salicylideneaniline-derivatives_fig1_227118036.
- Molecular Structure of Cadmium. *Look Chem*, www.lookchem.com/Cadmium-lactate/. Accessed 1 Sept. 2020.
- The Structure of Parabens and Estrogen*. Research Gate, www.researchgate.net/figure/The-structure-of-parabens-and-estrogen-17b-estradiol_fig1_255174651.
- "Relative Contributions of Different Sources to Human Cadmium Exposure." International Cadmium Association, www.cadmium.org/introduction. Accessed 2 Sept. 2020. Chart.
- Surh, Young-Joon. *Representative Chemopreventive Phytochemicals and Their Dietary Sources*. Semantic Scholar, 2003, www.ph.ucla.edu/epi/faculty/zhang/Webpages/zhang/courses/epi243_07/readings/reading%2010%20nrccchemoprevention.pdf. Accessed 1 Sept. 2020.
- Other images provided by Dr. Martin