

# Selenium

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# What is Selenium(Se)?

- ▶ Trace element
  - ▶ Found in *nearly* all soil and *some* natural water sources.
  - ▶ Exists in two main forms: organic and inorganic
  - ▶ Can be toxic or beneficial depending on daily intake
- ▶ Essential nutrient
  - ▶ Some essential health benefits include: hormone production, fertility, proper growth and detoxification.
  - ▶ Not manufactured by the body and must be consumed.
  - ▶ Selenium is naturally occurring in plant and animal food sources.



# RDA

Table 1: Recommended Dietary Allowances (RDAs) for Selenium [6]

Age	Male	Female	Pregnancy	Lactation
Birth	15 mcg*	15 mcg*		
7–12 months	20 mcg*	20 mcg*		
1–3 years	20 mcg	20 mcg		
4–8 years	30 mcg	30 mcg		
9–13 years	40 mcg	40 mcg		
14–18 years	55 mcg	55 mcg	60 mcg	70 mcg
19–50 years	55 mcg	55 mcg	60 mcg	70 mcg
51+ years	55 mcg	55 mcg		

<https://ods.od.nih.gov/factsheets/Selenium-HealthProfessional/#en10>



# Food sources



Brazil Nut



Mustard Seed



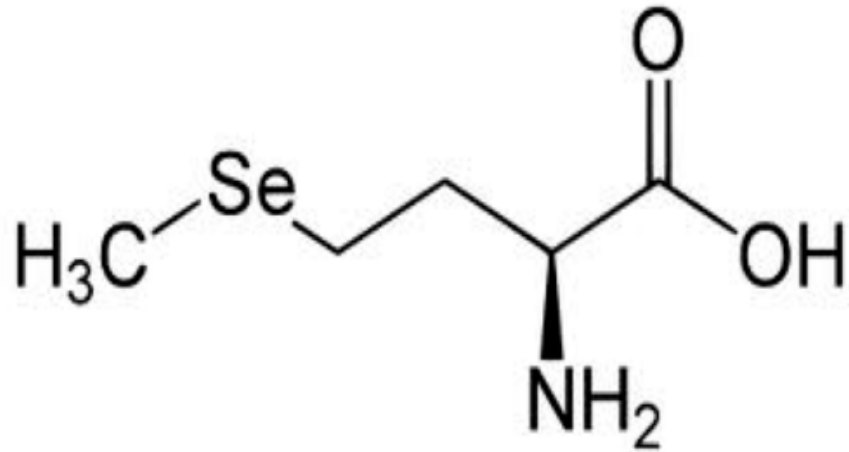
# Food sources

Food	Servings size	(mcg)
Brazil nuts (w/out shell)	5 each	340
Oysters(cooked)	75 g	116
Liver (lamb, chicken, turkey) cooked	75 g	51-87
Tuna (canned, light)	75 g	45-53
Cooked eggs	2 each	34
Tofu	150 g	12-30
Greek yogurt	249 mL	14-27
Bacon strips	3 slices (24 g)	12
Mustard seeds	4 g	8.32

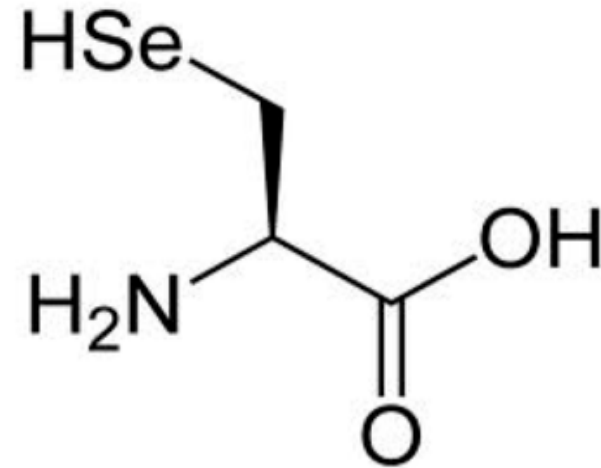


# Forms that exist in the body..

► ...include:



Selenomethionine



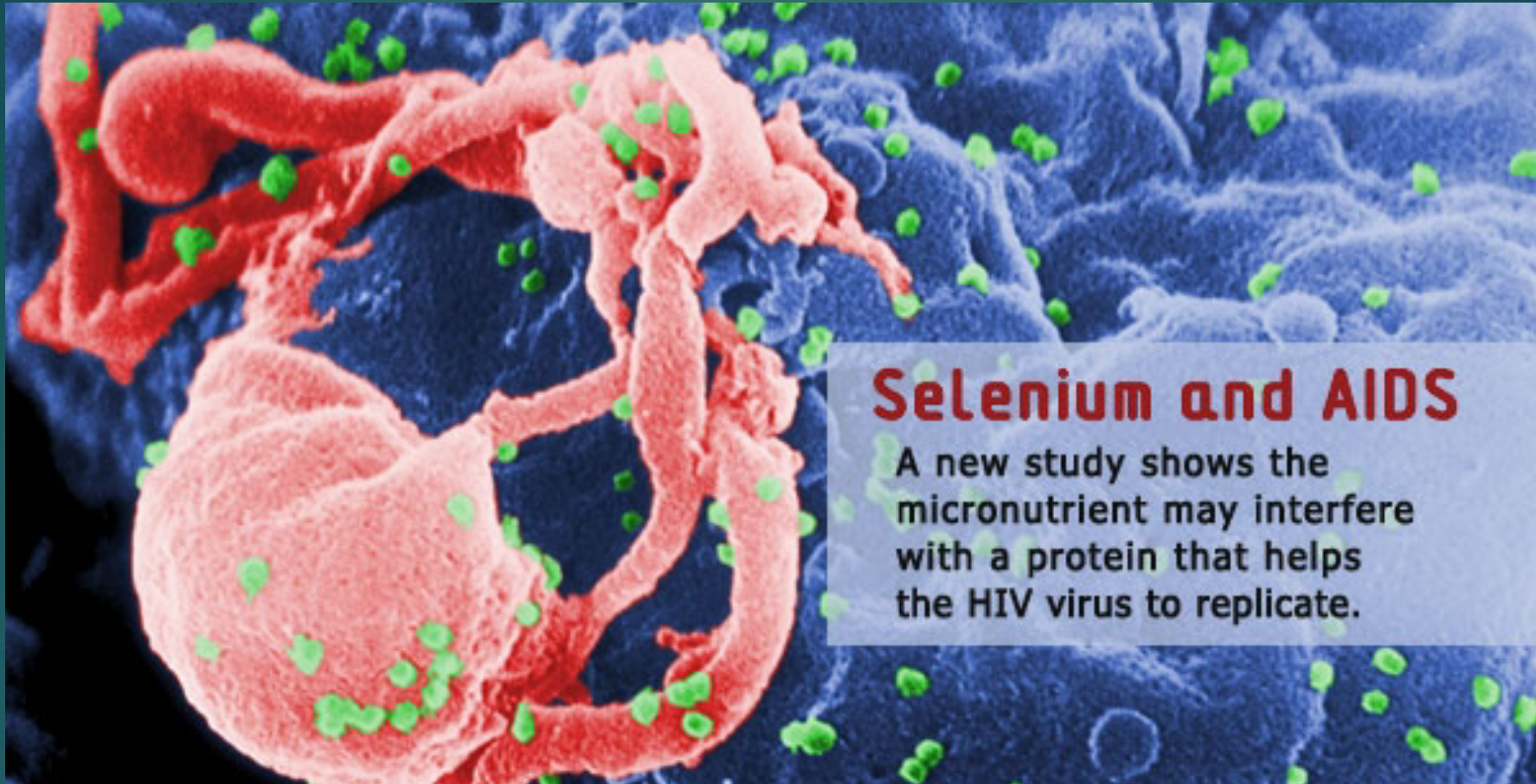
Selenocysteine



# Biological Functions

- ▶ 35 Selenoproteins have been identified in the human body
  - ▶ 3 well studied, hormone-related selenoproteins include:
    - ▶ Glutathione peroxidase
    - ▶ Iodothyronine deiodinase
    - ▶ Thioredoxin reductase
  - ▶ Each regulate the production of thyroxine in the thyroid gland with the addition of regulating other major functions but not limited to:
    - ▶ Detoxification
    - ▶ Regulating DNA replication
    - ▶ Fertility





## **Selenium and AIDS**

A new study shows the micronutrient may interfere with a protein that helps the HIV virus to replicate.

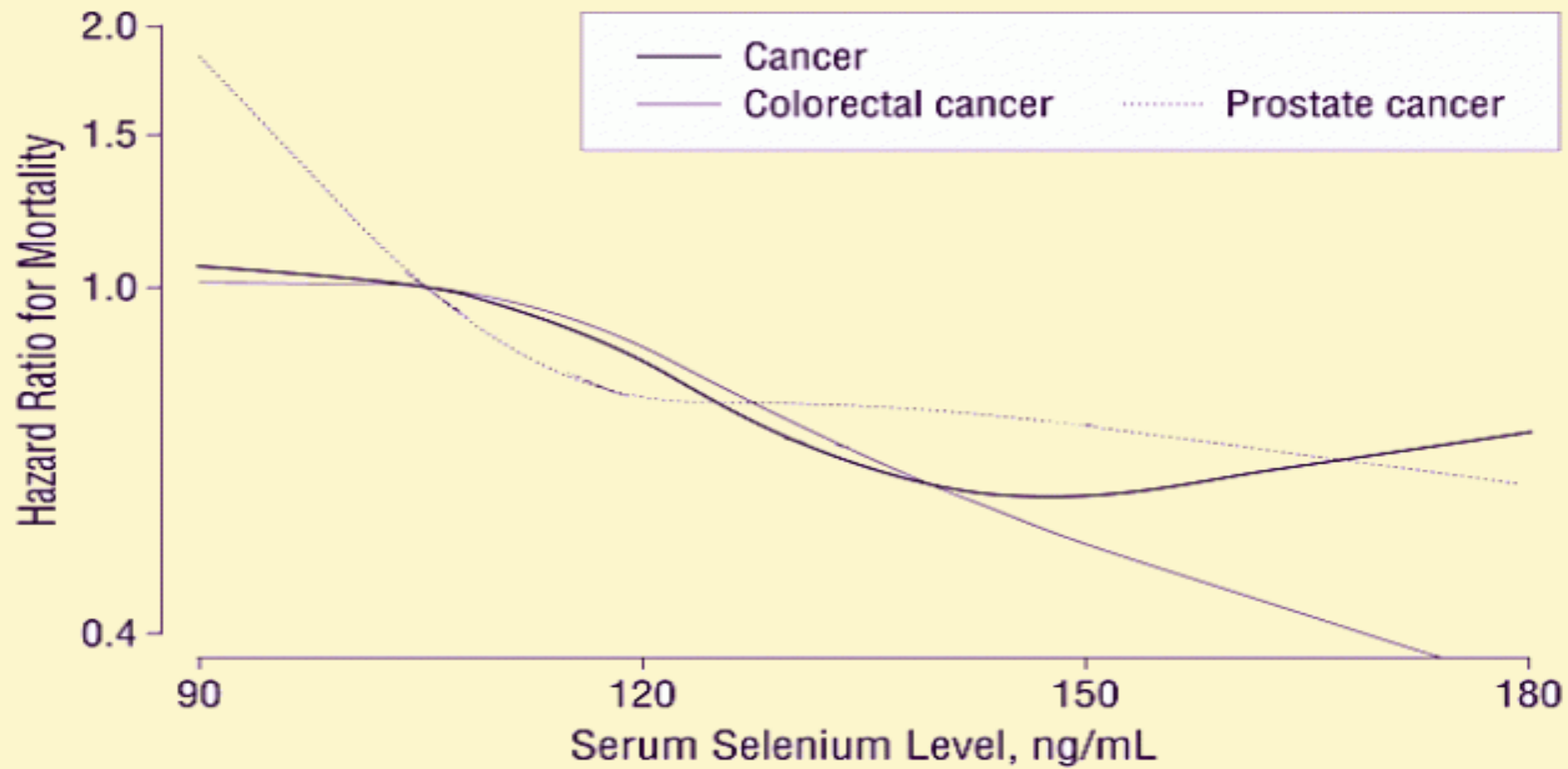
Image at: <http://news.psu.edu/story/141671/2009/08/31/research/selenium-may-slow-march-aids>



# Amazing Abilities of Se

- ▶ Fighting Cancer
  - ▶ Inhibits replication of some tumor cells
  - ▶ Detoxes carcinogenic substances that affect normal DNA replication
- ▶ HIV
  - ▶ Low serum selenium levels have been observed with some HIV patients
  - ▶ Slows the rate of the diseases progression

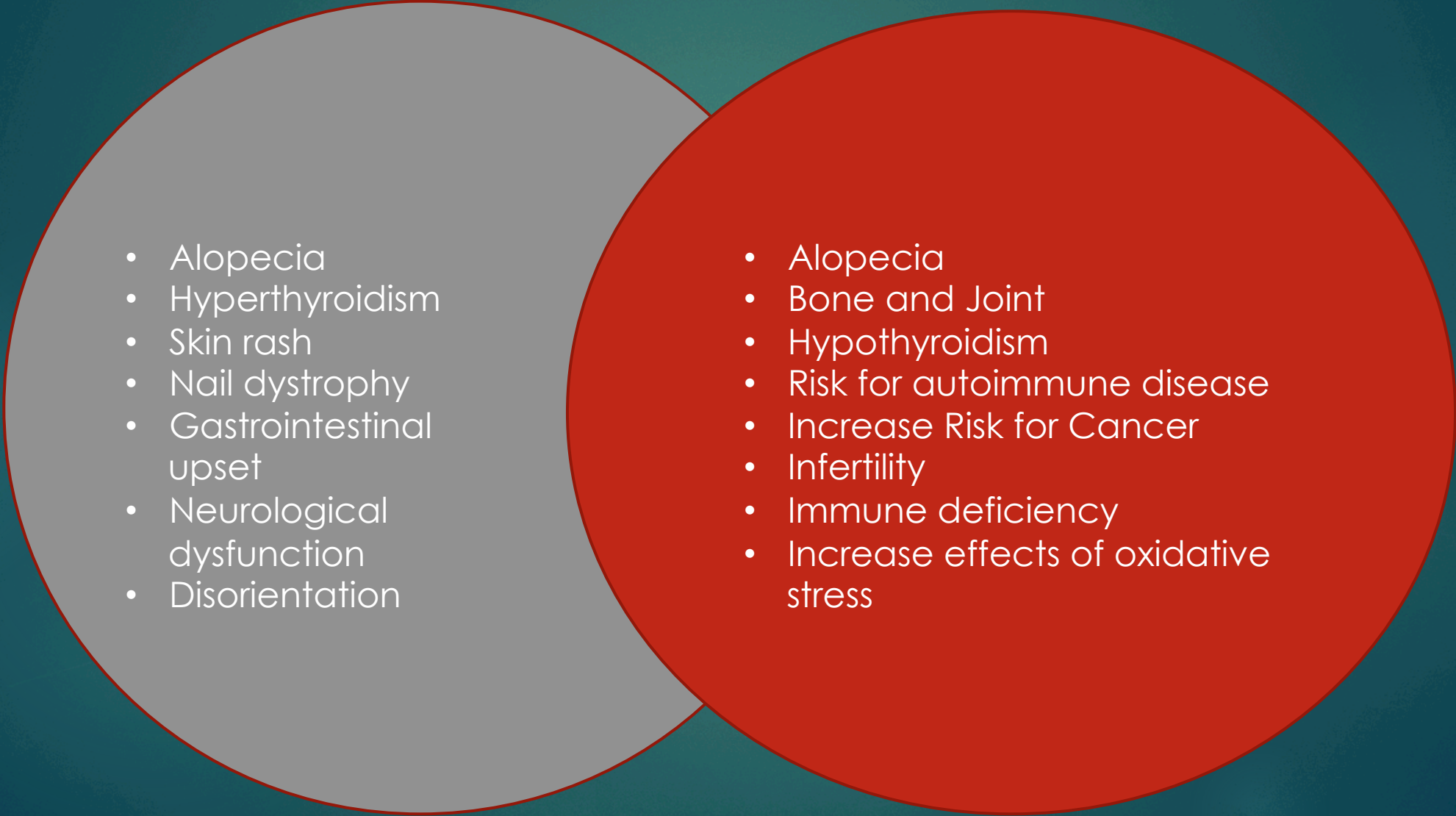




Bleys, J., Navas-Acien, A., Guallar, E. (2008).  
Archives of Internal Medicine.



# Toxicity vs. Deficiency

- 
- A Venn diagram with two overlapping circles. The left circle is light gray and represents 'Toxicity'. The right circle is red and represents 'Deficiency'. The two circles overlap in the center. The background is a dark teal color. A solid red rectangle is located in the top right corner of the slide.
- Alopecia
  - Hyperthyroidism
  - Skin rash
  - Nail dystrophy
  - Gastrointestinal upset
  - Neurological dysfunction
  - Disorientation

- Alopecia
- Bone and Joint
- Hypothyroidism
- Risk for autoimmune disease
- Increase Risk for Cancer
- Infertility
- Immune deficiency
- Increase effects of oxidative stress



# Kashin-Becks Disease

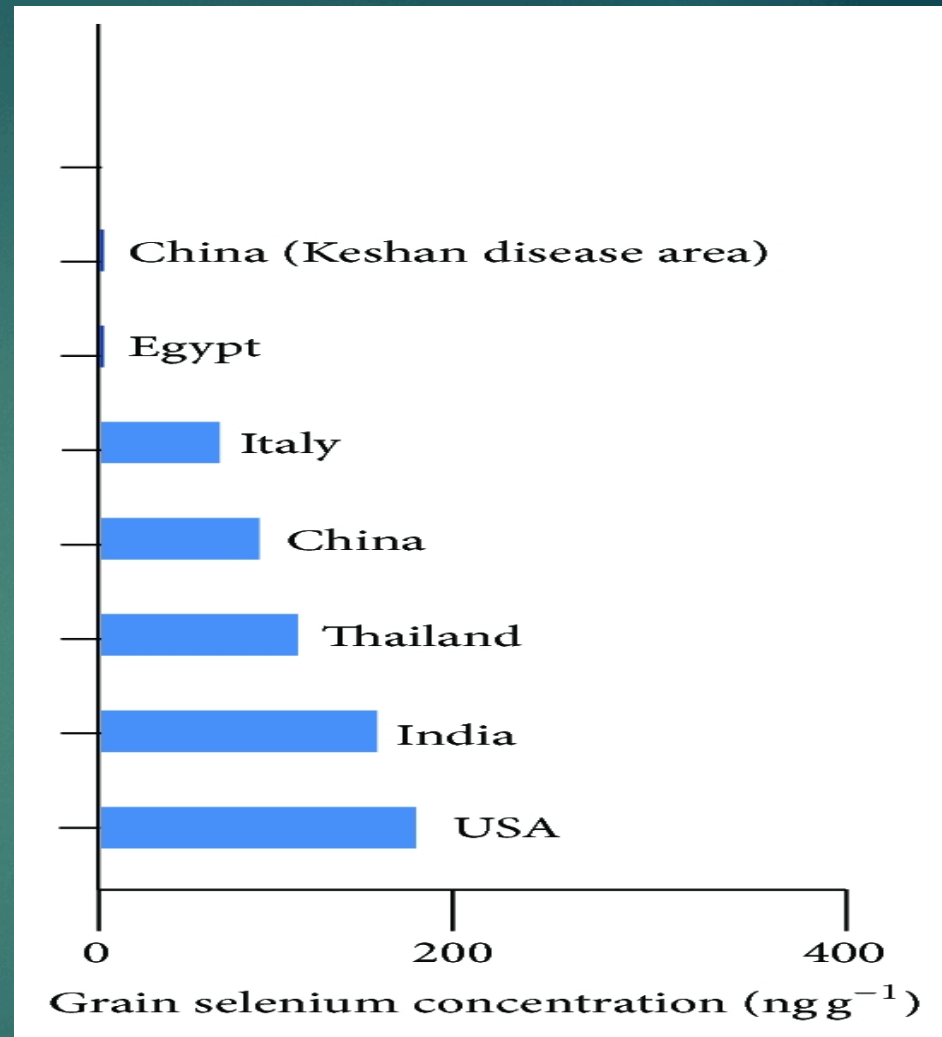
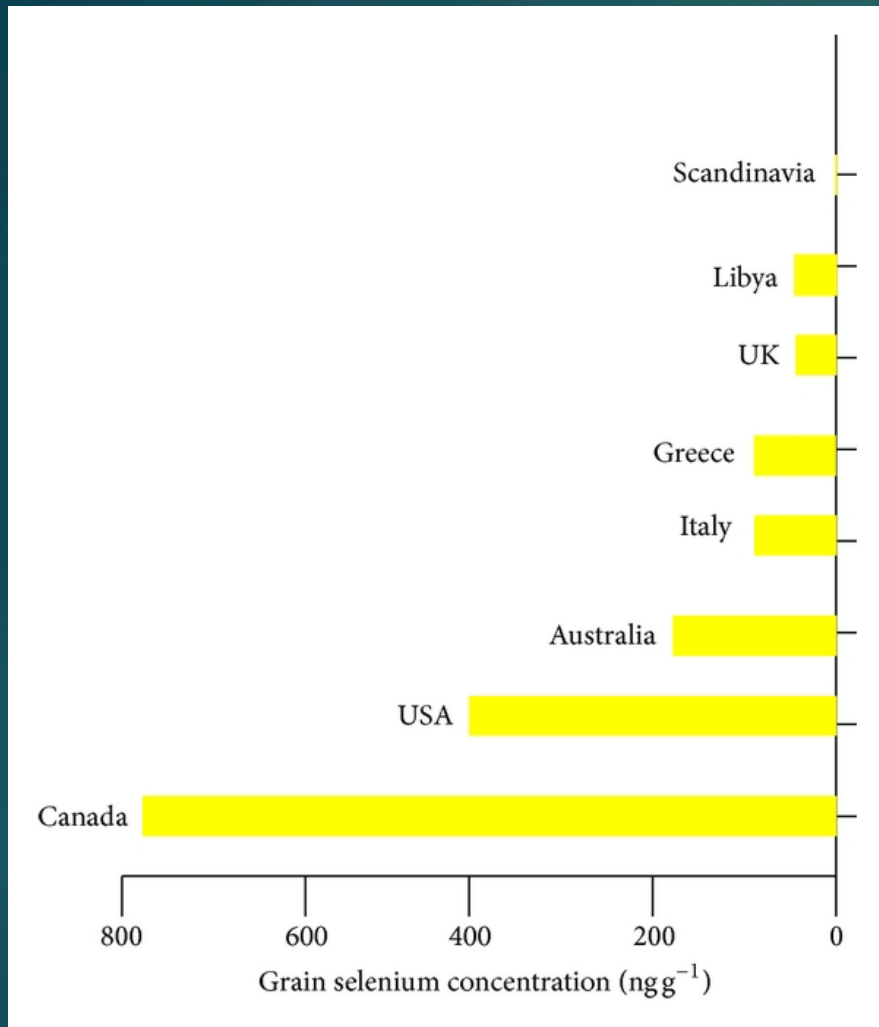




# The Future of Se Supply

- ▶ Geological Survey and Se supply
- ▶ Recycle it of organic matter
- ▶ Agronomic biofortification strategies





Y. G. Zhu, E. A. H. Pilon-Smits, F. J. Zhao, P. N. Williams, and A. A. Meharg, "Selenium in higher plants: understanding mechanisms for biofortification and phytoremediation," Trends in Plant Science, vol. 14, no. 8, pp. 436–442, 2009.



# Game Questions

- ▶ What are 3 things selenium can do for you?
- ▶ What are 3 foods selenium is found in?