

# **MANAGEMENT OF BLOOD LIPIDS, SUGARS AND LDL OXIDATION WITH RASPBERRIES**



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**March 18, 2007**



examples.

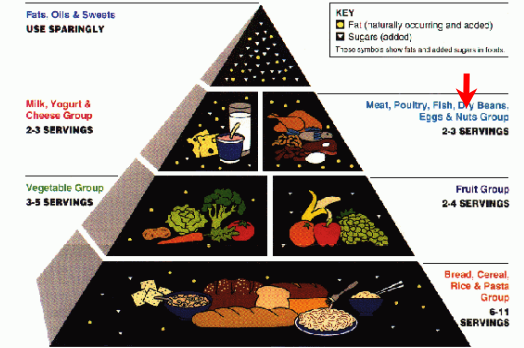
### Japan's Spinning Top



### Chinese Pagoda



### USDA Food Pyramid



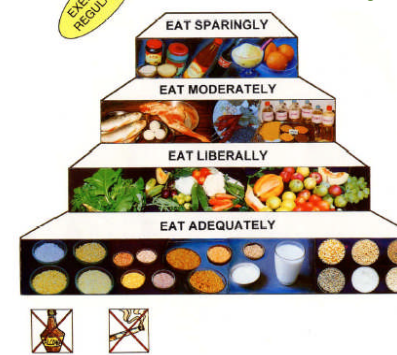
# GLOBAL DIETARY RECOMMENDATIONS

## GLOBAL NUTRITION RECOMMENDATIONS FOR PREVENTION OF CHRONIC DISEASES EAT MORE FRUITS & BERRIES

### Thailand Nutrition Flag



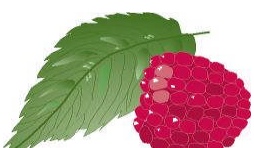
### India Food Stairway



### Guatemalan Food Jug



### Canada Food Rainbow





# Nutrient Composition of Raspberries

<b>NUTRIENT</b>	<b>UNIT</b>	<b>AMOUNT</b> <b>(100 Grams edible berry)</b>
<b>Water</b>	<b>g</b>	<b>87</b>
<b>Energy</b>	<b>kcal</b>	<b>29</b>
<b>Protein</b>	<b>g</b>	<b>1.1</b>
<b>Fat</b>	<b>g</b>	<b>0.4</b>
<b>Saturated fatty acids</b>	<b>g</b>	<b>0.0</b>
<b>Trans fatty acids</b>	<b>g</b>	<b>0.0</b>
<b>Monounsaturated fatty acids</b>	<b>g</b>	<b>0.0</b>
<b>Polyunsaturated fatty acids</b>	<b>g</b>	<b>0.3</b>
<b>Cholesterol</b>	<b>mg</b>	<b>0.0</b>
<b>Carbohydrates</b>	<b>g</b>	<b>3.2</b>
<b>Starch</b>	<b>g</b>	<b>0.0</b>
<b>Sugar</b>	<b>g</b>	<b>0.0</b>
<b>Fiber</b>	<b>g</b>	<b>4.3</b>
<b>Folate</b>	<b>µg</b>	<b>28</b>
<b>Vitamin C</b>	<b>mg</b>	<b>17</b>
<b>Calcium</b>	<b>mg</b>	<b>16</b>
<b>Sodium</b>	<b>mg</b>	<b>0.0</b>
<b>Potassium</b>	<b>mg</b>	<b>186</b>





# Raspberries

Nature's Gift of Health Promoting Phytonutrients

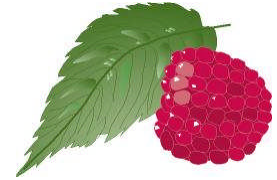
## PHYTONUTRIENT

## AMOUNT

<b>Anthocyanins</b>	<b>20-65 mg/100 g fresh weight</b>
<b>Ellagitanins as Ellagic acid</b>	<b>3.39 mg/g dry weight</b>
<b>Salicylic acid</b>	<b>5 mg/100 g fresh weight</b>
<b>P-Coumaric acid</b>	<b>small amounts</b>
<b>Ferulic acid</b>	<b>small amounts</b>
<b>Quercitin</b>	<b>12 mg/100 g fresh weight</b>
<b>Catechins</b>	<b>0.83 mg/100 g fresh weight</b>
<b>ORAC Value</b>	<b>24 umol TE/g fresh weight</b>

Washington Red Raspberry Commission. Phytochemicals in red raspberries 2007





**Raspberries also contain ketones that are structurally similar to capsaicin in red peppers and synephrine in Citrus Aurantium, shown to have health benefits**





## HEALTH BENEFITS OF RASPBERRIES

⊕ Low in energy value  
(only 61 calories per 100 g fresh raspberries)

⊕ Low in lipid content

⊕ Negligible amounts of saturated fatty acids

⊕ No cholesterol and trans fatty acids

⊕ Good source of dietary soluble fiber

⊕ Very good source of vitamin

C

⊕ Contains appreciable amounts of folic acid





## HEALTH BENEFITS OF RASPBERRIES (CONTINUED)

- ⊕ **Very low levels of sodium but good source of potassium**
- ⊕ **Contains high levels of beneficial phytonutrients**
- ⊕ **A high ORAC food (10 times more antioxidants than tomatoes and broccoli)**
- ⊕ **Very high in polyphenols including anthocyanins**
- ⊕ **Major source of the unique antioxidant phytochemical ‘ellagitannins’**
- ⊕ **Good source of salicylic acid**
- ⊕ **Contributes to dietary intake of quercetin and tannins**





# ASSOCIATED HEALTH BENEFITS OF CONSUMING RASPBERRIES

- ③ **Protect against free radical induced cell damage and reduce oxidative stress**
- ③ **Prevent the growth of cancer cells in vitro and in animal models**
- ③ **Reduce the risk of cardiovascular disease**
- ③ **Help regulate blood glucose and reduce the risk of diabetes**
- ③ **Provide protection against food induced allergic reactions**
- ③ **Effective against infectious bacterial diseases**
- ③ **Protect against viral diseases**





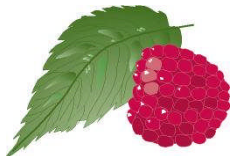
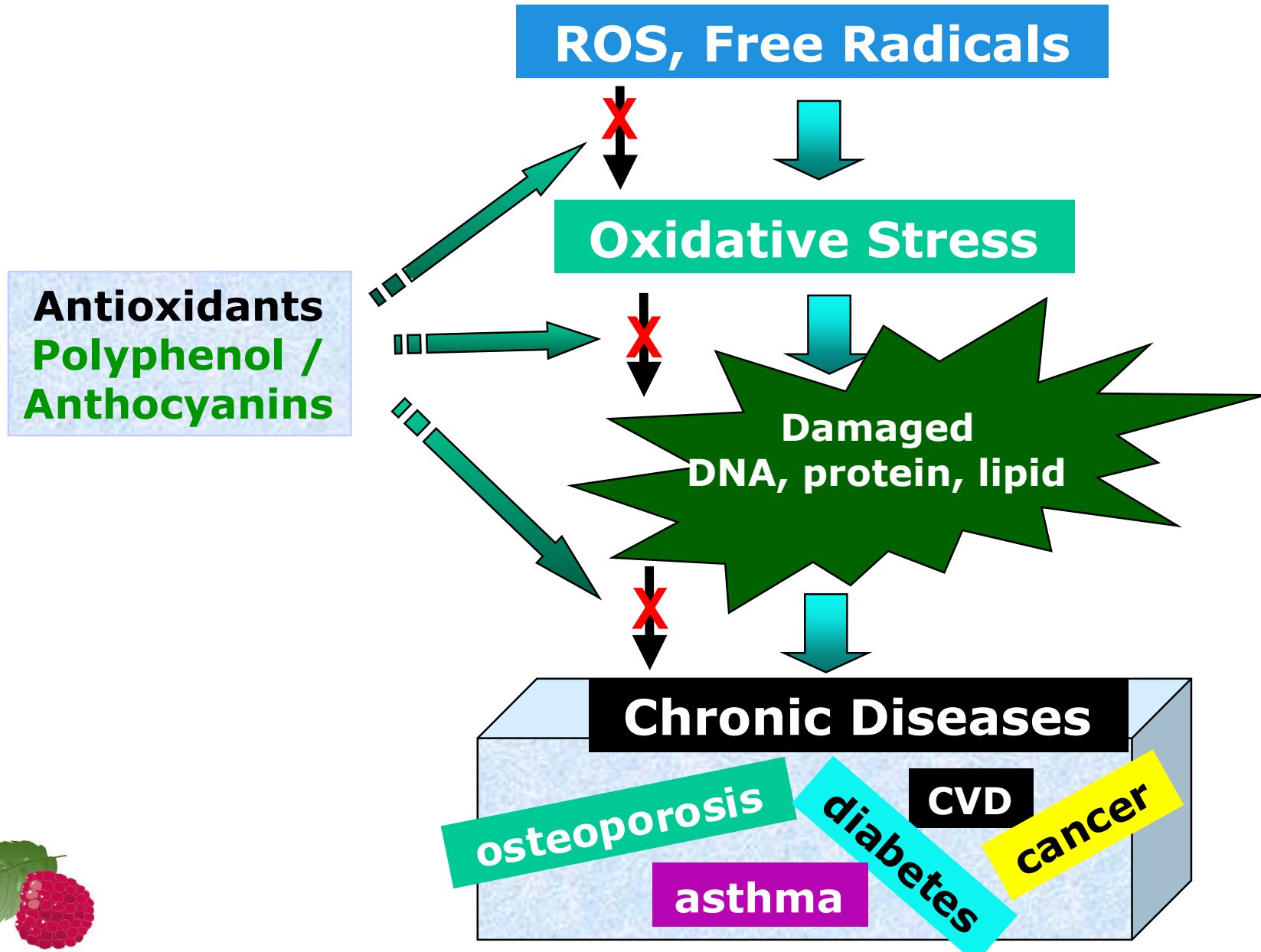
# MAIN CHRONIC DISEASE PREVENTION ASSOCIATED WITH THE CONSUMPTION OF RASPBERRIES

- ⊗ Cancers
- ⊗ Cardiovascular diseases
- ⊗ Diabetes
- ⊗ Osteoporosis
- ⊗ Inflammatory diseases
- ⊗ Neurodegenerative diseases

Common causal factor: OXIDATIVE STRESS



# Oxidative stress and chronic diseases: role of antioxidants



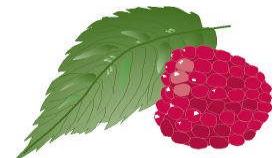


# HUMAN INTERVENTION STUDY WITH RASPBERRIES

## Need for the study:

- Evidence for the health benefits of raspberries based primarily on:**
  - ⊗ Epidemiology
  - ⊗ Cell culture studies
  - ⊗ Some animal studies
- Other berries and fruits such as pomegranate, blue berries and straw berries studied extensively**
- No human studies so far with raspberries**
- Claims for ‘Health Benefits’ based mostly on human studies**

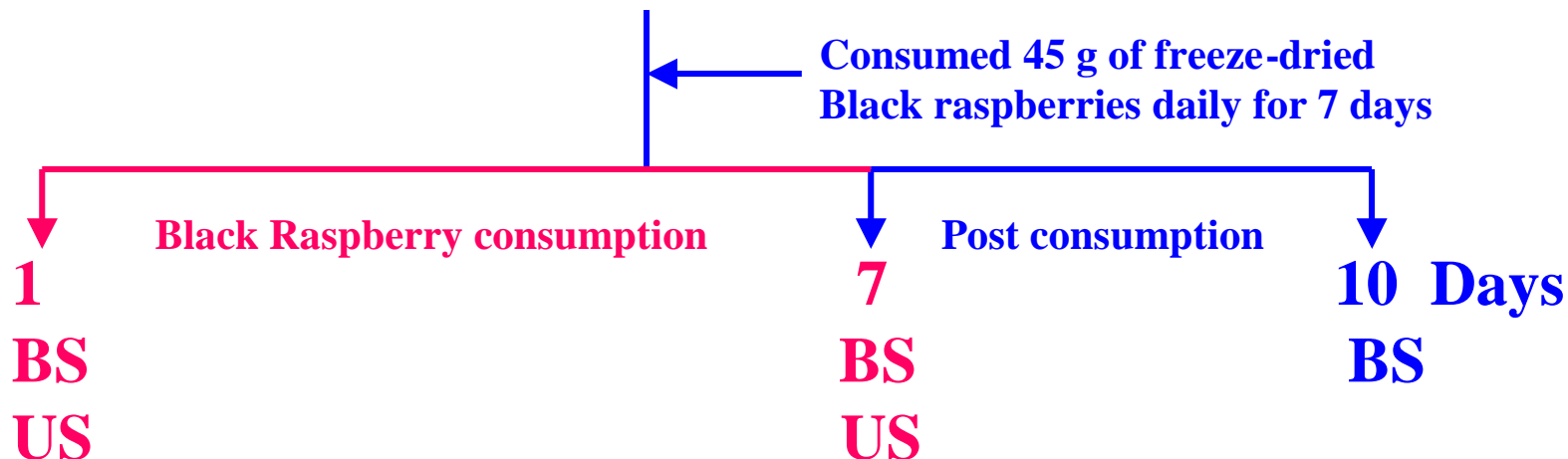




# PHARMACOKINETICS OF CONSUMING BLACK RASPBERRIES

Stoner GD et al. J Clin Pharmacol 2005, 45, (10), 1153-64

## Healthy human subjects (11)



## CONCLUSION

Consuming 45 g freeze-dried black raspberries daily is well tolerated and results in quantifiable amounts of anthocyanins and ellagic acid in plasma and urine





# RASPBERRY KETONES (RK) AND OBESITY

The Department of Medical Biophysics, Ehime University School of Medicine,  
Japan

## OBJECTIVES

- ⊗ Do RK prevent obesity
- ⊗ Do RK activate lipid metabolism

### Study 1



### Study 2





## STUDY FINDINGS

- ⊗ RK prevented the high fat diet induced elevation in:
  - ⊙ Body weights
  - ⊙ Liver weights
  - ⊙ Visceral adipose tissue weights
- ⊗ RK decreased high fat diet induced elevation in hepatic triglycerides
- ⊗ RK increased norepinephrine lipolysis

**RASPBERRY KETONES PREVENT OBESITY & FATTY LIVER IN A RAT MODEL**

**Safety ???**





# EFFECT OF RASPBERRIES ON BLOOD LIPIDS, SUGARS AND LDL OXIDATION

## SUBJECTS

**24 human subjects (12 female & 12 male) will be recruited meeting the following criterion:**

- ☉ **Healthy (20-55 years of age, BMI 23-26)**
- ☉ **No health problems**
- ☉ **Not on medication**
- ☉ **Not pregnant**
- ☉ **No herbal supplements**
- ☉ **No antioxidant supplements**
- ☉ **Non smokers**

## TREATMENT

**Treatment will consist of consuming one cup fresh red raspberries every day for two weeks**





# EFFECT OF RASPBERRIES ON BLOOD LIPIDS, SUGARS AND LDL OXIDATION

## PROPOSED STUDY

### RATIONALE

- ⊗ Blood lipids markers of cardiovascular disease
- ⊗ LDL oxidation represents important initial step in the development of cardiovascular disease
- ⊗ Blood sugar good indicator of risk for diabetes

### STUDY DESIGN



FR - Food record: 3 day food intake and symptoms dairy

BS - Blood sample: Total lipids, Tryglycerides, Total cholesterol, LDL, HDL, Lipid peroxidation, Oxidized LDL, Protein oxidation, DNA oxidation, Sugars, Insulin

Raspberries: Total antioxidant capacity (ORAC), total polyphenol content (ellergitannin)



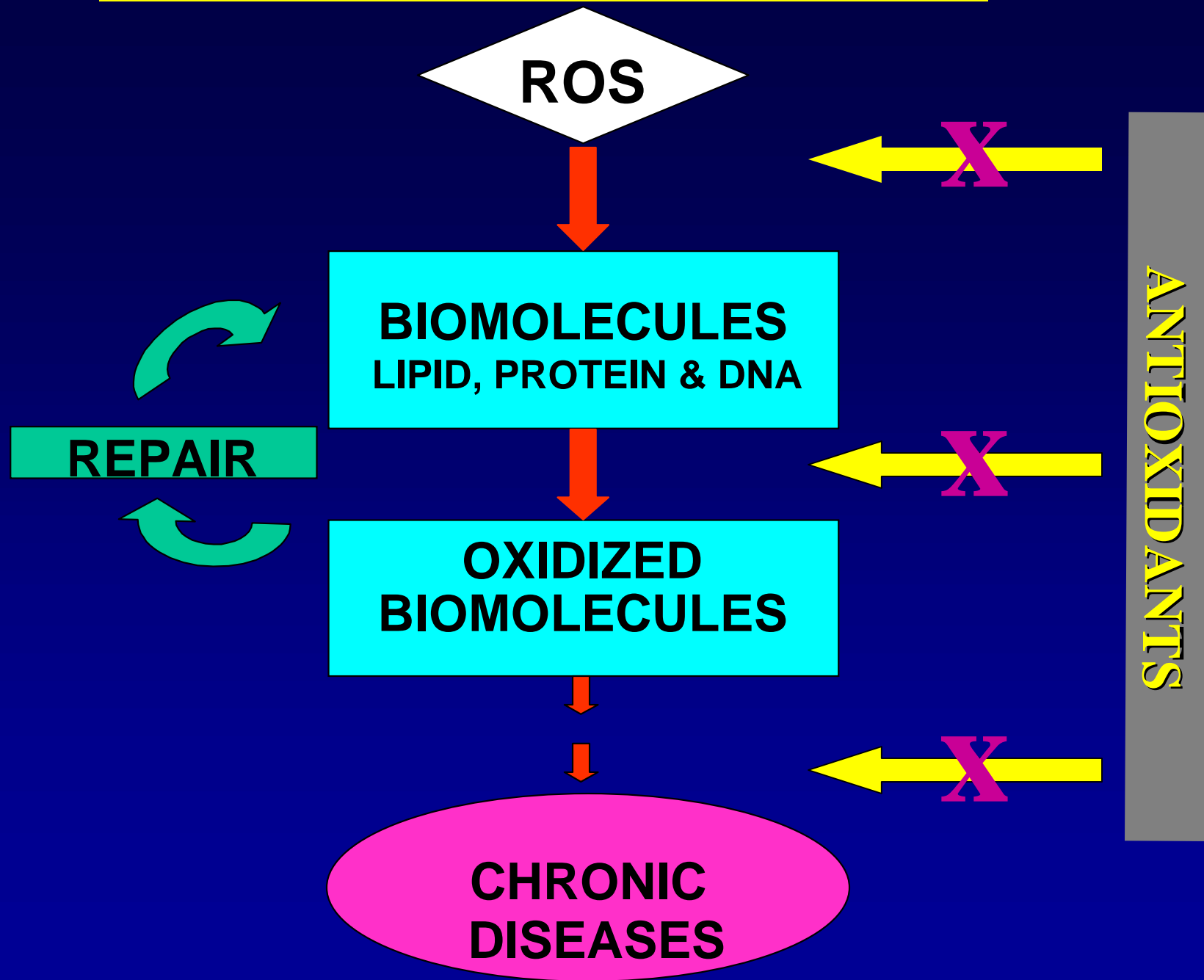


# CONCLUSION

- ③ **Raspberries full of flavor, color and nutrients**
- ③ **Raspberries contain many beneficial phytonutrients including potent antioxidant p[olyphenols**
- ③ **Oxidative stress is now recognized as an important factor in the development of many human diseases**
- ③ **Evidence for the role of raspberries in human health comes mainly from epidemiological, cell culture and some animal studies**
- ③ **Raspberry antioxidants can mitigate the damaging effect of oxidative stress and lower the risk of human diseases**
- ③ **No human studies conducted to demonstrate the role of raspberries in human health**
- ③ **Need for a good human intervention study**



# ROS AND CHRONIC DISEASES



# Oxidative stress and chronic diseases: role of antioxidants

