Natural Dyes and Synthetic Dyes

For Health and For Beauty
Natural Colours around Us

- Natural colours: everywhere and everyday interactions with natural colours
- Natural colours: in plants such as vegetables and fruits
- Natural colours: in animals and people, such as skin, feathers, hair
Focus on Natural Vegetable and Fruit Colours

- Colours of fruits and vegetables are bright and attractive – attract us to eat/use more
- Biologically, why so many colours? And how do the different colours interact or affect us?
Phytochemicals

- Phytochemicals = non-nutritive plant substances that have disease-prevention properties and give each piece of produce its specific colour.
Natural Colour Wheel and Health Benefits

- Fruits/Vegetables are made up of a different combination of phytochemicals
- Each of the color group offers its specific health benefits
Blue/Purple

- Blue/black berries
- Raisins
- Egg plants
- Rich in flavonoids which is strong anti-oxidant
- Prevent DNA problems
- Prevent cancers
- Staving off memory loss
- Reduce blood pressure
- Purple = red + blue
- Red = iron
- Behave like basic dye and have strong affinity to cell DNA
Red

- Red bell peppers, red beets, and tomatoes
- Strawberries, cherries and tomatoes
- Powerful anti-oxidant
- Fight heart disease, cancer and aging
- Red dyes extracted from plants are called Carthamin, anthocyanin, and lycopene.
- Carthamin is used as medicine for circulatory, heart diseases, rheumatism and uterine stimulant.
- Carthamin is also antigenic (ie: stimulating immune response)
- Anthocyanin has anti-carcinogenic, anti-bacterial, and anti-viral properties. It also reduces blood pressure and LDL oxidation
- Lycopene is an efficient anti-oxidant and a scavenger for free radicals.
Orange and Yellow

- Carrots, yams and cantaloupe
- Rich in vitamin C and beta-carotene which body needs to produce vitamin A.
- Vit. A promotes healthy skin and eyes
- Yellow pigment comes from Lutein, which is a fat soluble carotenoid.
- Yellow dyes, used medicinally, to treat sore eyes, eczema, and digestive and intestinal problems (eg: colic)
- Lutein also has sedative property
- In the old days and even in Europe nowadays, mothers make Calendula tea for colic babies and use fabric dyed with marigold as baby wraps and blankets
- Orange=yellow+red
- It also has red pigment benefits
- Other yellow pigments of plants have shown to have UV sun protection
Green

- Broccoli, spinach, kiwi
- Colour is formed by chlorophyll
- Green = yellow + blue
- Blue is less stable than the yellow pigment, therefore, old vegetables turn yellow
- It has benefits from the yellow and blue pigments in plants
- Assists in liver detox
- Proven effective against cancers
- More intense the green colour; more content of vitamins and minerals
White

- Garlic, onions, mushrooms and bananas
- Rich in potassium, allicin, and quercetin
- Contains pigment called antoxanthin.
- Nature’s antibiotics: activate natural killer B + T cells in our body
- Reduce the risk of colon, breast and prostate cancers
- Balance hormone levels
- Also maintains healthy bones and circulation
Why does nature provide colours?

- Beauty
- Protective health benefits
- My hypothesis of nature’s language:
  - Spring=green, eat more green foods
  - Eat more green foods to aid in liver and body cleansing
  - Summer=yellow, blue, green and red
  - Thus, we need to use yellow for sun protection, and other colours to build our body when we are most active
  - Fall=oranges, red and yellow
  - We eat more foods that are rich in vit. C and E and other fat soluble nutrients that protect our skin and eyes before the winter
  - Winter=white
  - Thus, we eat more foods that are rich in nature’s antibiotics
  - Foods that activate natural immune cells (nature’s flu shots)
Synthetic Food Colour

- E numbers of food colour = FDA approved safe food colour additives
- E129 (FD&C Red 29)=ADHD in children and cancers (found in Wine Gums, Turkish Delight, Cadbury Mini Eggs)
- E122 (FD&C Red 2)=ADHD and eczema (Found in Love Hearts and Cadbury Mini Eggs)
- E133 (FD&C Blue 1)= allergic reactions and tumours
- Citrus Red #2= damage to internal organs and is applied to skin of oranges
Synthetic Food Colour

- E127 (FD&C Red 3) = causes thyroid tumor and hyperthyroidism and is permitted in Canada, but banned in US (found in glace cherries)
- E143 (FD&C Green 3) = allergic reaction, genetic mutation and cancer. (Genetic Mutation is also indicated on my dye bottle in the lab)
- E132 (FD&C Blue 2) = hyperactivity and allergic reactions in children, brain tumor in rats
- E102 (FD&C Yellow 2) or Tartrazine = Asthma, migraine, hyperactivity, and thyroid tumor and allergic reaction, especially in ASA sensitive people
Synthetic Food Colour

- The red, blue and yellow food colours are the primary colours.
- The primary synthetic colours may be combined to produce other colours (secondary colours).
- Synthetic food dyes are generally safer than fabric dyes. Food dyes are not wash fast when used on fabrics.
Why use synthetic colours in food?

- Attractive
- Cover for flaws in food
- To give false nutritional and health impressions in consumers
Are colours really “INERT” or “NON-REACTIVE”?

- Applying this questions to both natural and synthetic dyes
- My experience with natural dyes and synthetic dyes in the histology lab and in textile
- Dyes bind, chemically, to proteins in wool, silk fibers and cells
- Dyes also bind to other types of fibers and other components of cells and tissue.
- Different dyes have different affinity to various types of cells.
Histology Processes

- A neglected tumour in the breast (autopsy case)
- Complete mastectomy

- Specimens can be removed from live or dead patients

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Histology Process

- The breast specimen is processed to remove water and fat and fixed.
- The specimen is embedded in wax to allow sectioning of tissue at 4um thick and mounted on a glass slide.
- The section on the slide is stained with Hematoxylin and Eosin Stain.
Histology Section of Specimen

- Hematoxylin is a natural dye from the Logwood tree
- It stains the nuclei (DNA) of tumour and normal cells
- Eosin is a synthetic dye
- It stains the connective tissues and rest of cells
Diagnosis from Stained Slides

- Pathologists look at the appearance of the nuclei (DNA) of cells and the architecture and arrangement of cells in the specimen to determine the status of specimen.
- Normal vs Cancerous vs Infection
- Extend of tumor infiltration into normal tissue
- Prognosis
Natural dyes and Synthetic dyes in Pathology

- Most dyes used in pathology are synthetic dyes that are manufactured in the 1800’s in the textile industry.
- These synthetic textile dyes have various affinity to different cells in our body.
- Unfortunately, dyes are dumped in the drain for maintaining diagnostic quality.
- Most of dyes are very beautiful but carcinogenic (i.e., cancer causing).
- Most of the dyes are still used in the textile industry.
Can Natural Dyes be used in Histology?

- Countries like India, Turkey, Africa have tested and used natural dyes in pathology
- Eg: pomegranate, black berries, saffron
- Result: not as intense as synthetic dyes, but they work
- I have tried pomegranate to stain connective tissues and blackberries to stain cell nuclei. They work quite well, but not as intense in colour as synthetic dyes.
What does this all mean?

- Cells in our bodies have affinity to natural and synthetic dyes
- Some dyes are attracted to the DNA and some are attracted to other parts of cells and organs
- Our bodies have mordants and chemicals, in small quantities, to assist the attachments of dyes to cells (ie: iron, zinc, acid, and alcohols)
What does this all mean?

- Synthetic and natural dyes are used in textile industries.
- Dyes attach to protein and cellulose fibers.
- Labs have protective wears and MSDS information of synthetic dyes.
- Textile dyers should have the same protective knowledge and precautions as lab workers.
- Natural and synthetic dyes are NOT inert.
Sources of Natural Dyes

- Plants
- Bugs
- Algae
- Clays (ocres)
- Mud
Synthetic Dyes vs Natural Dyes

- Balance the advantages and disadvantages of natural and synthetic dyes
- Use with cautions
- Increase use of natural dyes can increase use of lands for growing plants for food and textile
In Conclusion

- Colour is communication between us and nature
- Learn the language of nature and live with nature!