Antioxidants in Alaska Wild Berries

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Phytochemicals

- Non-nutritive plant chemicals that have protective or disease preventive properties

Antioxidants

Anti-bacterial phytochemicals

Phyto-estrogens

Antioxidants

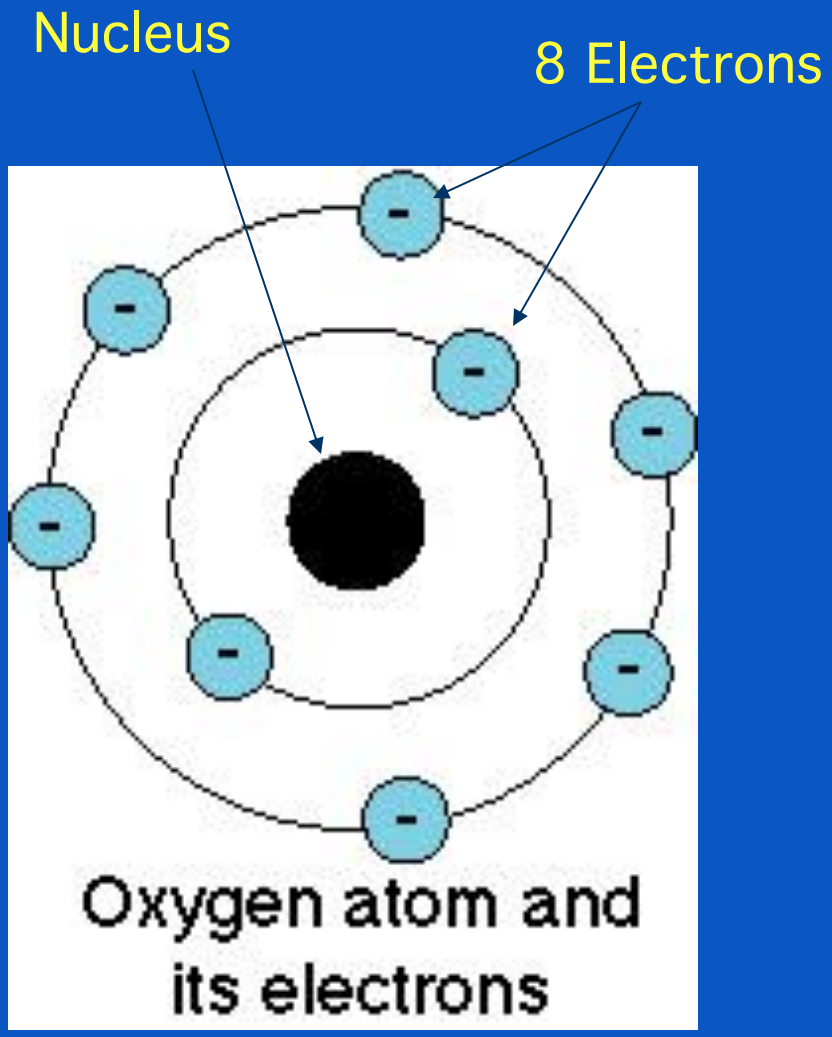
Phytochemicals that react with oxygen- containing free radicals

Free radicals- Unstable, highly reactive atoms looking for stability (electrons)

Atoms

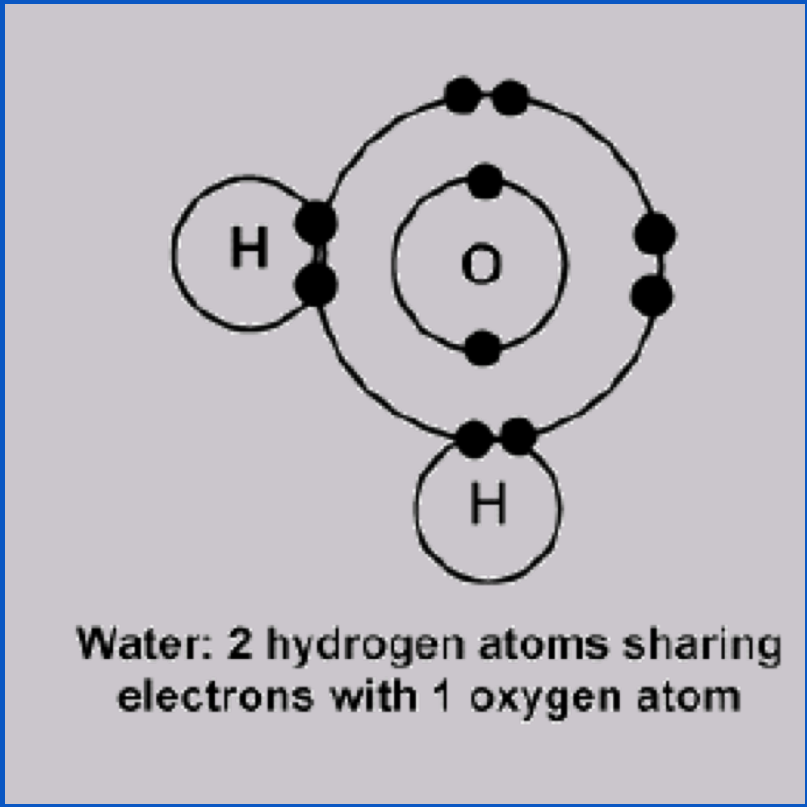
- Nucleus = protons, neutrons

- Shells- orbits of electrons
  - Shell 1 = 2 electrons
  - Shell 2 = 8 electrons



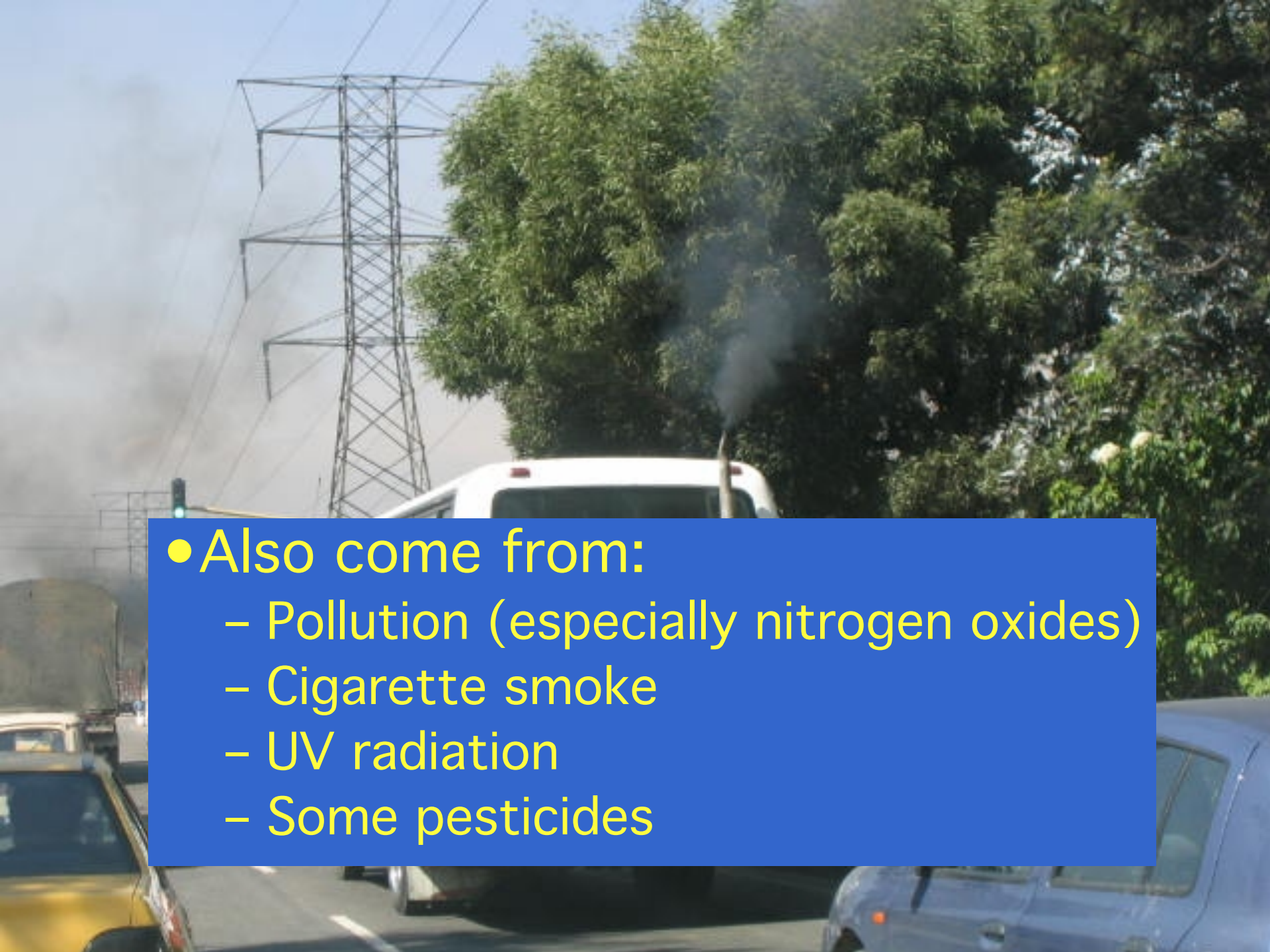
How to get a full outer shell

- Steal electrons
- Give up electrons
- Share electrons in a molecule



Free radicals: biochemical terrorists?

- Normal part of plant and animal cells:
  - Photosynthesis
  - Metabolism
  - Formation of complex molecules
  - energy (electron) transport
- Enzyme controlled



- Also come from:
  - Pollution (especially nitrogen oxides)
  - Cigarette smoke
  - UV radiation
  - Some pesticides

Problems with free radicals

- When in excess, body's own chemicals are not enough

  - React with and injure:
    - Proteins — cell walls
    - Fats — membranes
    - DNA — chromosomes

Free radical damage may be involved in:

- Aging
- Rheumatoid arthritis
- Alzheimer's
- High blood pressure
- Schizophrenia
- Parkinson's Disease
- Atherosclerosis
- Memory loss
- Mouth, esophageal cancer
- Emphysema

Antioxidants “neutralize” excess free radicals

- Which antioxidants are beneficial to humans?
- How much?
- How much is too much?

Antioxidants

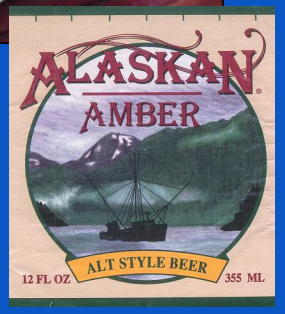
- More than 5000 phytochemicals with antioxidant activity

Vitamin C

- Christine Heller- CES
- Lydia Fohn-Hansen -CES
- Horace Drury- Arctic Aeromedical Laboratory

Phenolic compounds

- Products of plant metabolism
- Plant pigments
- Defense against insects, diseases
- Cellular waste products



Quercetin

- > 60% of antioxidants in blueberry and lingonberry

- Anti- inflammatory
  anti-histamine
  protect “good cholesterol”
  benefits in lung and prostate cancer

Anthocyanins

- > 300 kinds of pigments mostly in flowers, fruit

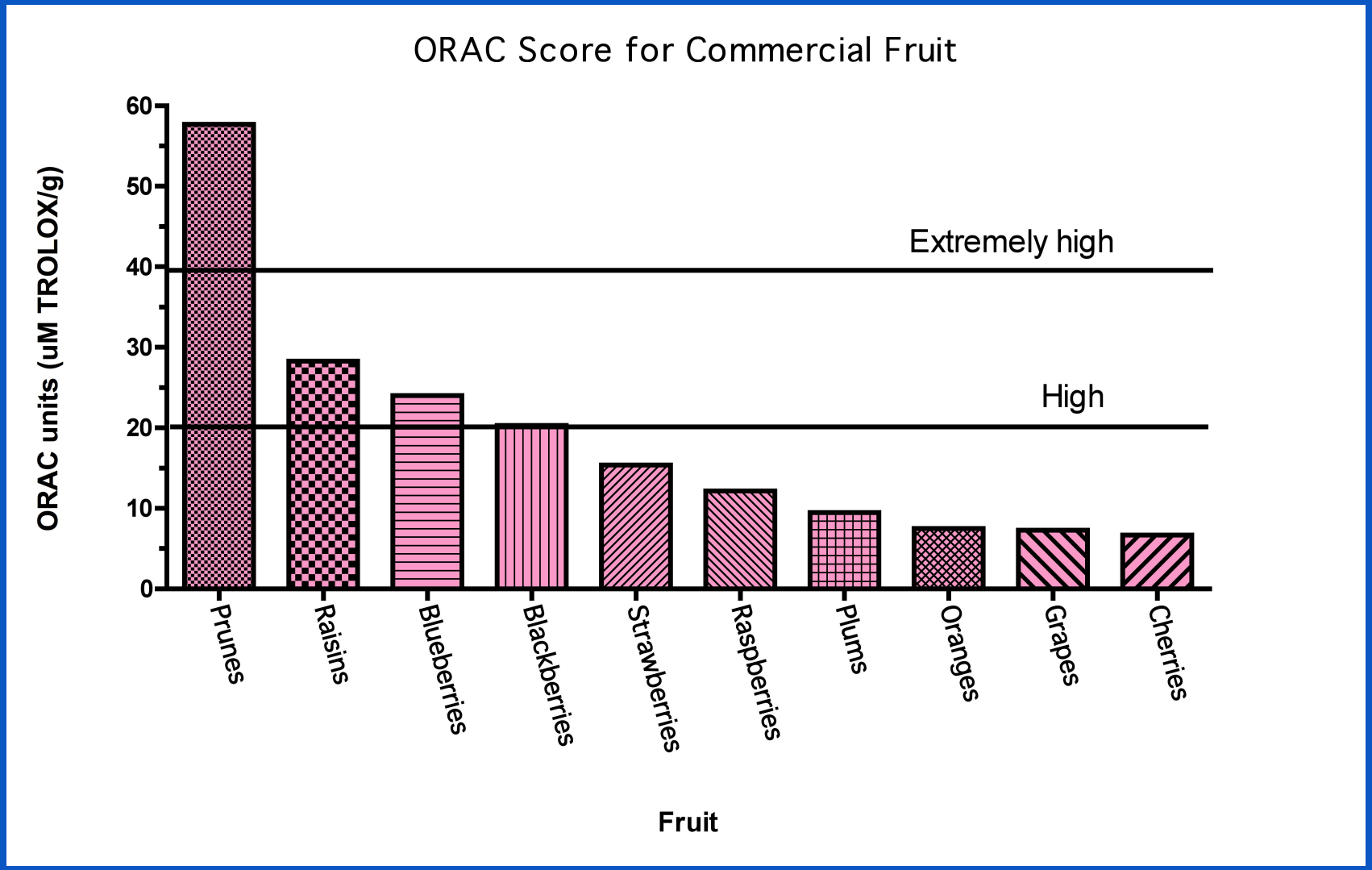
- Red, purple, blue

- Boost insulin production
- Anti inflammatory
- Anti- leukemia
- Anti-bacterial

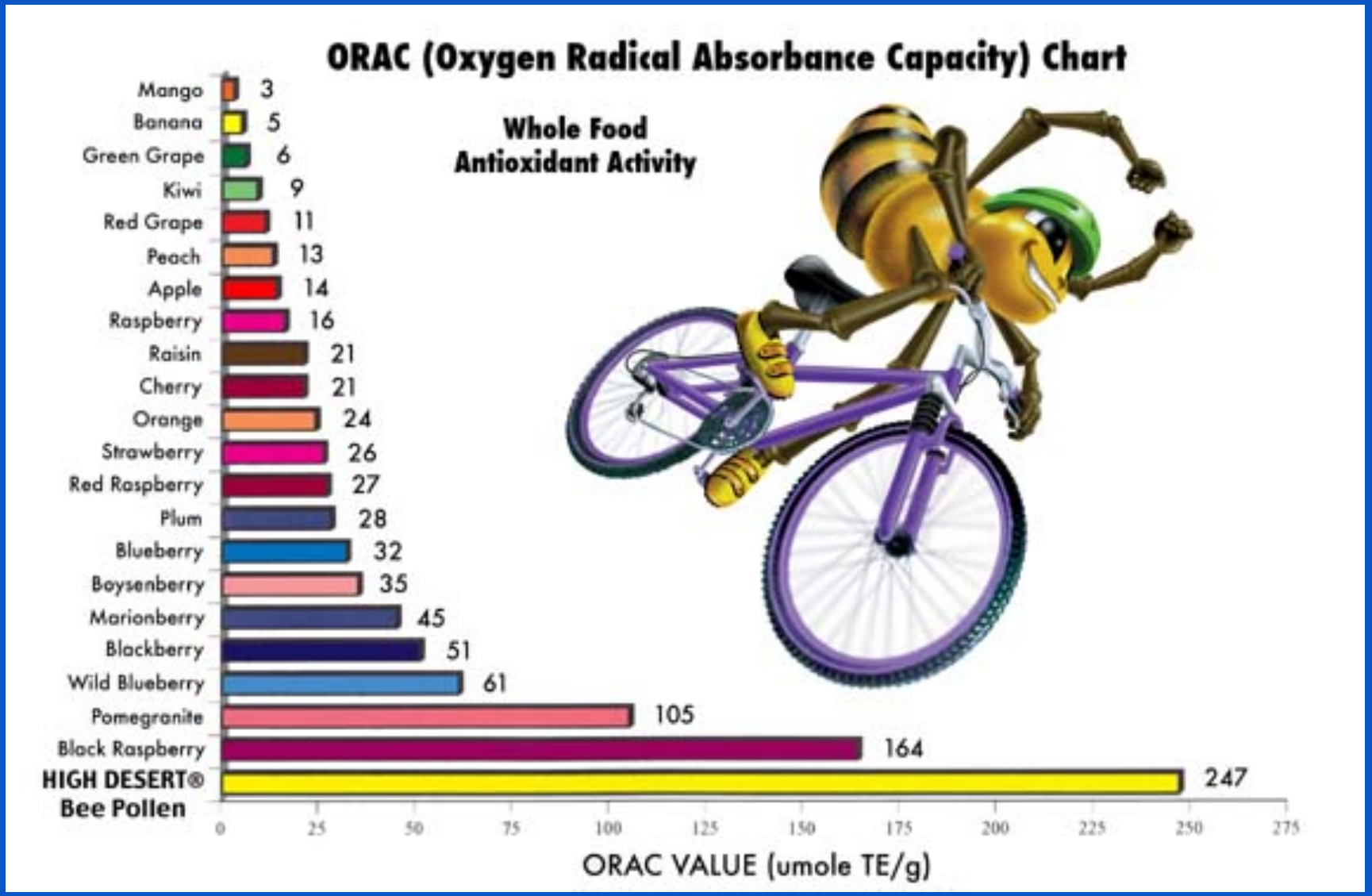
ORAC

Oxygen radical absorbance capacity

Antioxidant capacity compared to Vitamin E



R. Prior, USDA 1998



www.ccpollen.com

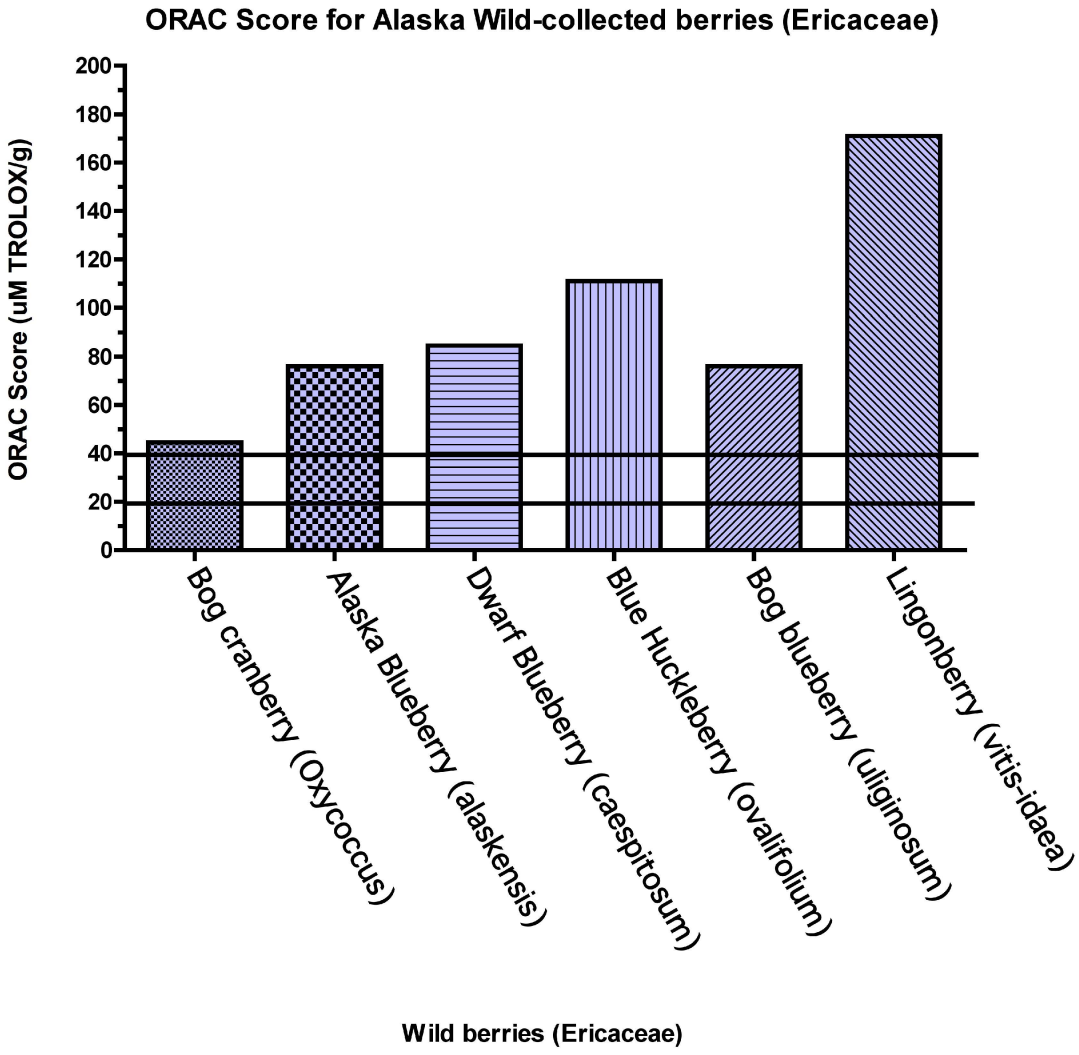
Experiment 1

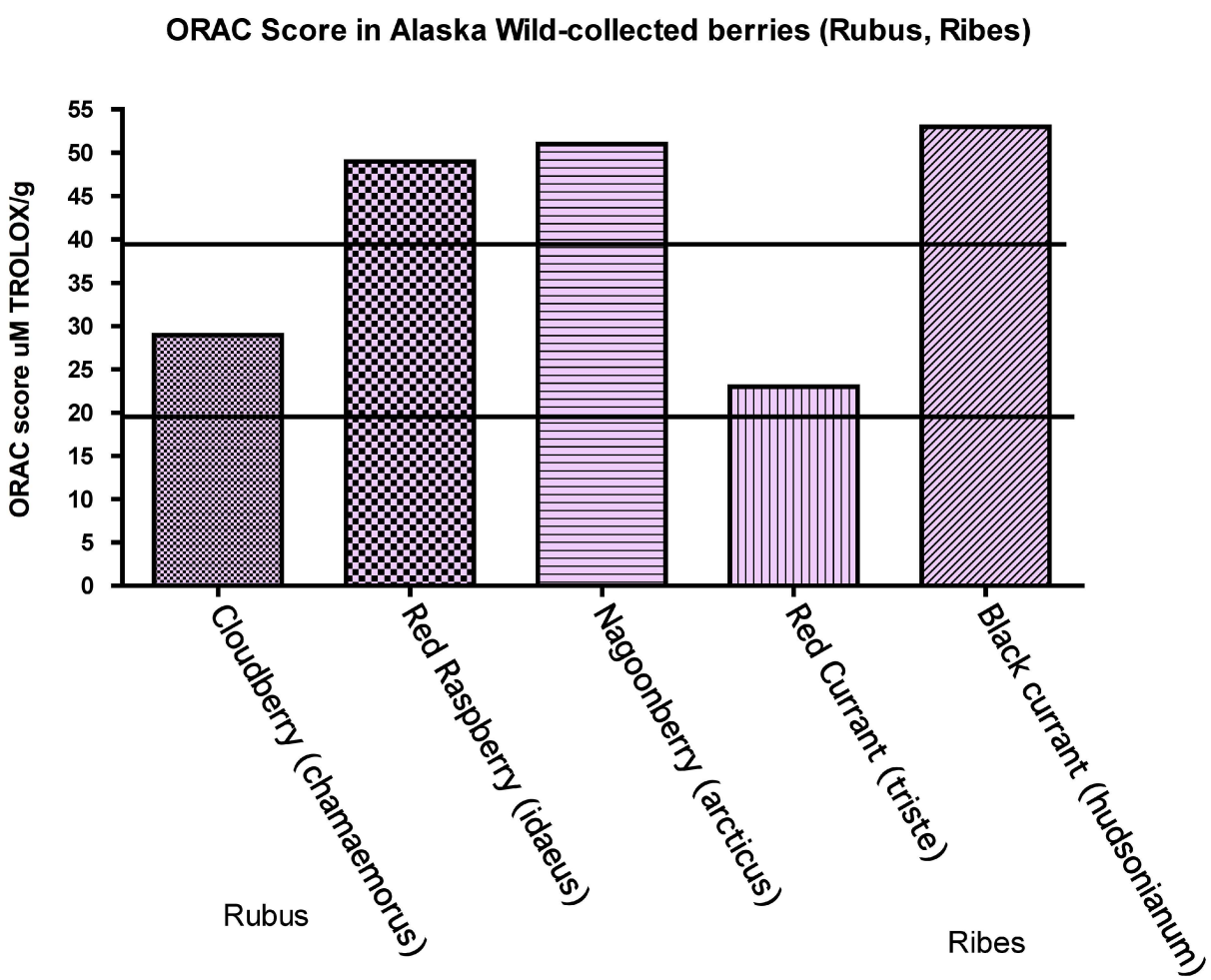
- Identify antioxidant levels in Alaska wild berries

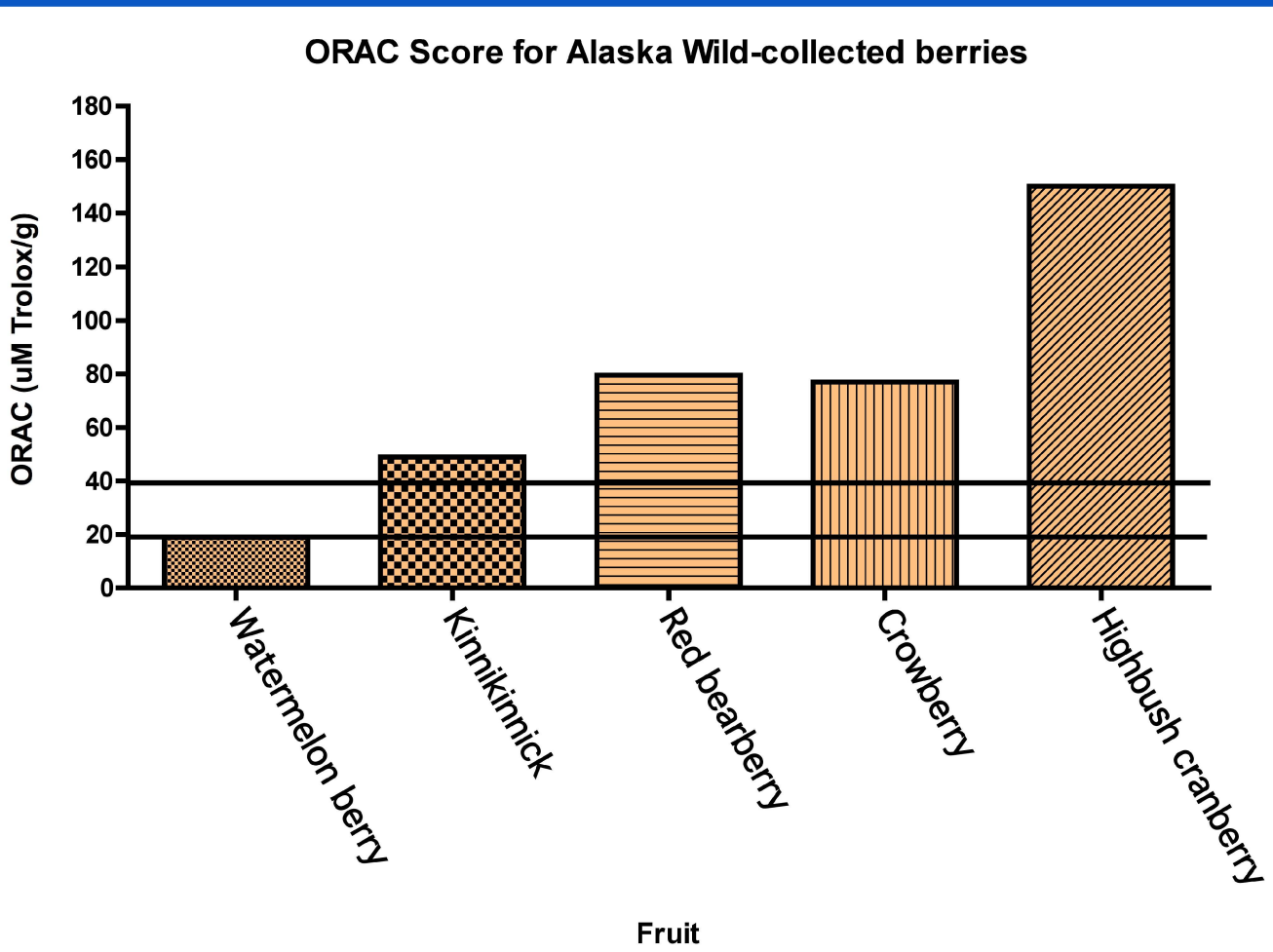
  -Harvested wild berries

  -Frozen berries shipped to Brunswick, MA

  -Analyzed for ORAC


ORAC Score for Alaska Wild-collected berries (Ericaceae)
ORAC Score (uM TROLOX/g)
200
180
160
140
120
100
80
60
40
20
0
Bog cranberry (Oxycoccus)
Alaska Blueberry (alaskensis)
Dwarf Blueberry (caespitosum)
Blue Huckleberry (ovalifolium)
Bog blueberry (uliginosum)
Lingonberry (vitis-idaea)
Wild berries (Ericaceae)


ORAC Score in Alaska Wild-collected berries (Rubus, Ribes)
ORAC score uM TROLOX/g
55
50
45
40
35
30
25
20
15
10
5
0
Cloudberry (chamaemorus)
Red Raspberry (idaeus)
Nagoonberry (arcticus)
Red Currant (triste)
Black currant (hudsonianum)
Rubus
Ribes


ORAC Score for Alaska Wild-collected berries
ORAC (uM Trolox/g)
180
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80
60
40
20
0
Watermelon berry
Kinnikinnick
Red bearberry
Crowberry
Highbush cranberry
Fruit

Conclusions Experiment 1

- All frozen wild berries are excellent sources of antioxidants
- Lingonberry > highbush cranberry > All kinds of Alaska blueberries/huckleberries
- Latitude? Temperature? Species? Light?

Experiment 2

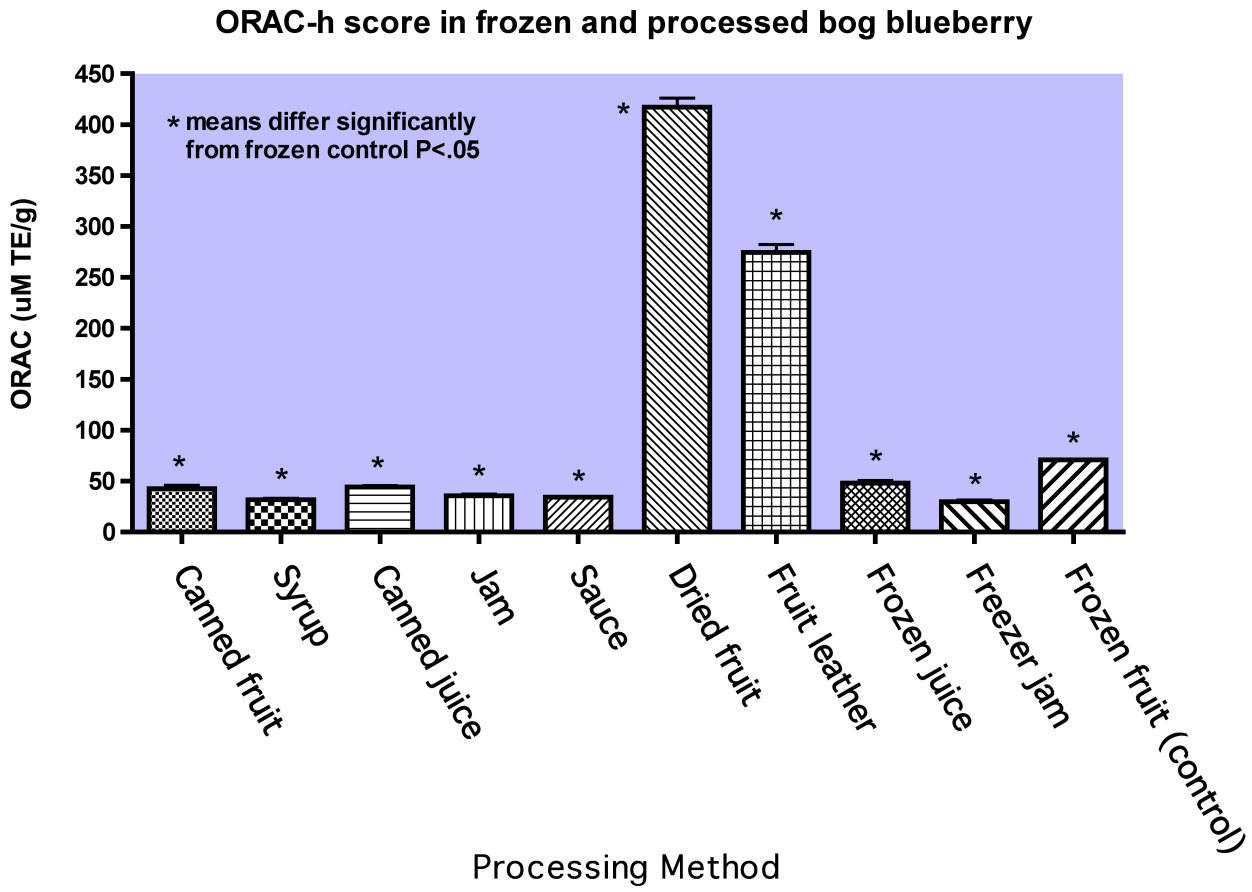
- What happens when you process berries into jams, jellies, etc?
- Does heat destroy antioxidants?
- Does processing change antioxidant levels?

Methods

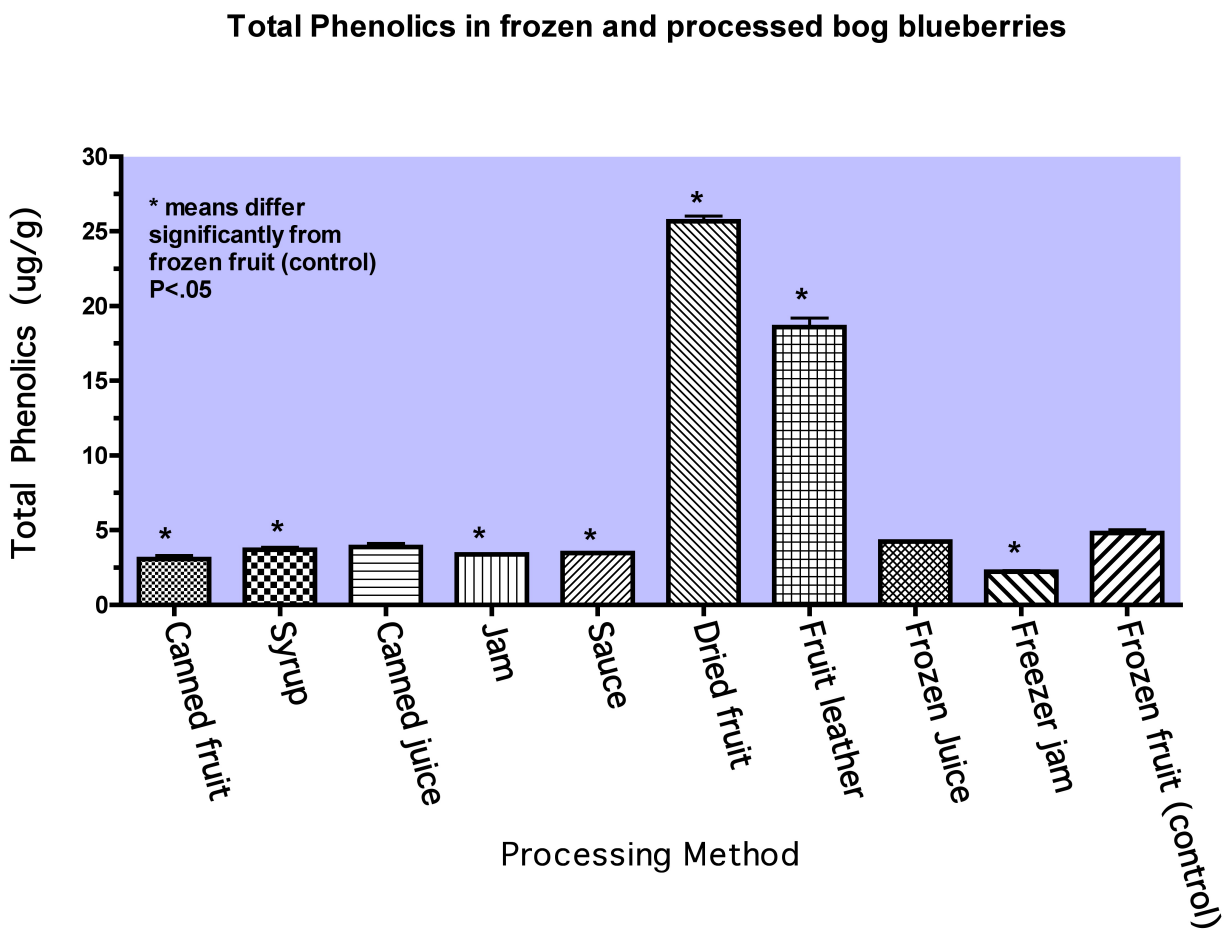
- Lingonberries and bog blueberries
- Purchased berries at the farmer's market, wild harvested
- Mixed all sources together and froze the berries

Methods

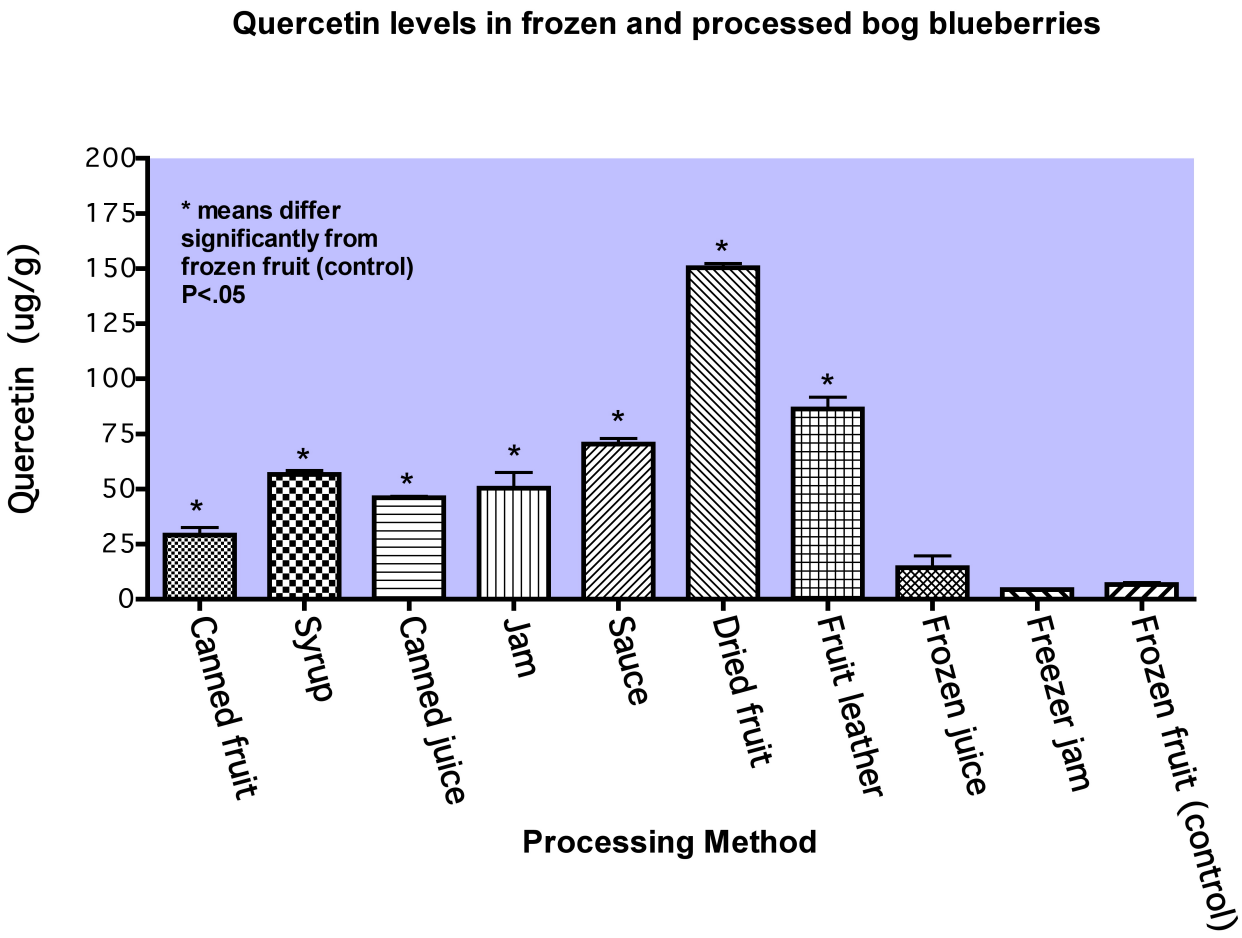
- Home Economics Team- Cooperative Extension Service
  - Jams
  - Freezer jam
  - Sauce
  - Leather
  - Canned fruit
  - Frozen berries (control)
  - Syrup
  - Jelly
  - Juice
  - Dried



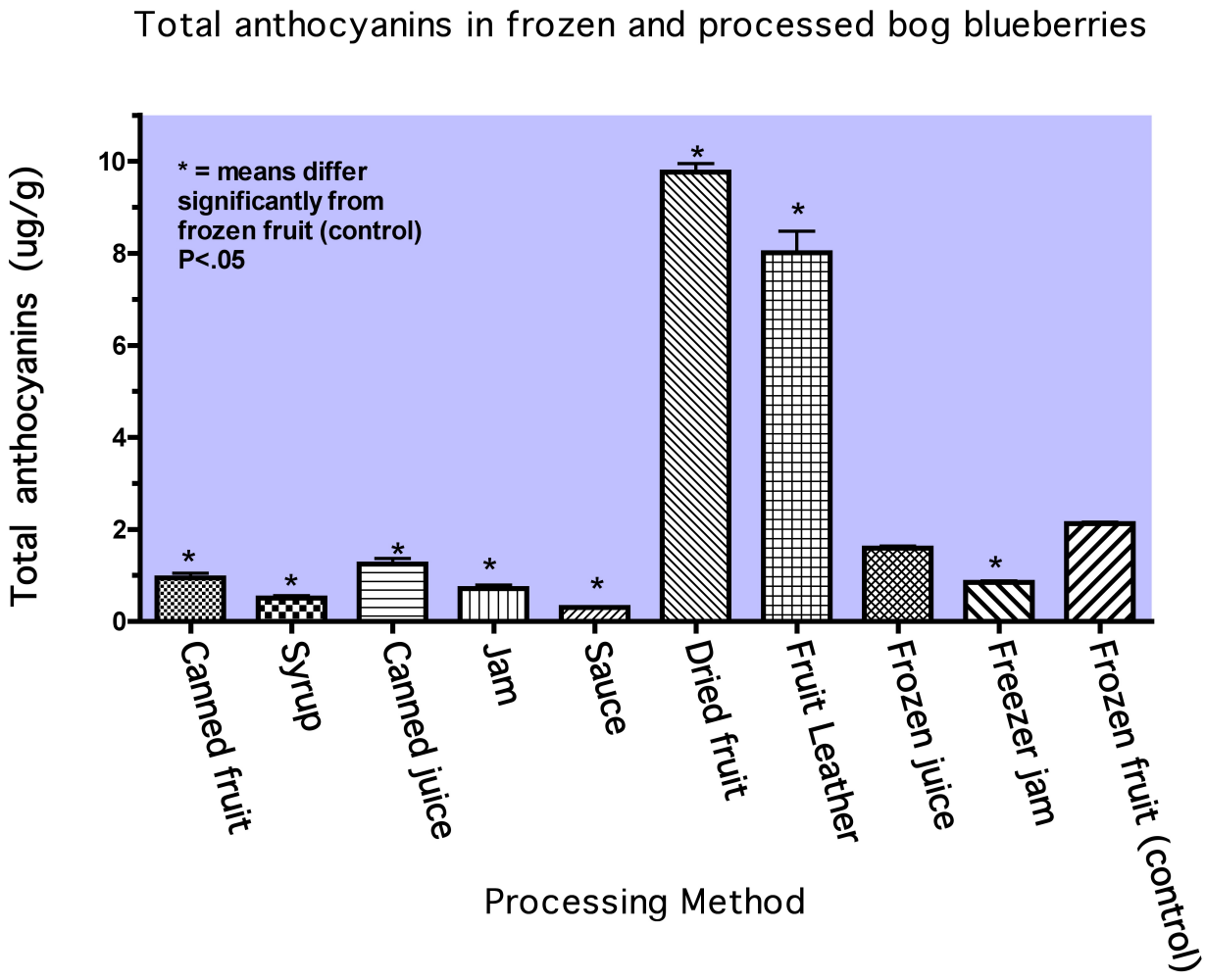
Bog blueberries- ORAC



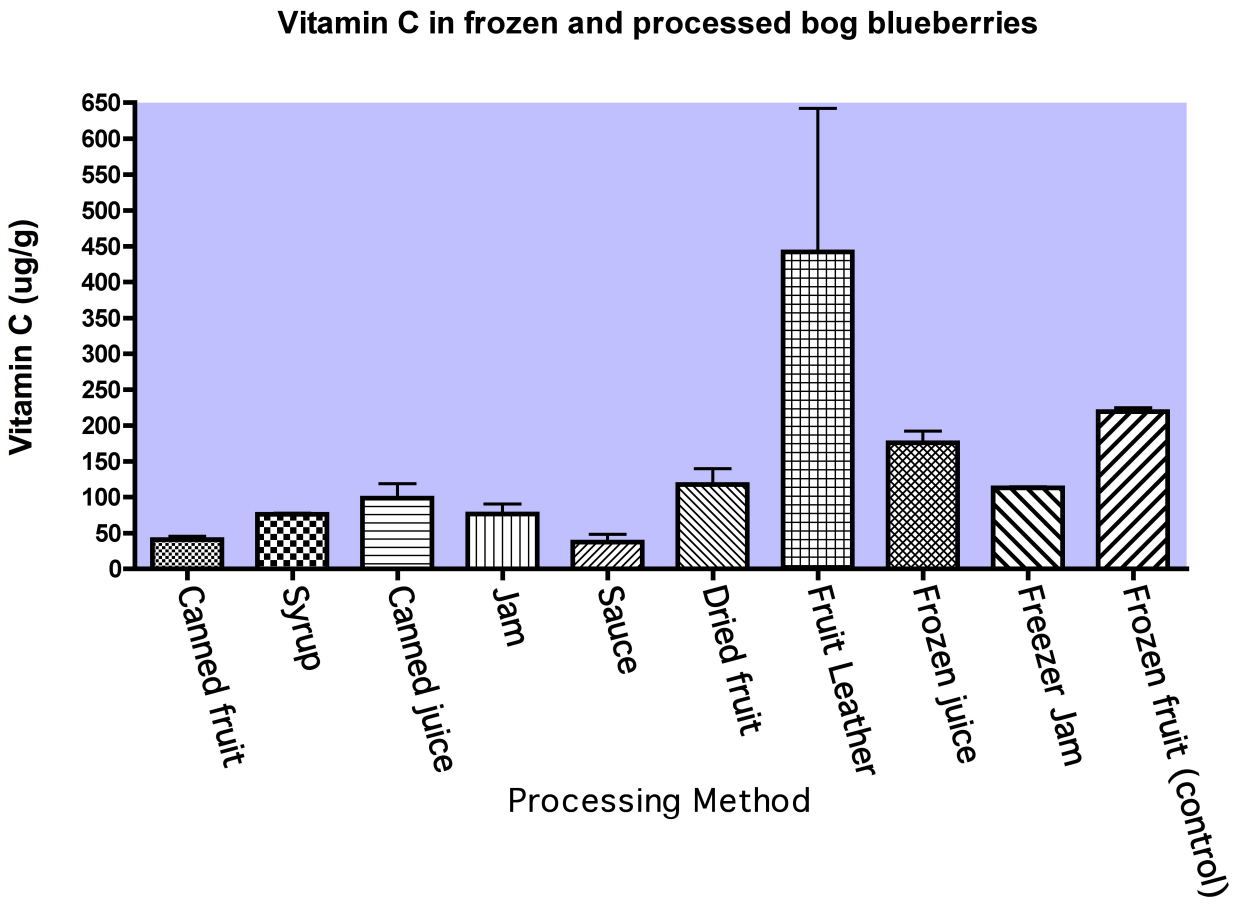
Bog blueberries- Total Phenolics



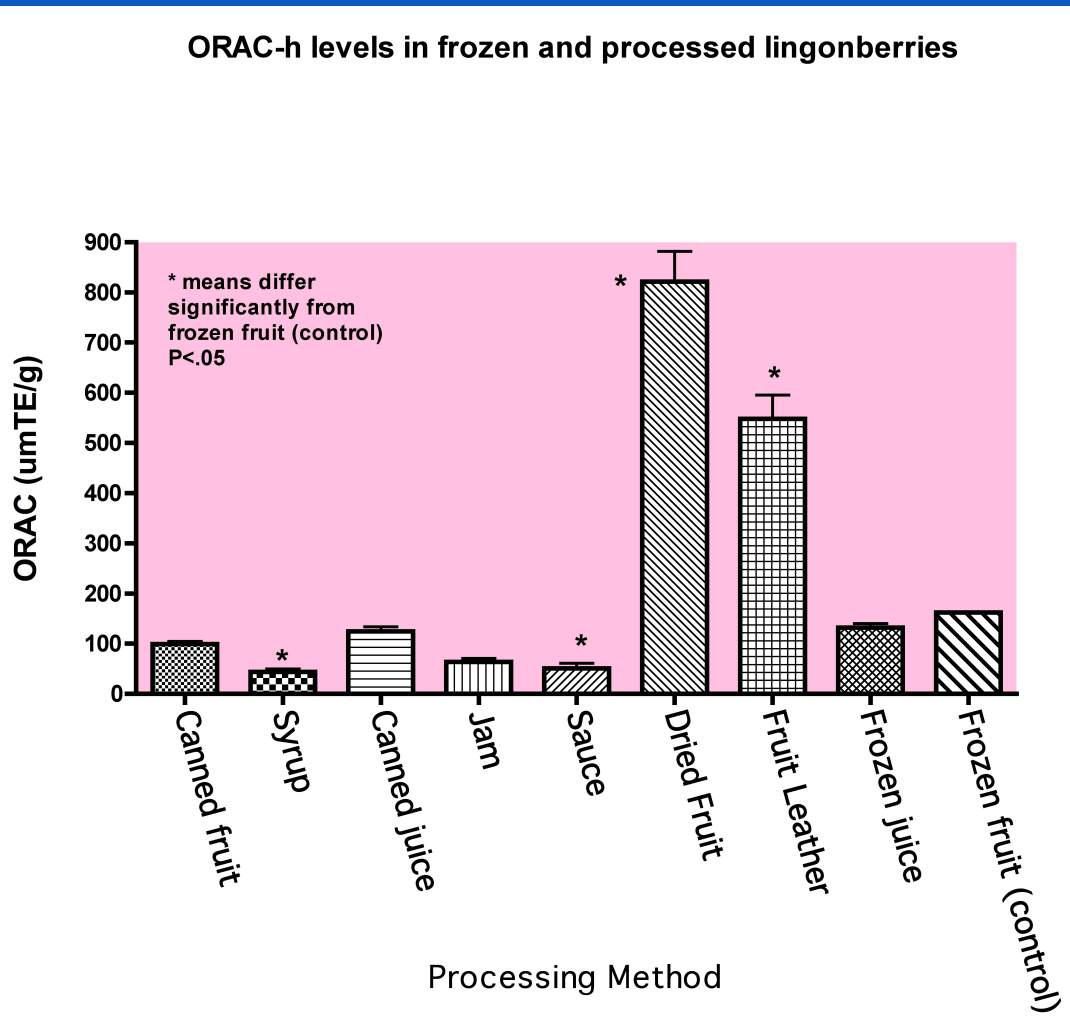
Bog blueberries- Quercetin



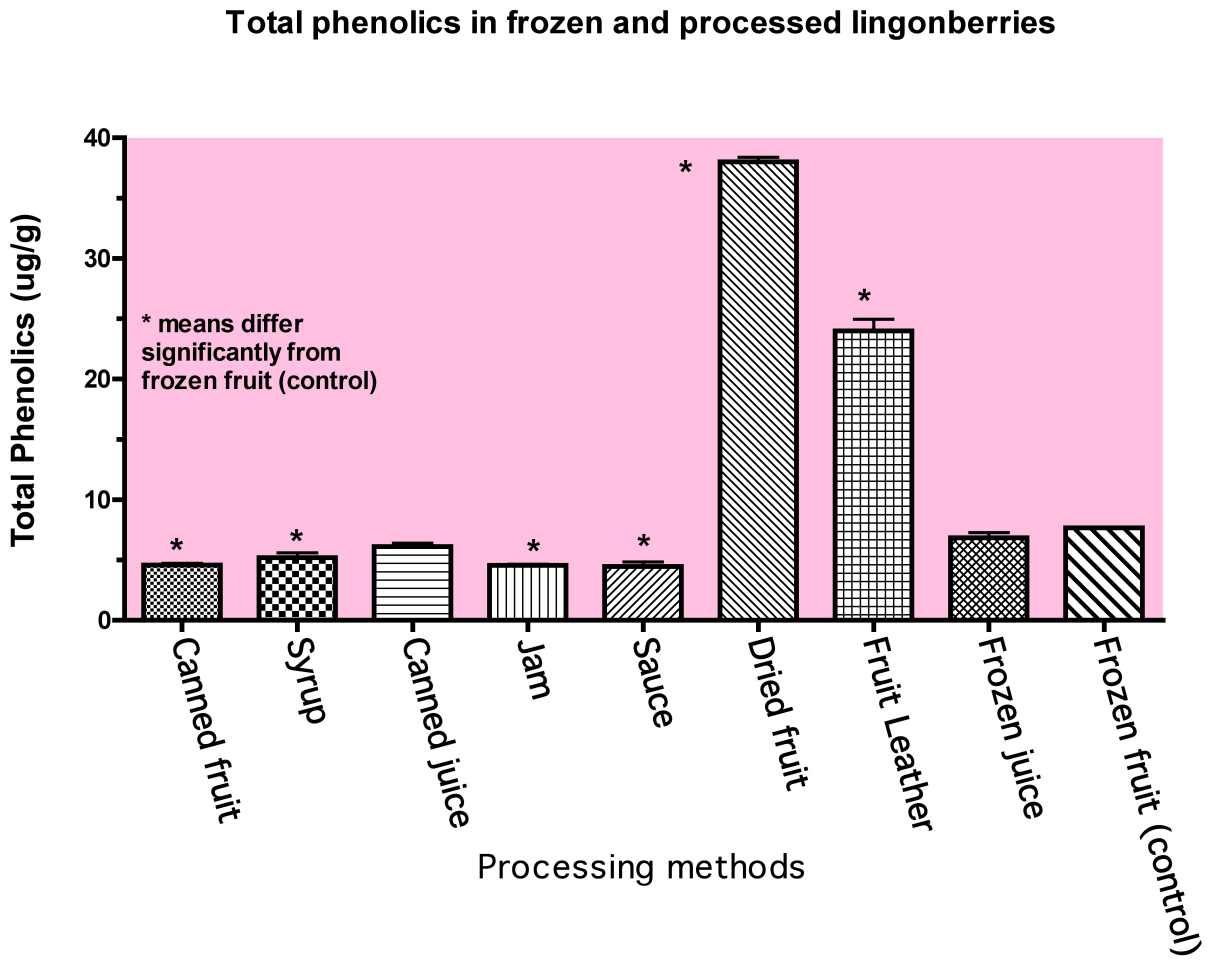
Bog blueberries- Total anthocyanins



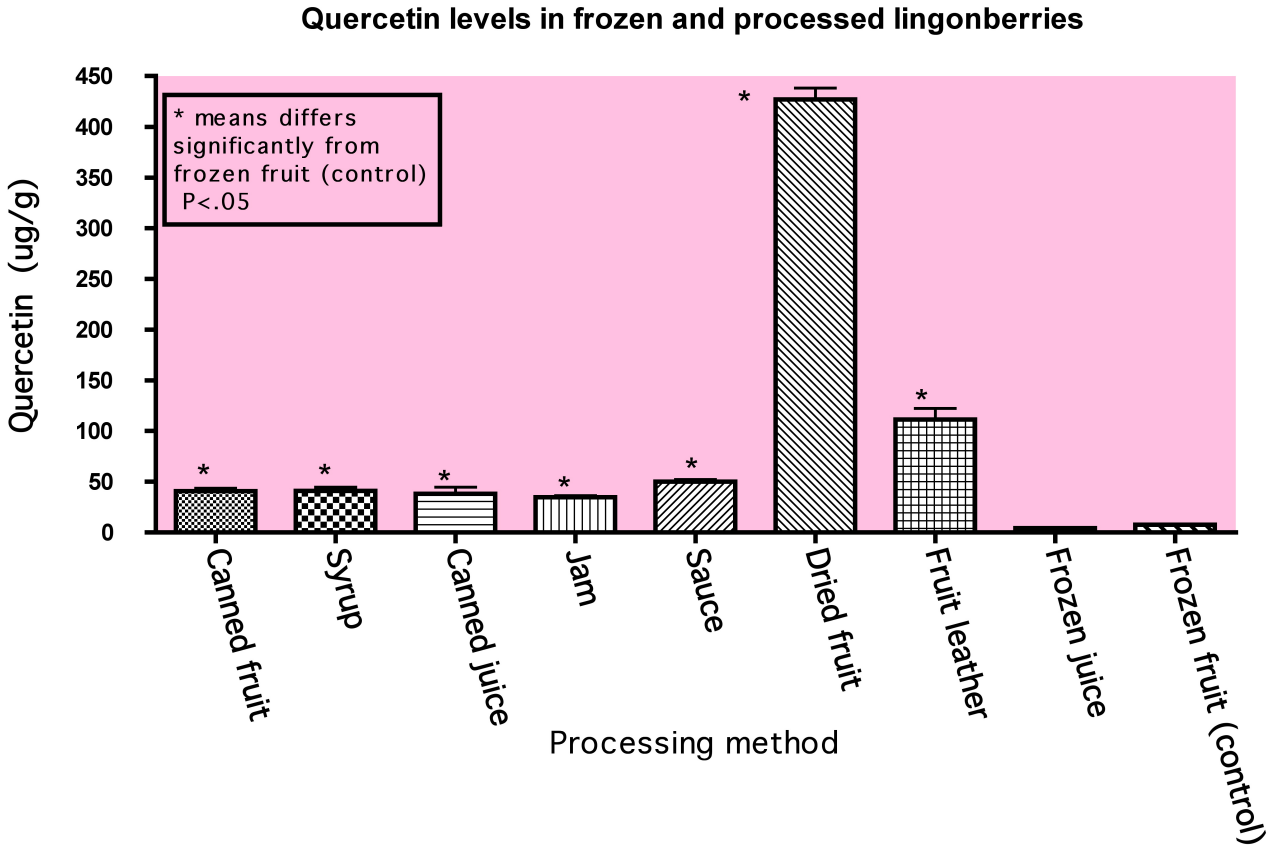
Bog blueberries- Vitamin C



Lingonberries- ORAC



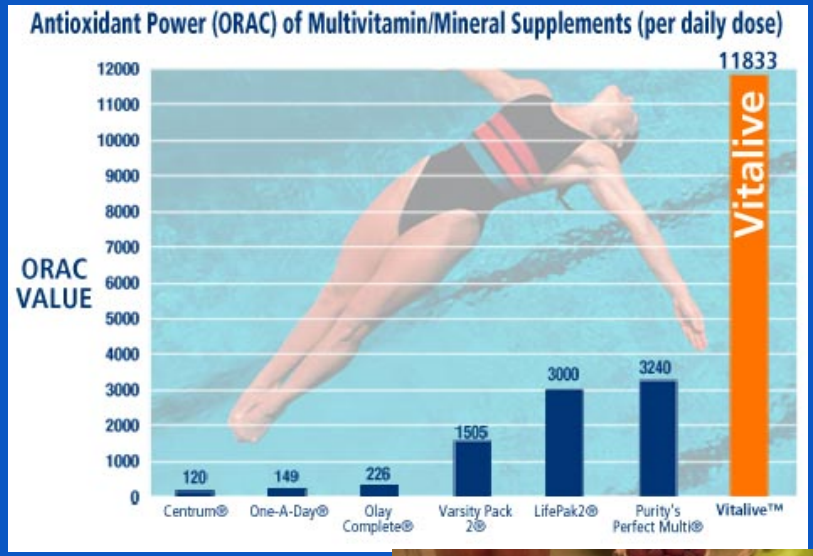
Lingonberries- Total phenolics



Lingonberries- Total quercetin

How many ORAC units do we need?

- USDA estimate - 3000 units per day
- Average adult American
  - 1200 - 1700 ORAC units per day
  - 5 average servings fruits and vegetables

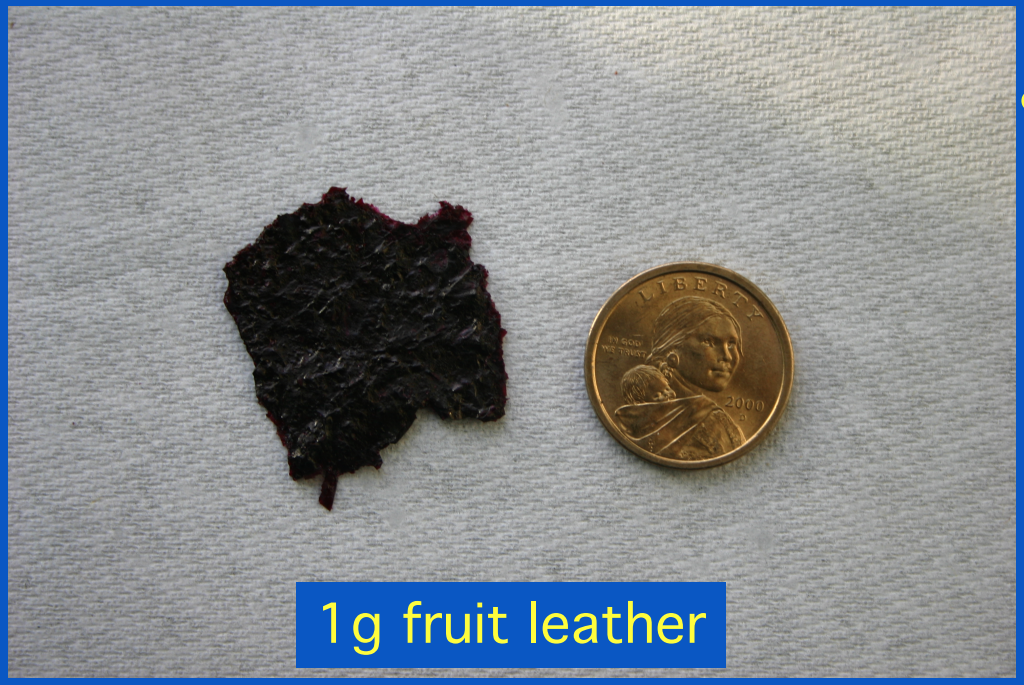


How to get more antioxidants?

- Lingonberries:
  - 1g = 3 fruit, 160 ORAC
  - 3000 ORAC = 57 fruit
- Bog blueberries
  - 1g = 50 ORAC
  - 180 fruit

Fruit Leather

- Lingonberry
  - 548 ORAC / g
  - 3000 ORAC = five pieces
- Bog blueberry
  - 275 ORAC / g
  - 3000 ORAC = 11 pieces



1g fruit leather

Our advice to you:

Go berry picking!

Follow that sage advice – eat more fruits!

Make fruit leather!