

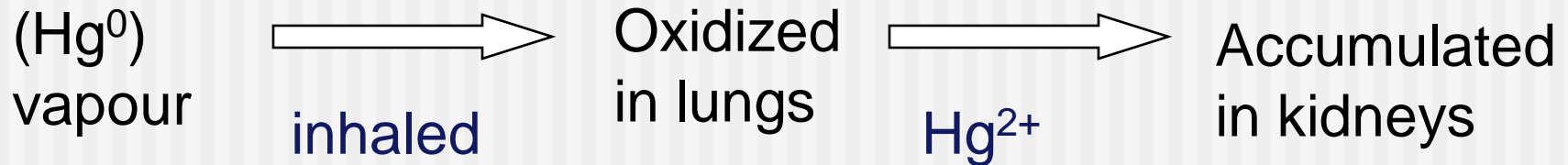
# Mercury Toxicity

# Mercury

USES	Red ink, thermometers, batteries, fluorescent tubes, electrical appliances, biocides, medications
FORMS	Elemental, metallic Hg ( $\text{Hg}^0$ ), divalent inorganic Hg ( $\text{Hg}^{2+}$ ) methylmercury ( $\text{CH}_3\text{Hg}^+$ and $(\text{CH}_3)_2$ )
SPECIES	Monomethyl-Hg is the worst!
NATURE	Soils/rocks, Cinnabar ( $\text{HgS}$ ), food (fish)
HUMAN RELEASE	Combustion of coal and oil, mining/smelting mercury, Cu/Pb smelting, chlor-alkali plants, dental amalgam, fluorescent lamp manufacturing

# Mercury - in the body

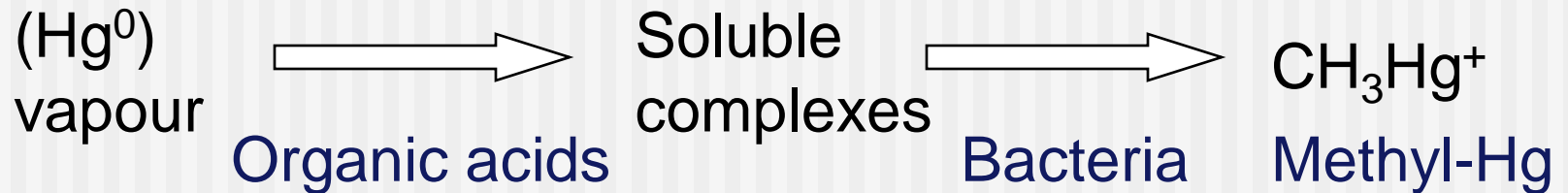
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- Hg<sup>2+</sup> binds to proteins (affinity for proteins)
- Kidney mistakes protein w/Hg as glutathione (a good guy), and retains it
- Hg is concentrated in the kidneys
- Leads to kidney failure and/or death, can also damage central nervous system

# Mercury - in the environment

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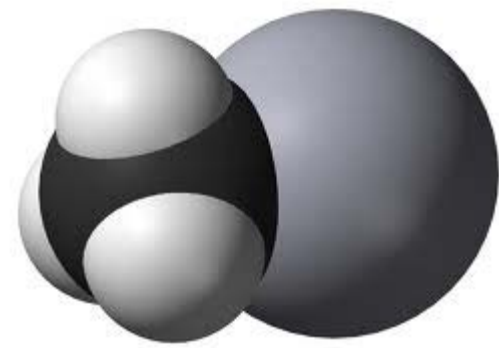
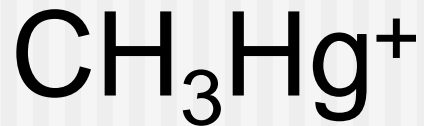


- Hg<sup>0</sup> is oxidized and transformed to Methyl-Hg @ the water-sediment interface
- Methyl-Hg is the most soluble, persistent, and toxic form of Hg (bio 1/2 life of 70 days in humans - vs 6 days for inorganic Hg)

# Factors Affecting Methylation

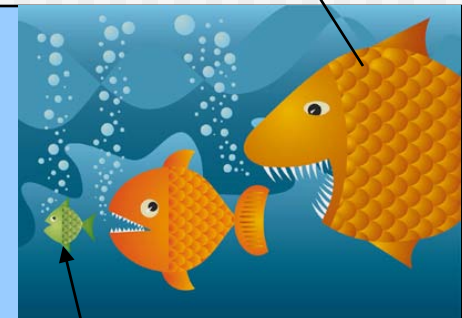
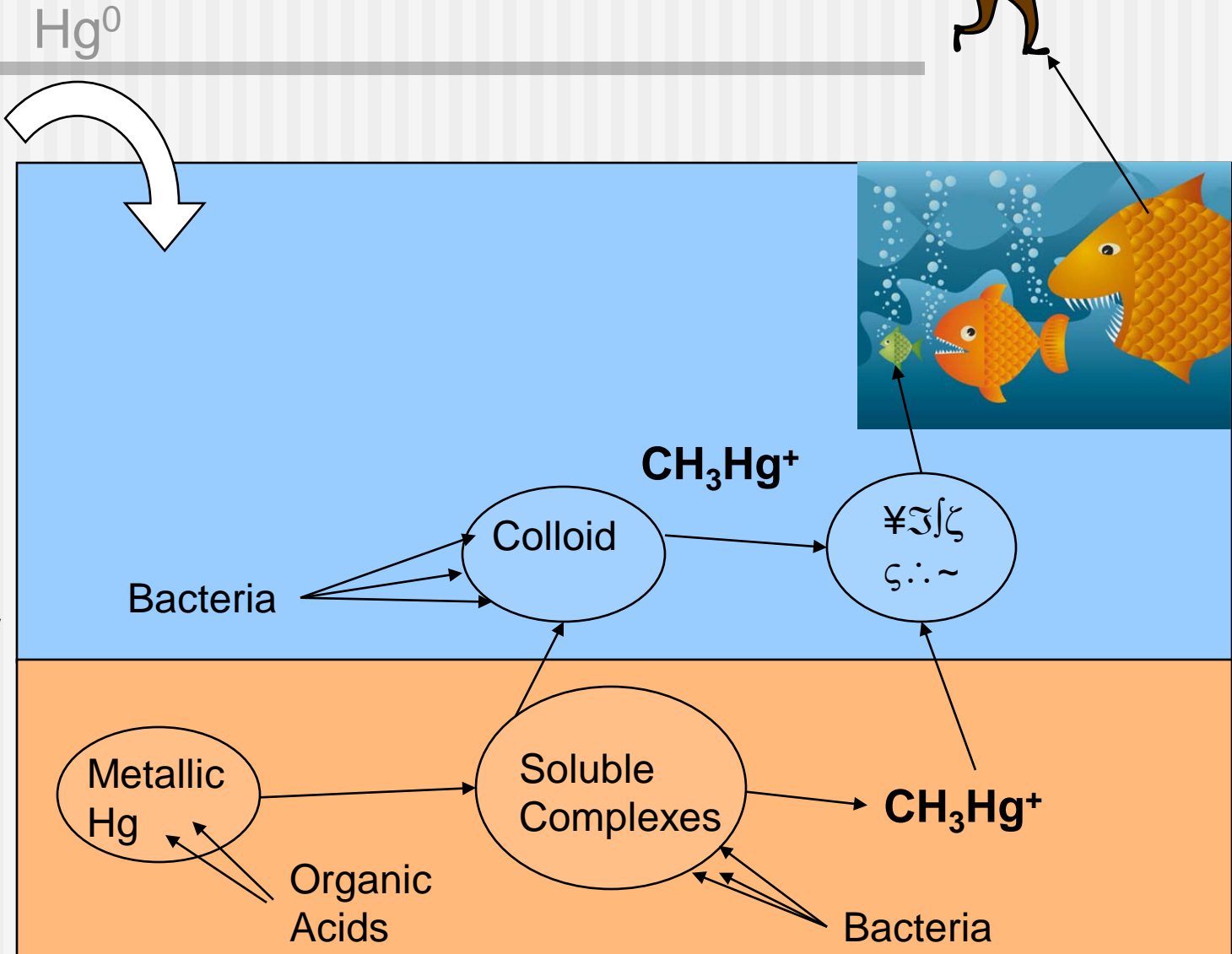
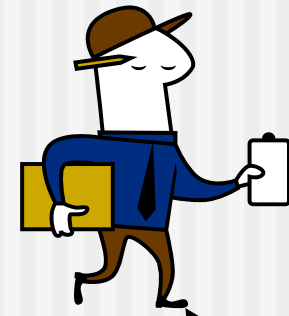
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- Low pH = stimulates  $\text{CH}_3\text{Hg}^+$  production, increases total Hg available for methylation (increased binding to particulates and decreased evaporation)
- High DOC (leads to methylmercury in fish even in pristine locations - eg. N.pike in LaGrande reservoir, Quebec)



- Affinity for proteins, moves readily across bio membranes, bioaccumulates in fish muscle tissue, and biomagnifies up the food chain
- Fish are tolerant (10x more so than humans) b/c they store Hg in muscles
- Bad news for those that eat the fish!
- Causes decrease egg hatching/growth, and death in fish when levels are very high

# The Process....



# Effects on Humans

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- Impaired hand-eye coordination
- Memory/ Speech loss
- Lowers IQ
- Blurred vision, blindness
- Teratogen (babies born w/twisted limbs)
- Kidney damage
- Cancer
- Death
- .....



# Mercury

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- Kidneys = affected organs w/ moderate duration exposure to moderate levels
- Brain = receptor in long-term exposure to moderate levels