



USDA-ARS Grape & Wine Workshop

David Klurfeld

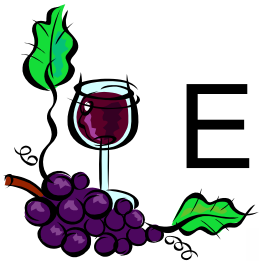
National Program Leader, Human Nutrition
Beltsville, MD





Health and Nutrition

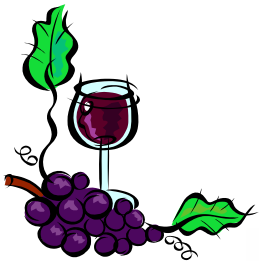
- Components of grapes/wine that can enhance human health and provide for the nutritional needs of the American public
 - Compounds may need to be delivered as a package to derive maximal benefit
- Health and nutrition concerns will be strong drivers for the market of both traditional and innovative products



Established Health Attributes

- Antioxidants
- Antioxidants
- Antioxidants

- Red wine – heart disease
 - Still controversial – AHA says no specific link
- Grape/wine reduction of blood clotting
 - Ethanol has similar effect



Grapes & Health in ARS

- Analysis of grapes – 3 locations
- Metabolism of grape constituents
- Animal models for human diseases
 - Aging
 - Cholesterol-lowering
 - Prevention of diabetes, cancer, Alzheimer's disease, Parkinson's disease
- Vision study in humans





Antioxidants in Muscadines

- Selection of muscadine germplasm with increased phenolics/anthocyanins
- NP306 – Quality & Utilization of Agricultural Products
- Penny Perkins-Veazie, South Central Agricultural Research Lab, Lane OK
 - Grape breeders in Davis, CA and Poplarville, MS
- 16 varieties tested, grown in 2 locations; found 2 with unusually high total phenolics

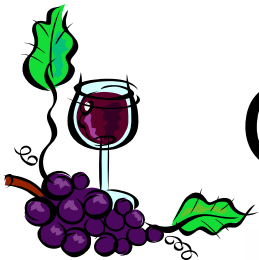




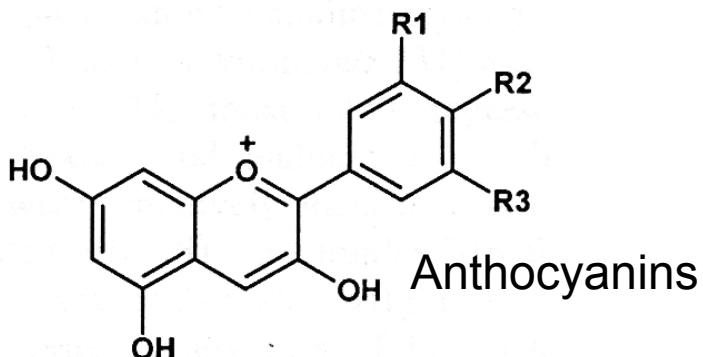
Antioxidants in Fruits

- Health consequences of phytochemical intake
- NP107 – Human Nutrition
- Ron Prior – Arkansas Children’s Nutrition Center
 - Another chemist at ACNC
 - Adapted ORAC assay for routine use
 - Special nutrient database -- proanthocyanins

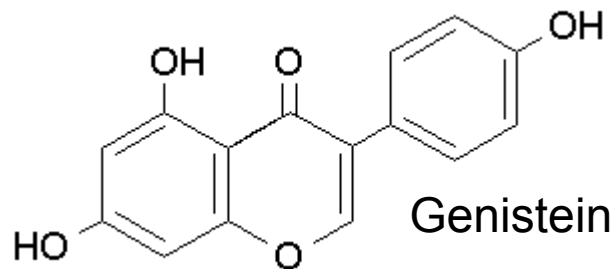




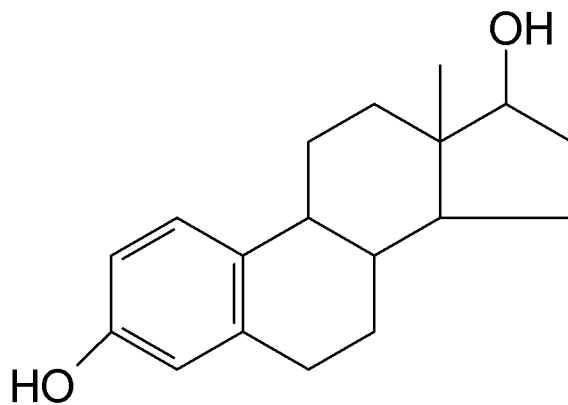
Organic Chemistry Lesson



4 biological mechanisms
to inhibit cancer, heart disease



>10 biological
mechanisms to inhibit
cancer, heart disease,
osteoporosis

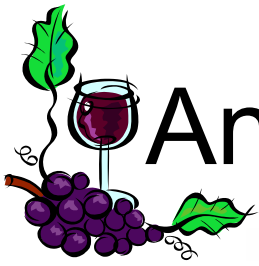


Estradiol



Antioxidants in Fruits

- 25 fruits screened for anthocyanin content
 - 14 contained compounds
 - Range was 2 in peaches to 31 in Concord grapes
 - 4 more than in blueberries
 - 11 in red grapes
 - 13 in cranberries
 - 7 in strawberries
 - Many anthocyanins identified for the first time



Antioxidant Method Development

- NP107– Human Nutrition
- Food Composition Lab – Beltsville, MD
- Dave Luthrie and Jim Harnly
- Improving methods for extraction and measurement of phenolics, including polymeric tannins
 - Have method to measure 13 at once



Food Composition Lab

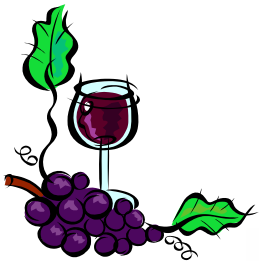
- Flavonoid database
 - Released 2003
 - Determined 27 flavonoids (19 published)
 - Grapes – black, red, white
 - Grape juice
 - Raisins
 - Wine – red, white
 - Industry support of analysis for chocolate, blueberries, plums, tea
 - www.nal.usda.gov/fnic/foodcomp





Metabolism of Grape Compounds

- NP107 – Human Nutrition
- Michael Grusak, Children's Nutrition Research Center, Houston
 - Two other ARS scientists
- Growth chambers to label suspension cultures of grape and berry cells with radioactive carbon
- Feed to animals for tissue distribution studies



Benefits of Pterostilbenes

- NP302 – Plant Biol & Molec Processes
- Agnes Rimando, Natural Products Utilization Research Unit, University, MS
 - Chemist from WRRC, Albany, CA & others
- Pterostilbene is a much more active analog of resveratrol
 - Lowers LDL cholesterol by 29% in hamsters
 - Induces PPAR- α 8-14-fold



Cancer Prevention

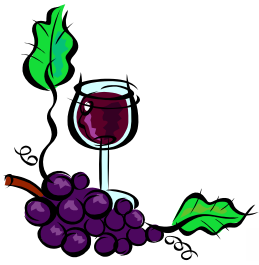
- Collaboration with Univ. of Illinois
- Fed 3 levels of Concord grape juice to rats
 - Juice/Water – 1:3, 1:2, 2:1
- Reduction in breast cancers in rats
- Freeze-dried grape color extract reduced growth of cancer cells in culture



Diabetes Prevention

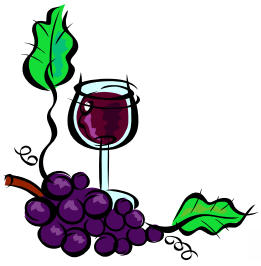
- NP107 – Human Nutrition
- Susan Zunino and Charles Stephensen, WHNRC, Davis, CA
- Feeding NOD mice 1% grape powder
 - At 28 weeks, 71% of controls have diabetes
 - 33% of grape-fed mice have diabetes
- Plan to increase grape powder, study individual antioxidants, identify specific grape varieties





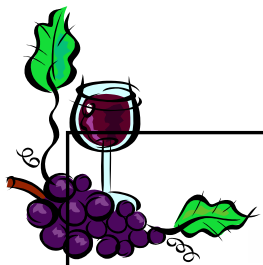
Neurological Functions

- NP107 – Human Nutrition
- James Joseph, HNRCA, Boston, MA
 - Research increased demand for blueberries
 - Doing similar studies with grape juice
- Grape juice/extract studies
 - Functional improvements in memory & behavior during aging
 - Muscarinic (acetylcholine) receptor sensitivity increases – relevant to AD and PD

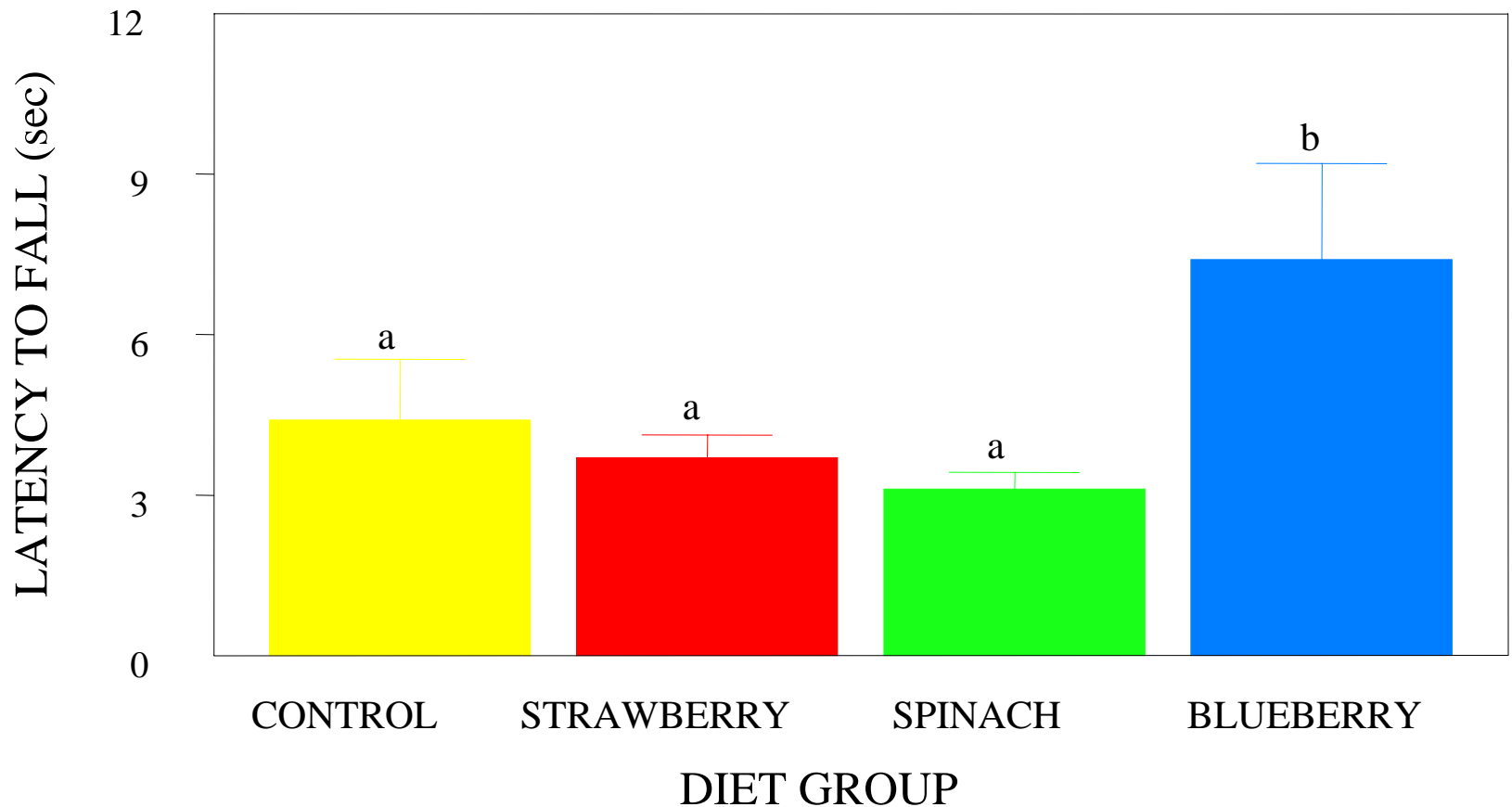


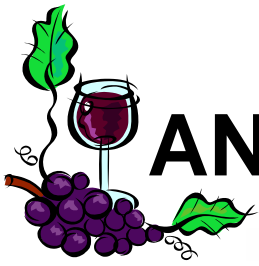
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Industry Workshop





ROTAROD TEST REVERSAL AGE DIET STUDY





BENEFICIAL EFFECTS OF HIGH ANTIOXIDANT FRUITS ON BRAIN AGING

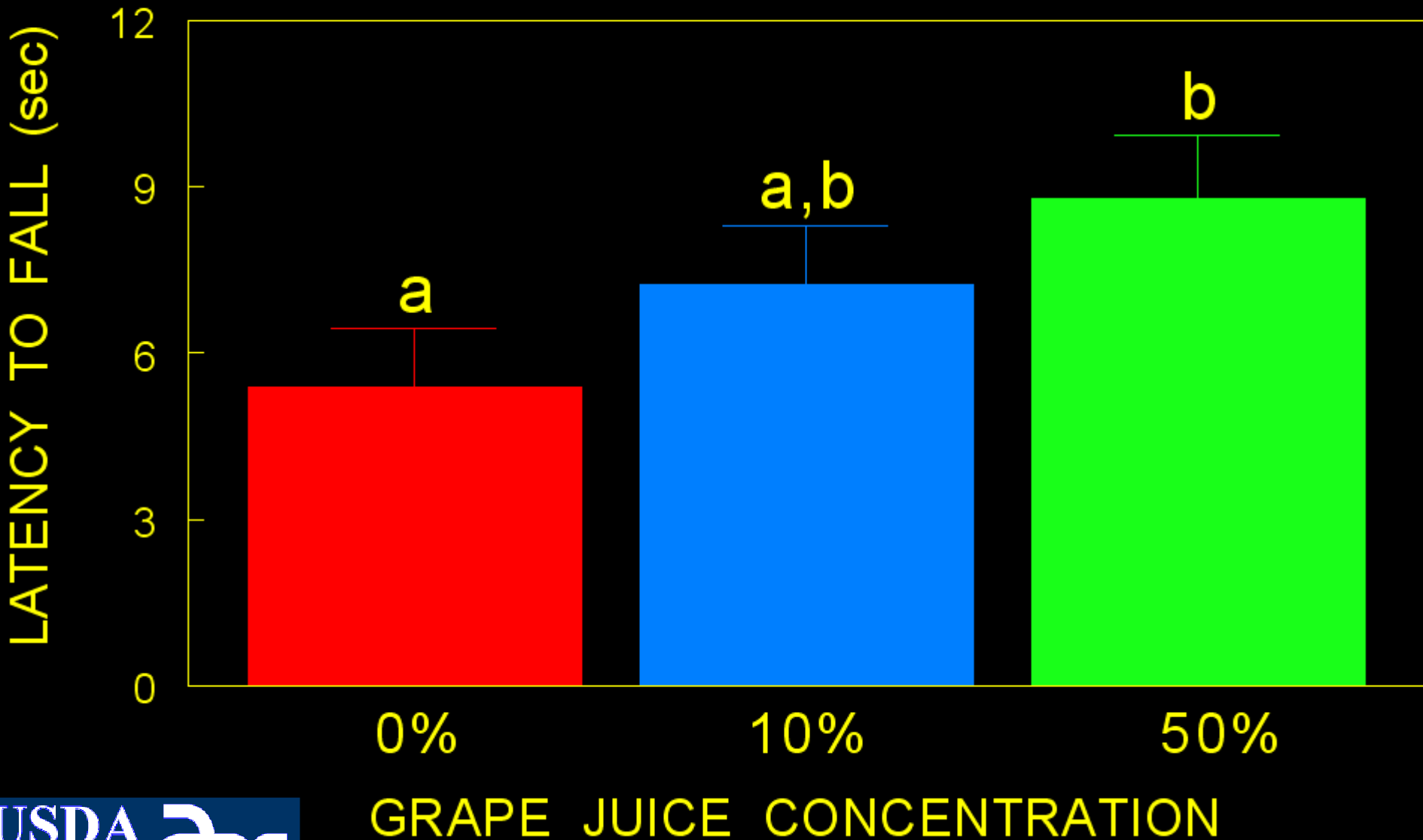
Senescent rats drank Concord Grape Juice for two months:

- Improved coordination, strength and memory
- Improved dopamine release from brain tissue

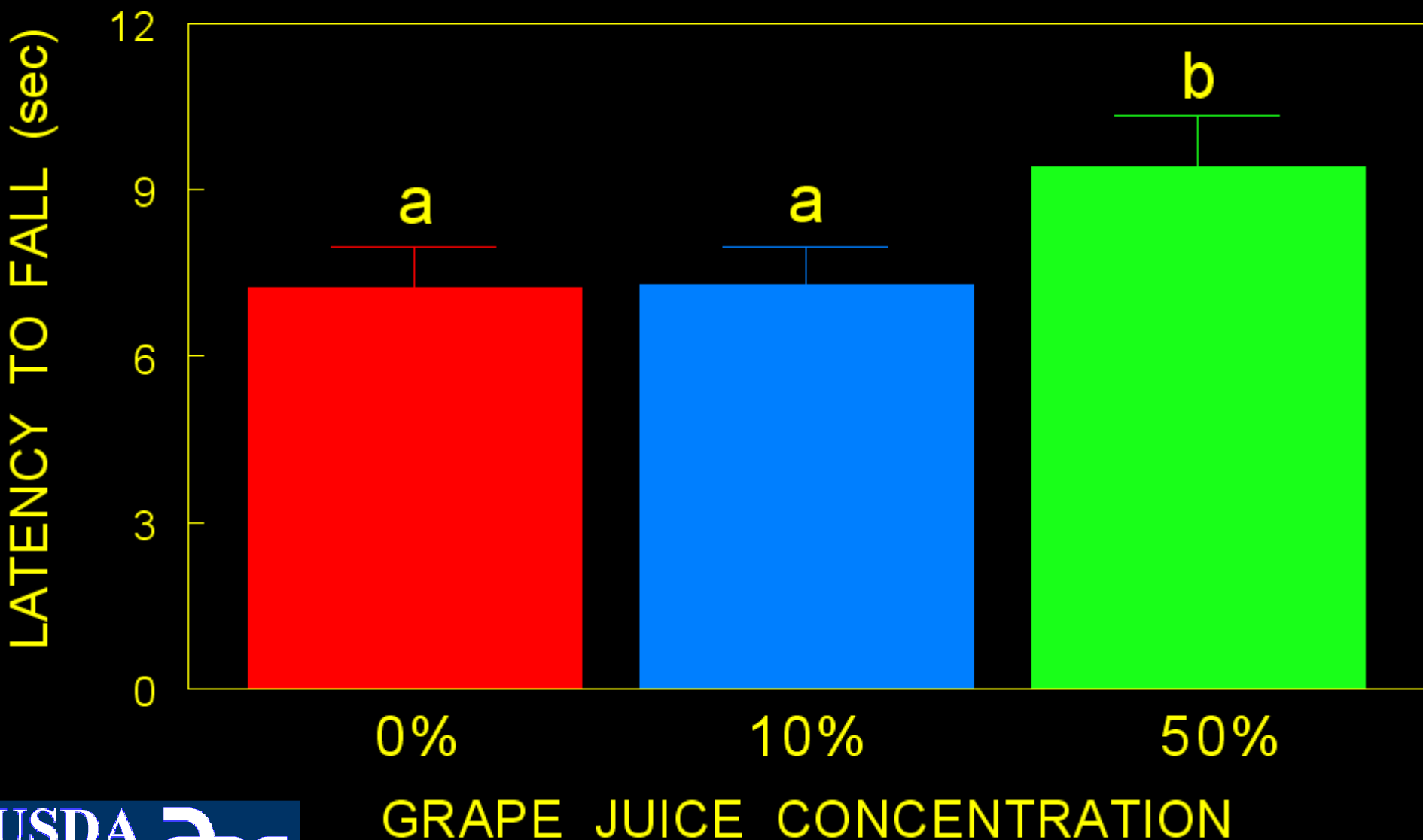
J. Joseph, HNRCA at Tufts

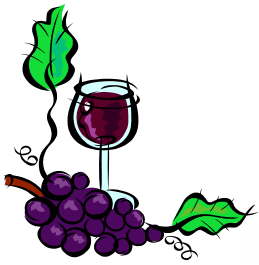


ROD WALKING



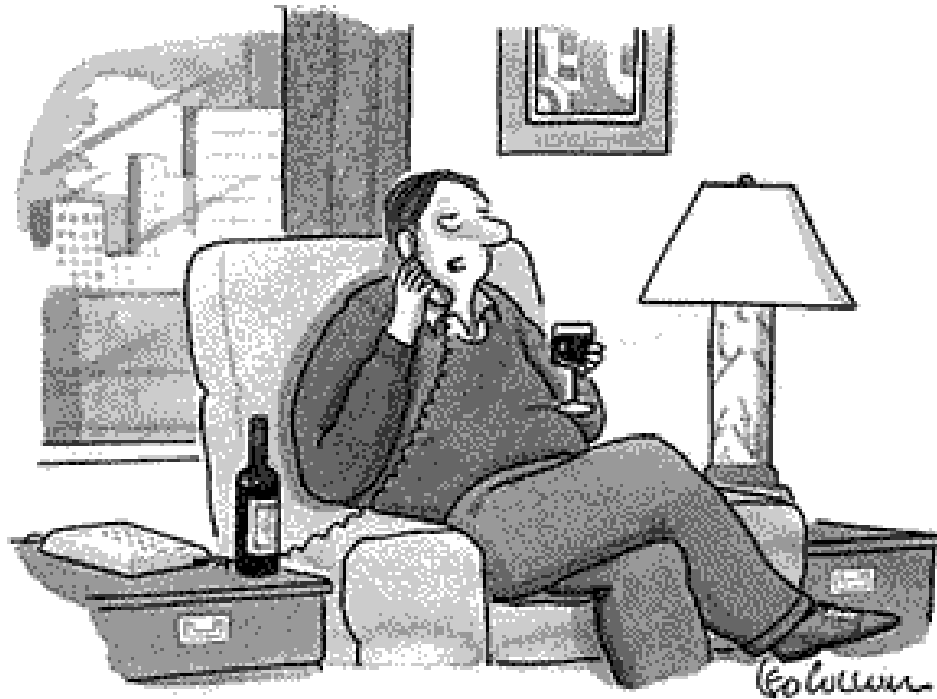
WIRE SUSPENSION





Wine and Cataracts

- NP107 – Human Nutrition
- Allen Taylor, HNRCA, Boston, MA
 - 4 other scientists at HNRCA
- Nurses Health Study - Harvard
 - 556 women aged 53-74 years
 - Moderate wine intake
 - 17% more nuclear cataracts (~20% of total)
 - 12% fewer cortical cataracts (~60% of total)



“Not much ... just flushing out my arteries.”