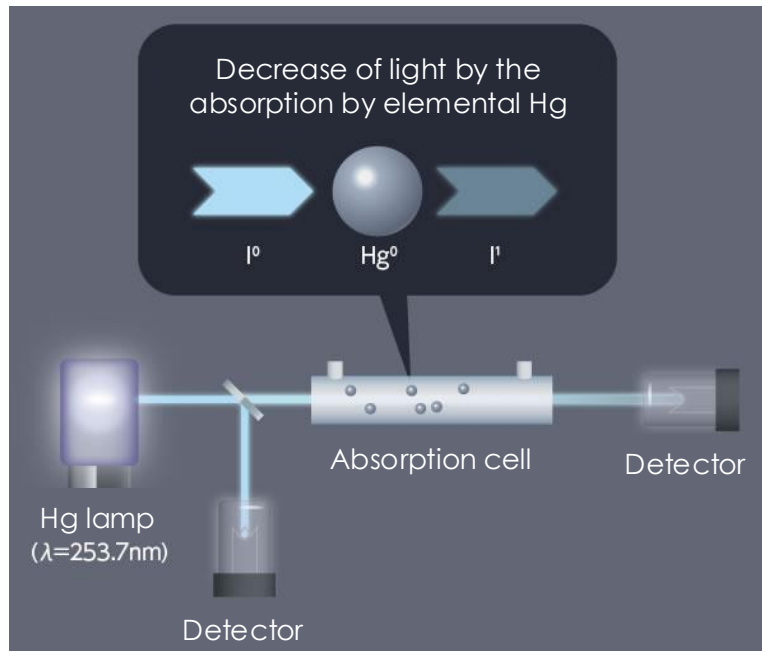# Chemical Analysis day2

2024/8/1 JSC2024

HOKKAIDO UNIVERSITY, JAPAN
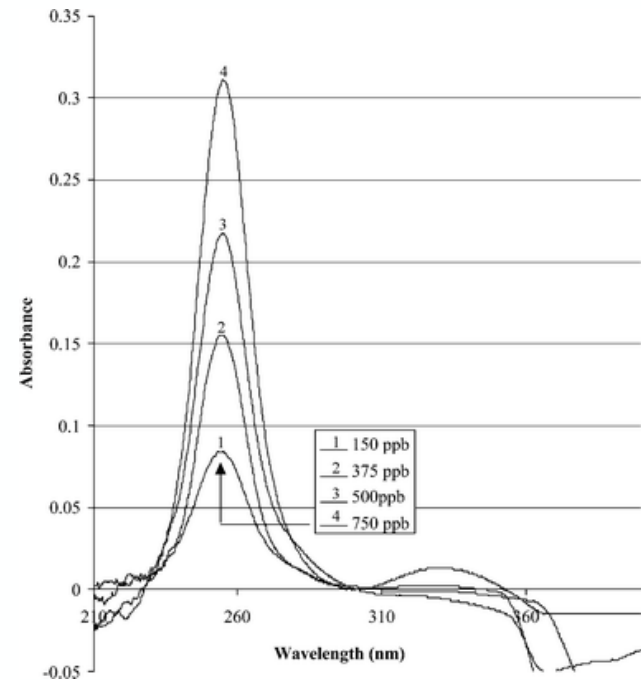
How to "detect" the existence of Hg?

Atomic Absorption Spectrometry (AAS)

- Need to measure specific spectrum of the target element
    - Hg specifically absorbs the light with the wavelength of 253.7 nm

- Peak size correspond with the amount of the element
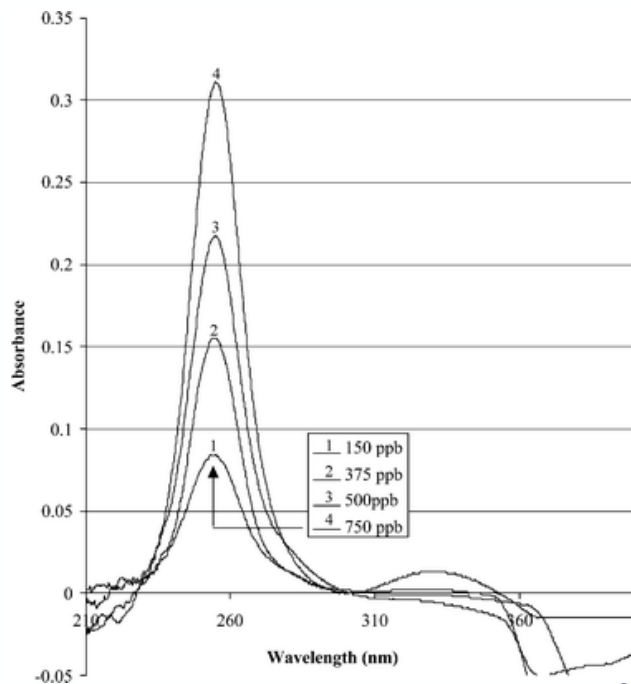   - Height of the peak
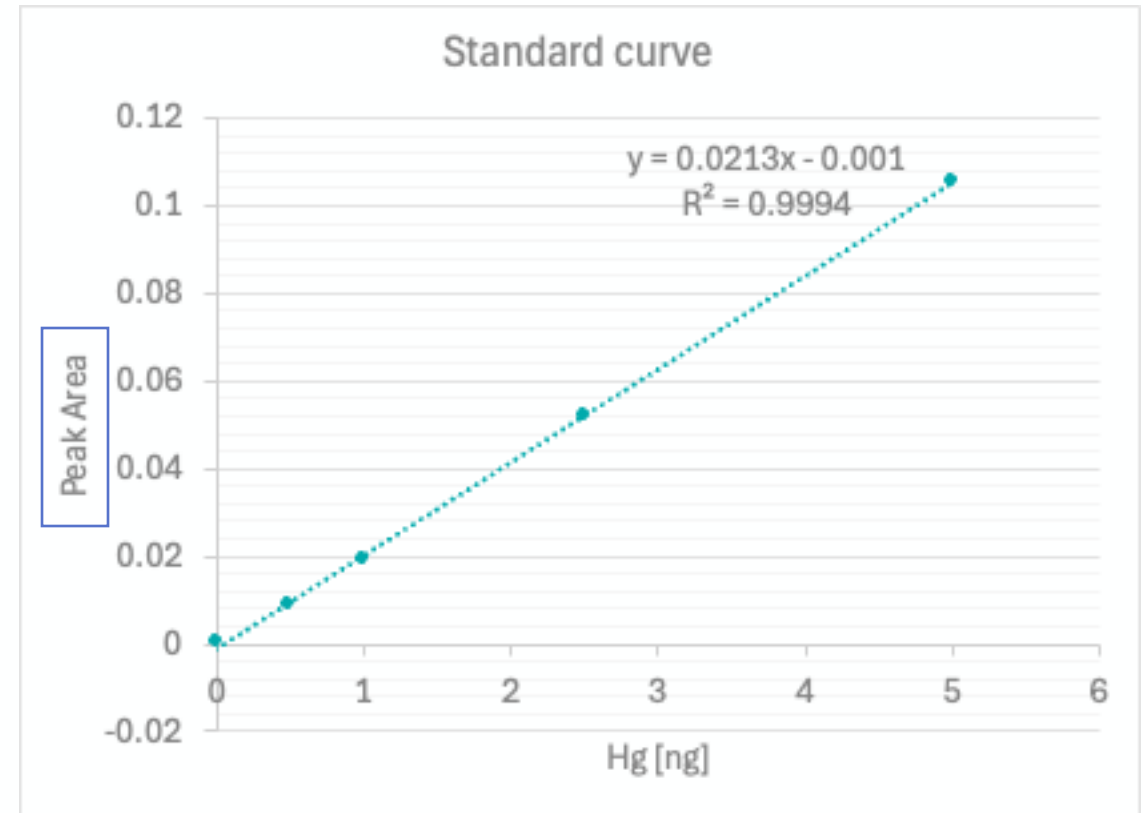   - Area of the peak

modified from NIC

2004, Tao et al.

How to "quantify" the amount of Hg?

- Peak size correspond with the amount of the element
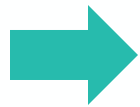 - Height of the peak
  - Area of the peak

2004, Tao et al.

$y = ax + b$
a: slope
b: intercept

→ [Peak area] = a[Hg amount] + b
a: slope
b: intercept

How to "quantify" the amount of Hg?

$y = ax + b$
a: slope
b: intercept

→ [Peak area] = a[Hg amount] + b
a: slope
b: intercept

↓

$y = ax + b$

a: slope
b: intercept
we need to know "x" value
(x=Hg amount)

$y-b=ax$

$x=(y-b)/a$

[Hg amount] = ([peak]-b)/a

Unit

1 kg = 1000 g
1 g = 1000 mg
1 mg = 1000 μg(micro)
1 μg = 1000 ng (nano)

Let's calculate your result by yourself!

https://africa.vetmed.hokudai.ac.jp/en/jsc2024.html

Hg in Hair

Methylmercury (MeHg)

Cysteine

MeHg-Cysteine

Methionine (Essential Amino Acid)

Mercury (Hg) Carbon (C) Oxygen (O) Sulfur (S) Nitrogen (N) Hydrogen (O)

Cysteine (Cystine) 17.5%

- Cysteine
- Serine
- Glutamic acid
- Threonine
- Glycine
- Leucine
- Valine
- Arginine
- Aspartic acid
- Alanine
- Proline
- Isoleucine
- Tyrosine
- Phenylalanine
- Histidine
- Methionine
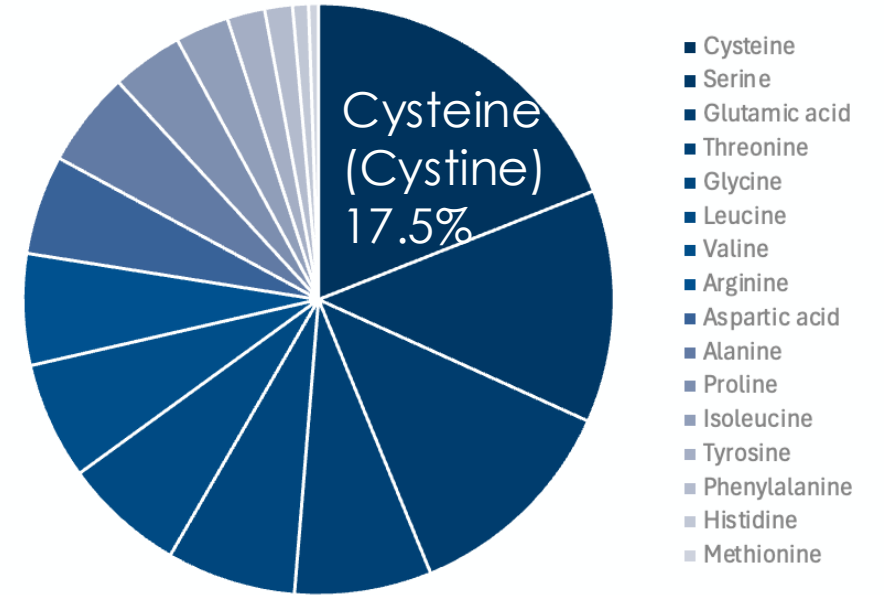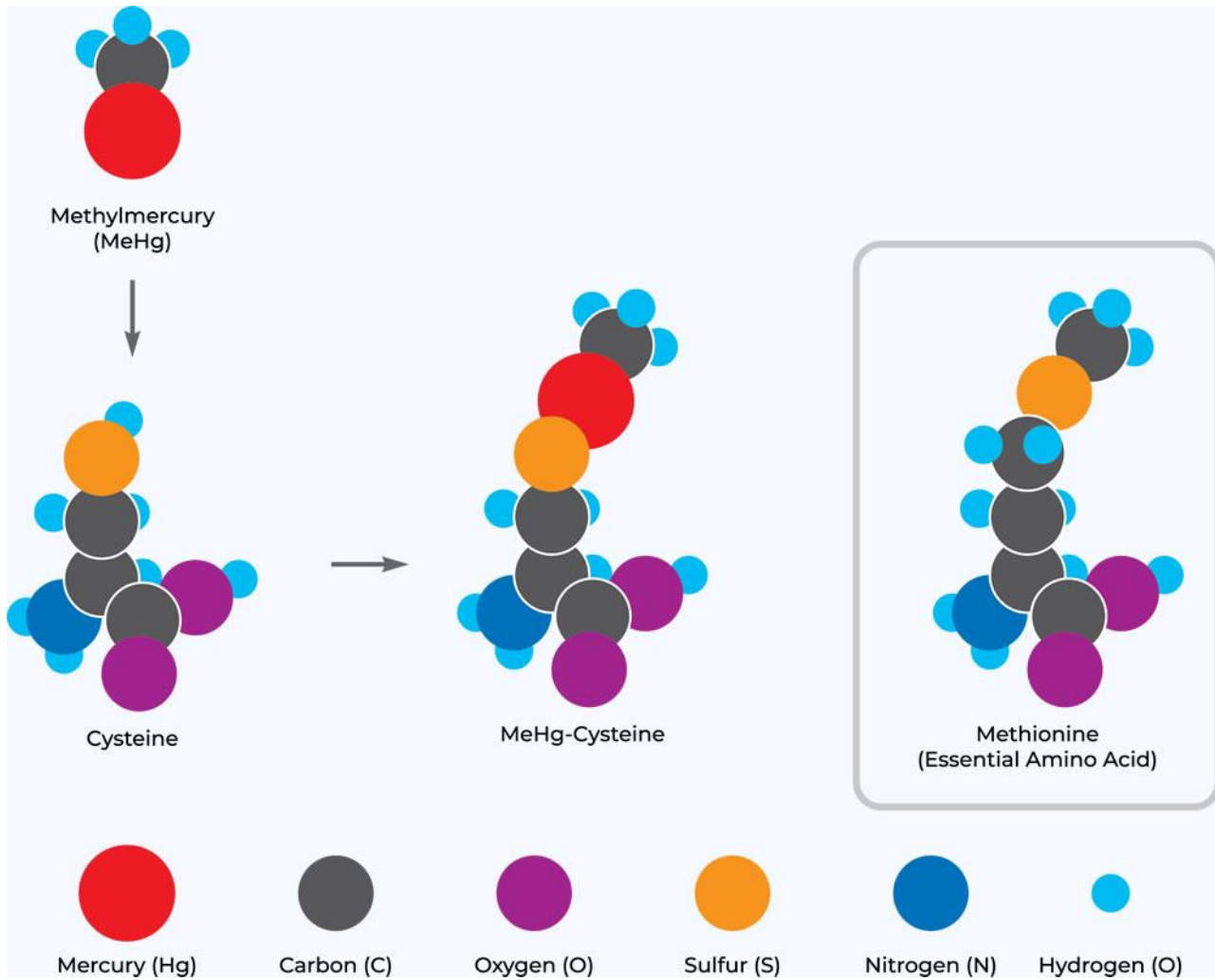
Amino avid composition of human hair
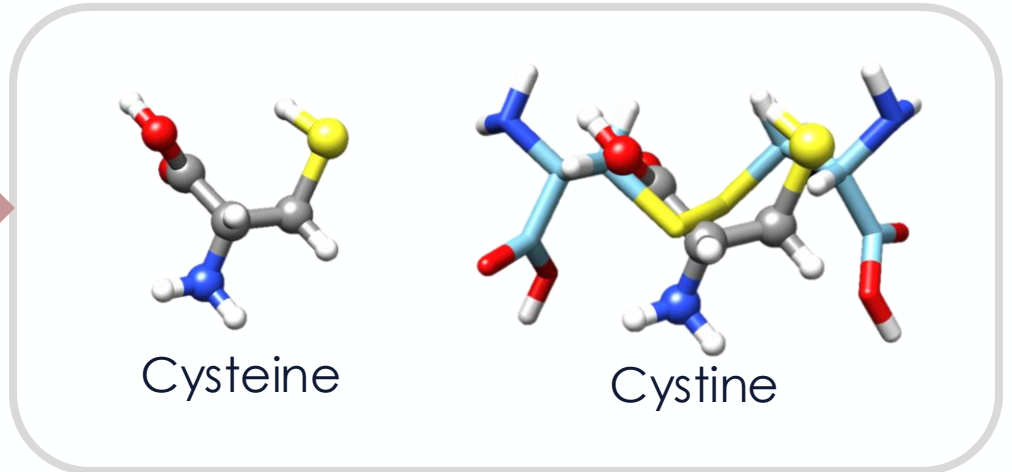
Cysteine   Cystine

Methionine is converted into cysteine/cystine

Hg in Hair

ppm (mg/g)

50 — 成人で神経症状出現が疑われる最小値（WHO1990）	Minimum concern level for general population
11 — 胎児影響が疑われる母親の最小値（日本2005）	Minimum concern level for pregnant women
5 — 成人に対する耐容摂取量に相当（日本1973）	Tolerable level for general population
2.8 — 胎児影響を考慮した母親の耐容摂取量に相当（日本2005）	Tolerable level for pregnant women
2.5 — 男性の平均レベル	Average level in men
1.6 — 女性の平均レベル	Average level in women

毛髪水銀レベルの参照値 Reference levels of Hg

"Is it safe to eat seafood?"

https://www.pref.miyagi.jp/soshiki/shoku-k/suigin.html

MHLW Japan
Guidebook for pregnant women
"Vulnerable population"