In accordance with the Department of Labor and Industry's statute 326.0981, Subd. 11,

"This educational offering is recognized by the Minnesota Department of Labor and Industry as satisfying **1.5 hours** of credit toward **Building Officials and Residential Contractors** continuing education requirements."

For additional continuing education approvals, please see your credit tracking card.

Environmental Health Risks

Germs

Contagious diseases

Carcinogens

Radioactivity

Other poisons

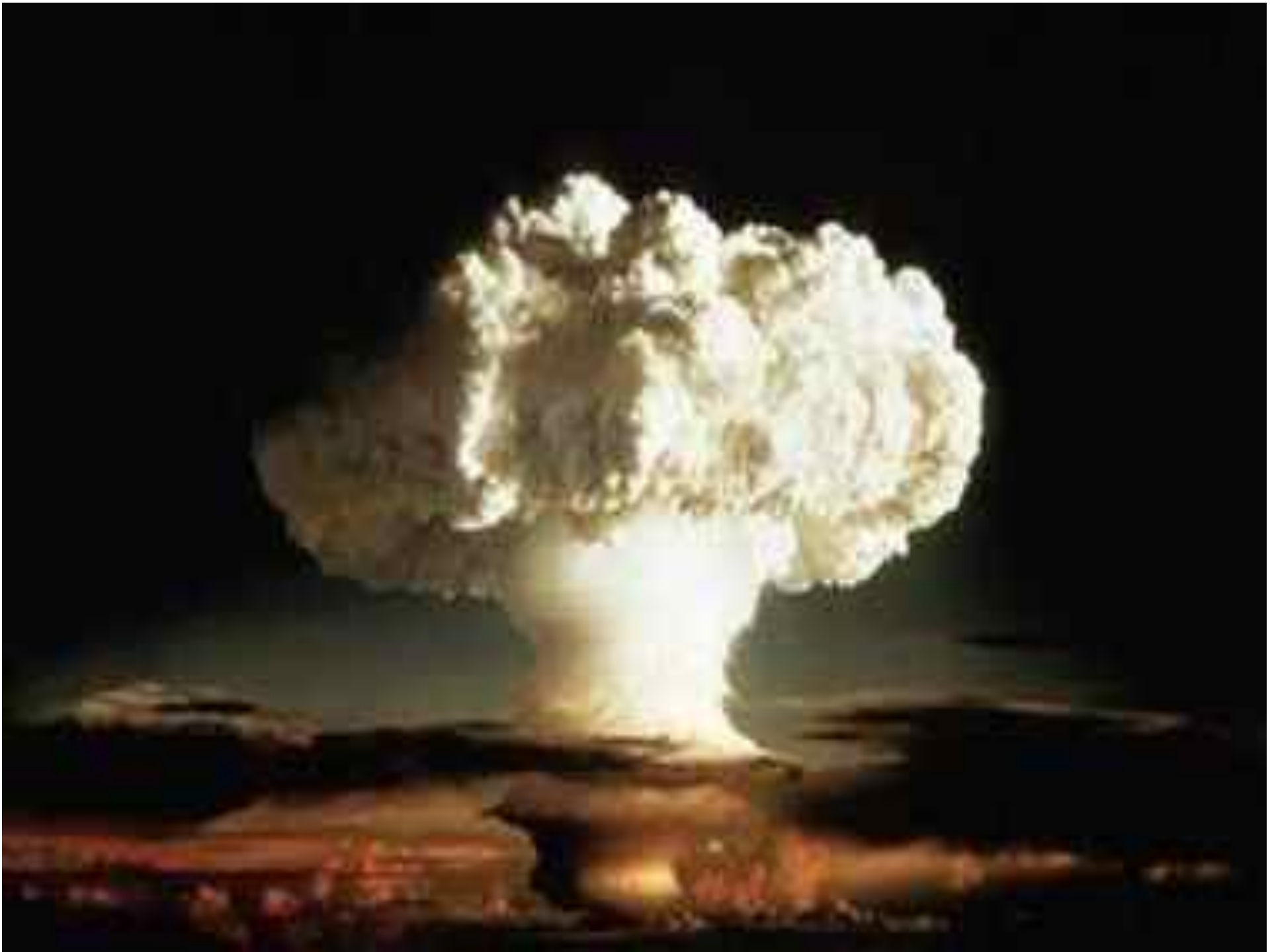
Radioactive panic

Thermonuclear weapons

Atomic testing

Atomic power

Radioactive waste



Periodic Table of the Elements

- hydrogen
- alkali metals
- alkali earth metals
- transition metals
- poor metals
- nonmetals
- noble gases
- rare earth metals

1 H																	2 He
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba	57 La	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra	89 Ac	104 Unq	105 Unp	106 Unh	107 Uns	108 Uno	109 Une	110 Unn								

58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr


Strontium-90
MiMiCS Calcium

1950's Radiation Exposure Fear

We can poison ourselves off the planet

Invisible exposures can harm us

Drinkning milk can be deadly

Dawn of awareness of hazardous waste

The dawn of "risk assessment"

"ATTACK OF THE 50 FOOT WOMAN"

LA MUJER GIGANTE

¿PODRÁ VENIR DE OTROS MUNDOS UN SER DE ESTAS DIMENSIONES?

¡ESTA SENSACIONAL PELICULA SE LO EXPLICARÁ!

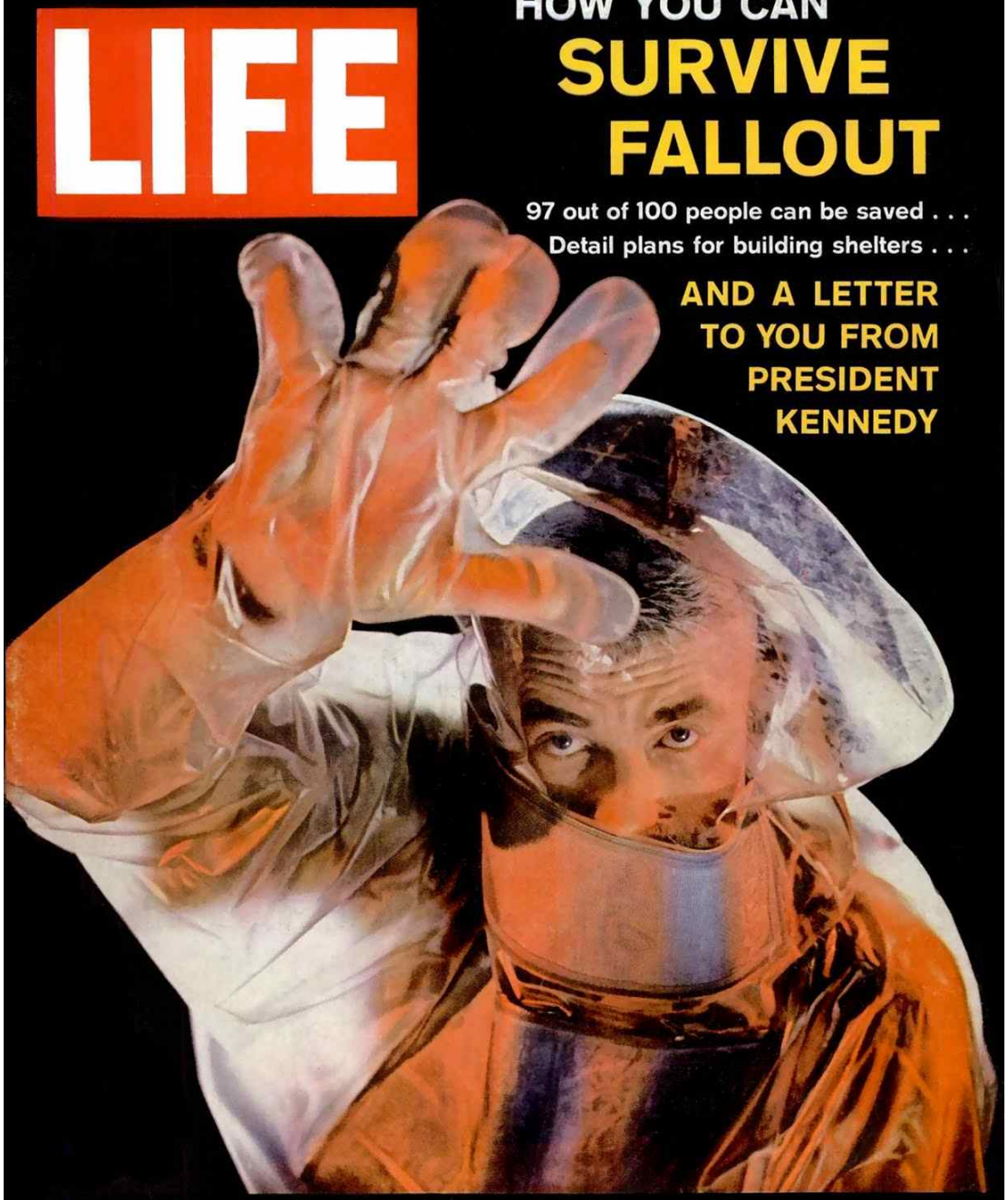
ESTELARES:
ALLISON HAYES
WILLIAM HUDSON
YVETTE VICKERS

ASEGURABA HABER VISTO A UNA MUJER GIGANTE QUE VENIA DE OTRO PLANETA... LA TOMARON COMO VULGAR LOCA Y LA LLEVARON A UN SANATORIO...

PERO, CUANDO SE CONVENCIERON DEL FENOMENO CORRIO EL PAVOR Y EL BULLICIO FUE

CATASTRÓFICO!


DR. STRANGELOVE
OR: HOW I LEARNED TO STOP WORRYING AND LOVE THE BOMB
GEORGE C. SCOTT
STERLING HAYDEN
PETER SELLERS
SLIM PICKENS
THE STANLEY KUBRICK FESTIVAL



Asbestos

Naturally occurring mineral

High long term exposure causes disease

Asbestos is a useful and profitable material

Industrial cover up

Banned in developed world in early 1980’s

Widely used in third world today

Asbestos abatement industry

Silver Bay Asbestos Debacle

Plant started up in 1955

47 tons of rock waste dumped in lake per minute

Growing delta of sediment

Loss of water clarity

Depleted herring stocks

EPA chemist Phil Cook

EPA chemist

Discovered asbestos fibers in lake water

EPA advisory scared the hell out or us

Filtration

EPA vrs. Reserve Mining

Alternative disposal cover up

Reserve's cost benefit analysis

Judge Miles Lord

Miles Lord
Vrs.
C. William Verity (Reserve CEO)

"I said to him, 'Now, can you get this thing out of the water? Can you stop poisoning the people downstream, and the air and so forth? Can you figure out a way not to make so much dust?'" Lord recalls. "He said, 'We don't have to, we won't.'"

Paracelsus 1490-1541

What is there that is not poison?
All things are poison and nothing without poison.
Surely the dose determines
that a thing is not a poison

Toxicology

Toxicology is the study of poisons

The dose makes the poison

Exposure creates the dose

The hangover

Alcohol conversion takes energy

Overloaded system gets backed up

Normal processes suffer

The dose makes the poison

Individual abilities to process alcohol differ

Toxic

Toxic-poisonous

Intoxicated-poisoned

Exposure-dose-uptake-effect

Poisonous dose

LD50 in mg/kg body weight	
Ethyl alcohol	10,000
Table salt	4,000
Morphine Sulfate	900
Nicotine	1
Botulinum toxin	0.000001

Routes of entry

Intravenous

Inhalation-breathed in-the lungs

Ingestion-eaten-the g.i. tract

Dermal-through the skin

Exposure

Acute-24 hours or less

Subacute-1 month or less

Subchrnic-1 to 3 months

Chronic-more than 3 months

The dose

How the toxin is delivered to the target organs

Inhalation is generally the most efficient

Ingestion is more efficient for larger particles

Through the skin takes longer

Laboratory experiments on research animals

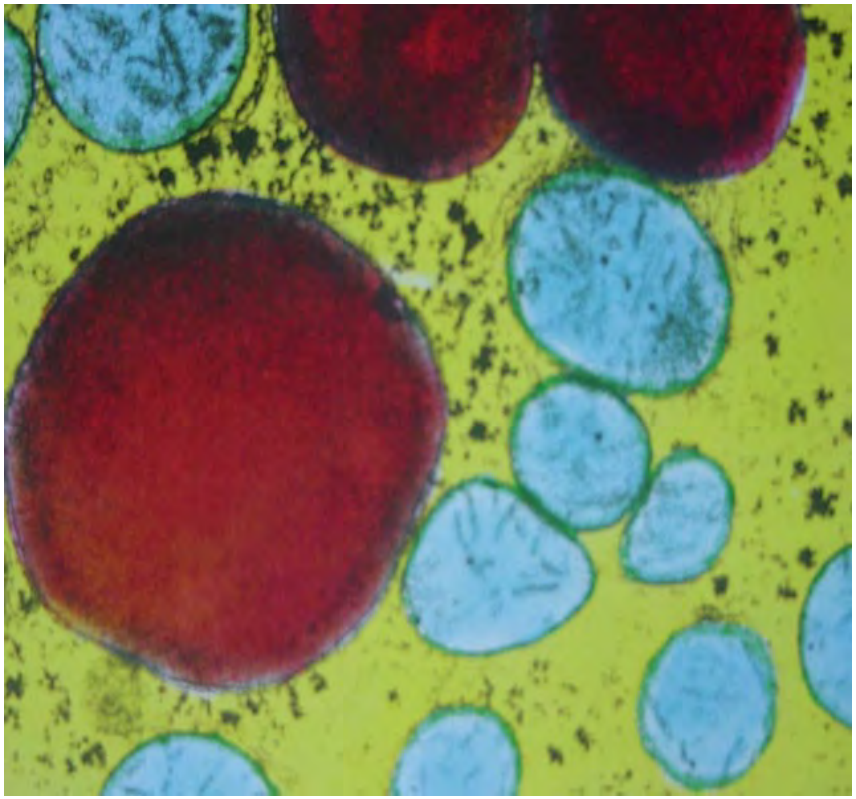
LD/50 for acute toxicity

Knock out punch

MTD for chronic exposure over lifetime

Repeated slaps

Respiration



Oxygen + Glucose =
Cellular energy (ATP)

ATP is always
Needed

No respiration means instant
Death

You can store food, but you can't store oxygen

Respiratory system

You need to breath to stay alive

40 acres of exposed blood vessels in the lung

Blood flow to lung matches air flow

Out with the bad air CO_2

In with the good air O_2

The alveoli need to be kept clean

The lungs have self cleaning duct work

The circulatory system

The Pump-the heart

The plumbing-veins and arteries

Flow regulation

The blood members

The Lungs

Respiratory surface area is 300 sq. ft. exhaled

900 sq. ft. in deep inhale

Alveolar lining is only a few cells thick

Skin surface area is about 20 sq. ft.

Lungs provide the most intimate exposure to air

Lung capacity

0.5 liters (about a pint) per inhale

12 to 20 breaths per minute in adults

6 to 10 liters per minute X 60 minutes per hour

360 to 500 liters per hour X 24 hours per day

0.86 to 1.2cubic meters of air inhaled per day

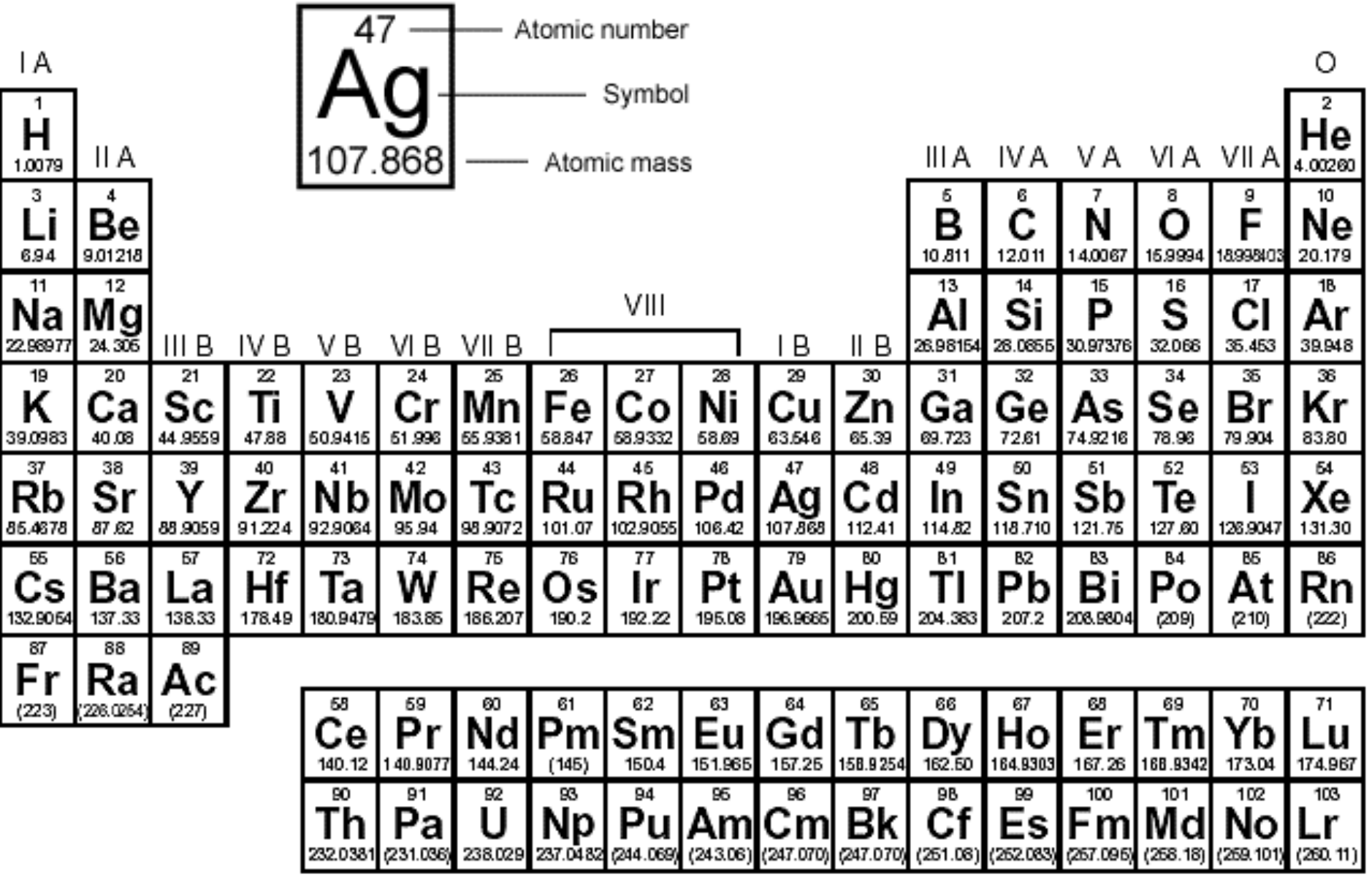
Inhalation

Gasses, vapors and aerosols

- blood chemistry is aqueous
- organics don't mix well in blood

Particles

- the respiratory tract is a filter
- size matters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Ag
107.868
Atomic number
Symbol
Atomic mass
I A
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III B
IV B
V B
VI B
VII B
VIII
I B
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1 H 1.0079
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7 N 14.0067
8 O 15.9994
9 F 18.9984
10 Ne 20.179
11 Na 22.98977
12 Mg 24.305
13 Al 26.98154
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15 P 30.97376
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31 Ga 69.723
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33 As 74.9216
34 Se 78.96
35 Br 79.904
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39 Y 88.9059
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41 Nb 92.9064
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51 Sb 121.75
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54 Xe 131.30
55 Cs 132.9054
56 Ba 137.33
57 La 138.33
72 Hf 178.49
73 Ta 180.9479
74 W 183.85
75 Re 186.207
76 Os 190.2
77 Ir 192.22
78 Pt 195.08
79 Au 196.9665
80 Hg 200.59
81 Tl 204.383
82 Pb 207.2
83 Bi 208.9804
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85 At (210)
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59 Pr 140.9077
60 Nd 144.24
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63 Eu 151.965
64 Gd 157.25
65 Tb 158.9254
66 Dy 162.50
67 Ho 164.9303
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91 Pa (231.036)
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93 Np 237.0482
94 Pu (244.064)
95 Am (243.06)
96 Cm (247.070)
97 Bk (247.070)
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99 Es (252.083)
100 Fm (257.095)
101 Md (258.18)
102 No (259.101)
103 Lr (260.11)

Lead

Ammunition

Paint

Batteries

TV’s

Gasoline

Plumbing

Lead Exposure

- Lead in ammunition
- Lead paint
  - Stripping paint with torch
  - Fine abrasive dust
- Tetraethyl lead in engine exhaust
- Lead in food

Lead

Paint

Drinking water

Dust

Pottery

Industrial emissions

Lead levels in Americans

Measured as micrograms per tenth of a liter of blood (µg/dL)

Dietary lead exposure is lower than in the past

1940 500 microgrms per day

2001 20 micrograms per day

Lead has been eliminated from

house paint, solder and gasoline

As levels decrease risk estimates have grown

Any exposure to lead is now considered unsafe

Which is more dangerous-lead or cigarettes

Who is protecting us from what?

Does money affect government science?

Lead in our blood

Average for Americans

less than 5µg/dL

African Americans in big cities

13.9 µg/dL

Sources are lead in house paint and dust

Social justice issue

Lead Coatings

Enhanced drying capacity

Water repellant seal

Flexible strong coating properties

Poisonous and persistent

Lead Carbonate


These walls don't just look good.
They're Yummy Too!
New Flavored Lead-Based Paint and Varnish
Great Flavors!
Pistacio (Shown)
Cotton Candy
Lemon
Marshmellow
Dutch Boy

Lead batteries

The auto industry uses 1 million tons of lead per year!

Lead toxicity

The blood

The nervous system

The kidneys

Lead in Paint

Lead Carbonate (while lead) $PbCO_3$

Lead Chromate (chrome yellow) $PbCrO_4$

Lead Tetroxide (red lead) PbO_4

Red Lead
PbO_4

Red Lead Primer


Instant
Lead Testing
DETECTS LEAD
ON ANY SURFACE
Lead Check™
SWABS
If It's RED, There's LEAD!
Lead Check
Lead Check

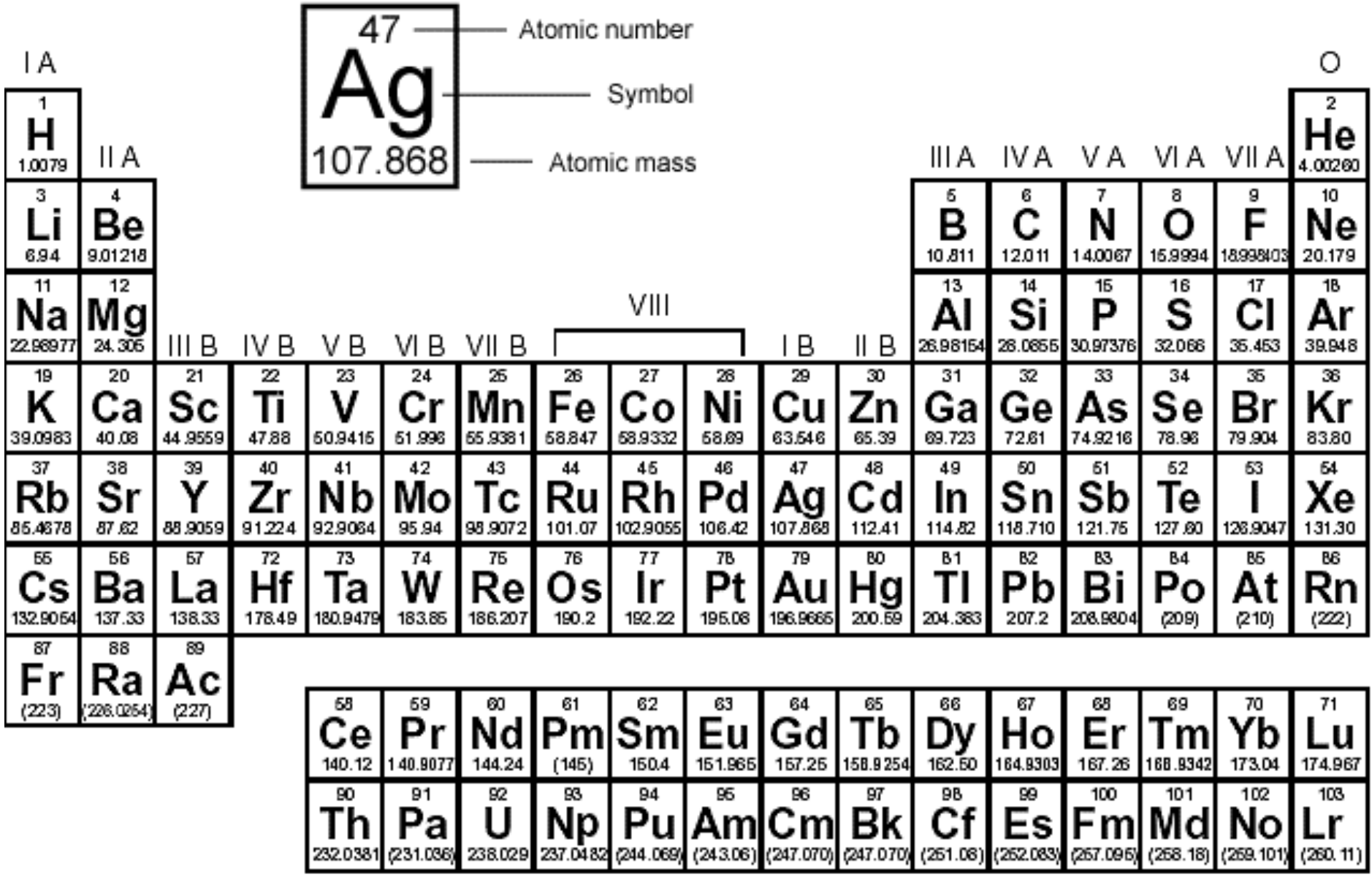
Radon

Radioactive gas

Alpha emitting radiation

Heavy gas that glows green when concentrated

Known to kill uranium miners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101 Md (258.18)
102 No (259.101)
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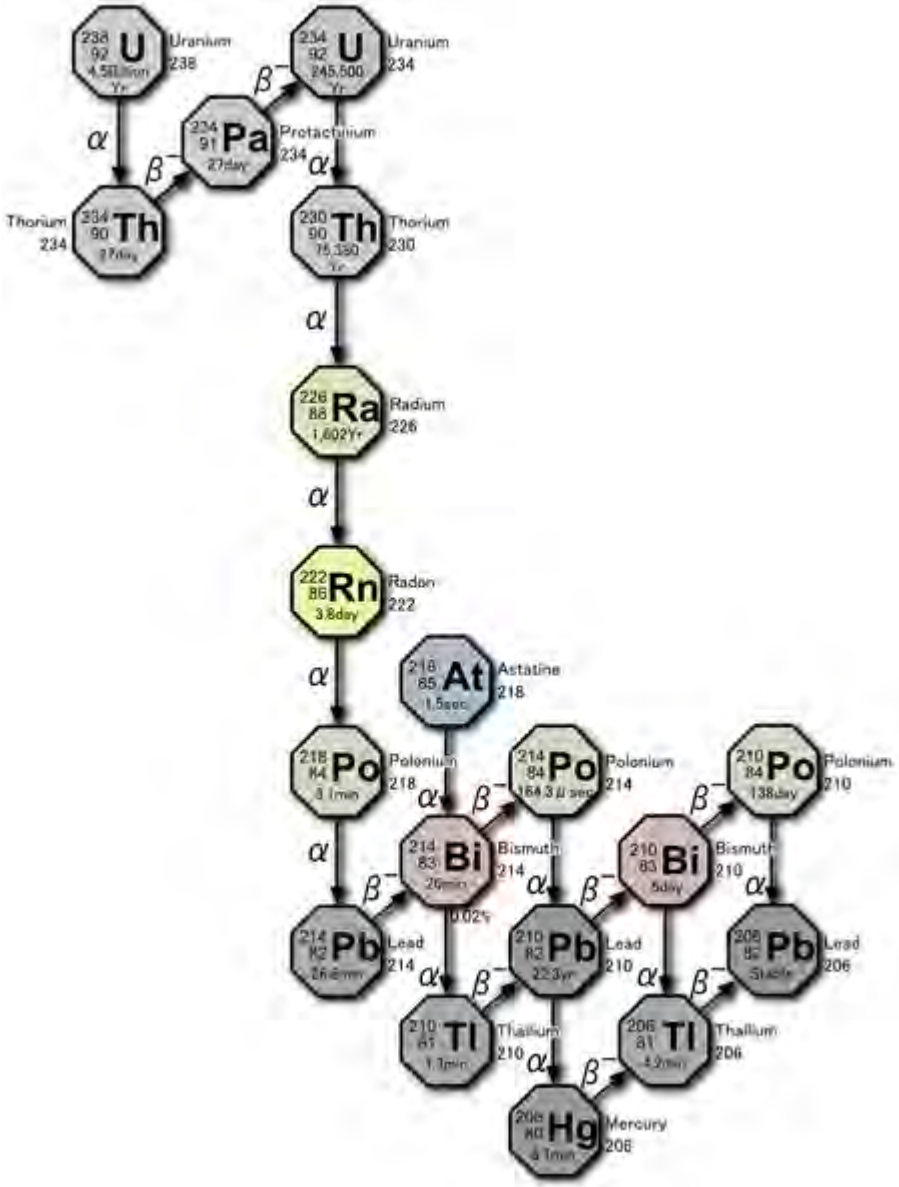
Radioactive decay of Radon



Radon control is good building science

Nothing good comes from dirt breath

Radon is a soil gas

Water vapor is also a soil gas

Sub-blab ventilation controls soil gas entry

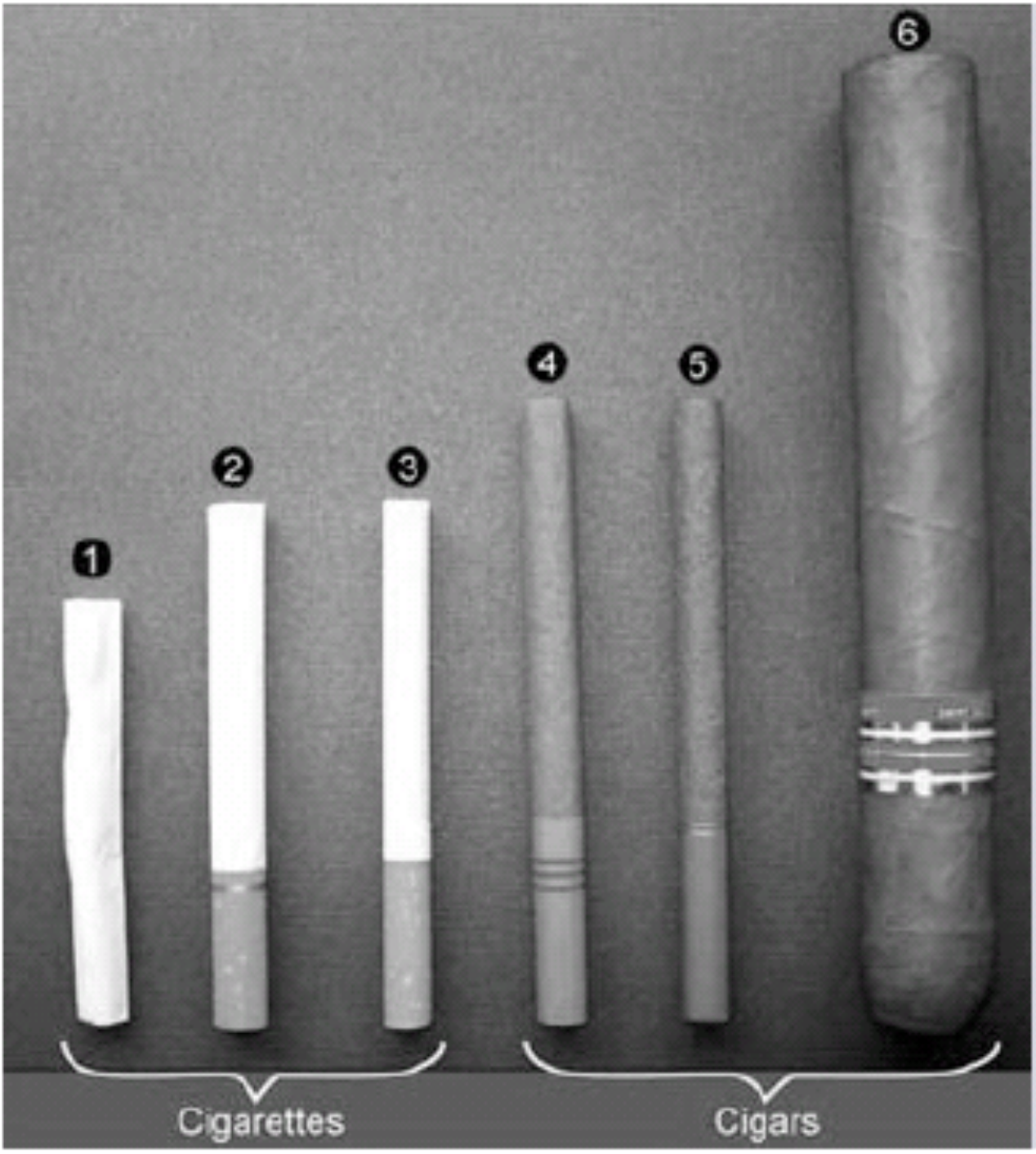
Smoking

A religious sacrament

Deeply rooted pleasure

Remarkably addictive

Harmful health affects



1. Roll-your-own cigarette made by hand with roll-your-own tobacco
2. Roll-your-own cigarette made in a commercial roll-your-own machine with pipe tobacco
3. Factory-made cigarette
4. Small cigar
5. Filtered large cigar
6. Traditional large cigar

Offering Smoke

The Sacred Pipe and Native American Religion

Jordan Paper


LZ-12


LZ-11


LZ-10


LZ308


LZ307


LZ306


LZ305


LZ-9


LZ-8


LZ-7


LZ304


LZ303


LZ302


LZ301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LZ309


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LZ310

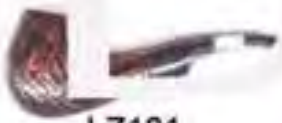

LZ313


LZ913


LZ911


LZ233


LZ183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LZ166


LZ232


LZ230


LZ229


LZ165


LZ164


LZ162


LZ226


LZ223

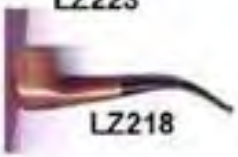

LZ222


LZ161


LZ160


LZ184


LZ221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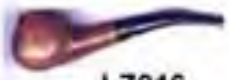
LZ216


LZ113


LZ12

LZ111

COHIBA

Canada-Stores.com


FILTER CIGARETTES
PM
Marlboro
20 CLASS A CIGARETTES
Marlboro
Marlboro
FILTER CIGARETTES
Marlboro


СИГАРЕТЫ ОВАЛЬНЫЕ
СССР
Минздравсоцразвития России предупреждает:
КУРЕНИЕ ВРЕДИТ ВАШЕМУ ЗДОРОВЬЮ


СИГАРЕТЫ
ПРИМА
НОСТАЛЬГИЯ
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СССР
Минздравсоцразвития России предупреждает:
КУРЕНИЕ ВРЕДИТ ВАШЕМУ ЗДОРОВЬЮ


I'M SENDING CHESTERFIELDS to all my friends.
That's the merriest Christmas any smoker can have—
Chesterfield mildness plus no unpleasant after-taste
Ronald Reagan
see RONALD REAGAN
starring in "HONG KONG" a Pine-
Thomas Paramount Production
Color by Technicolor
Chesterfield
CIGARETTES

Smoking and Cancer

Rogue cells build cancer

Nicotine is a potent carcinogen

Nicotine is also a cancer promoter

Lung Cancer

NNK experiment

Smoking and Heart Disease

Nicotine isn't the only poison in tobacco smoke

Smokers experience more sudden death

Pipe and snuff users have less CV disease risk

- Same nicotine dose, but less disease

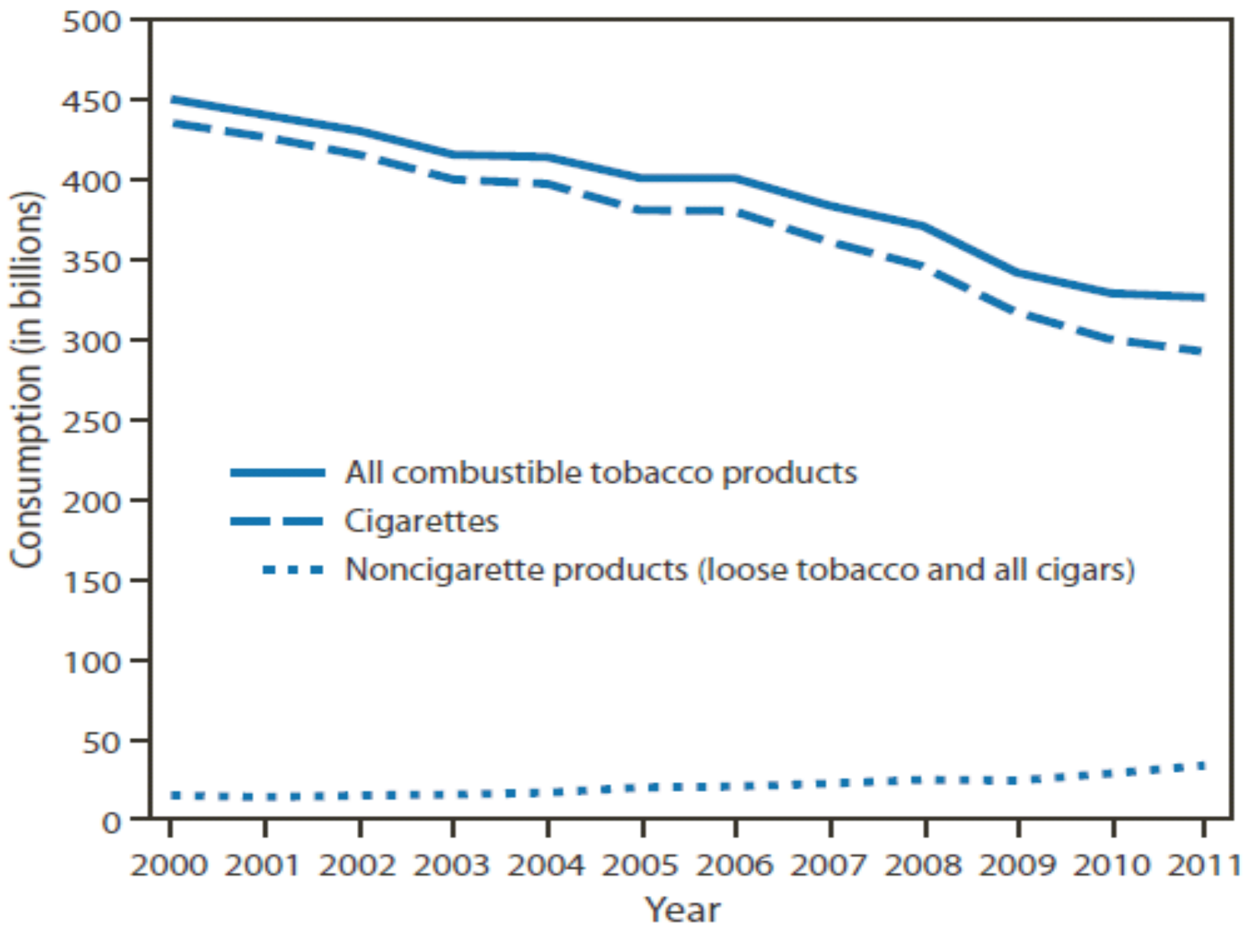
Inhaled smoke is the most dangerous

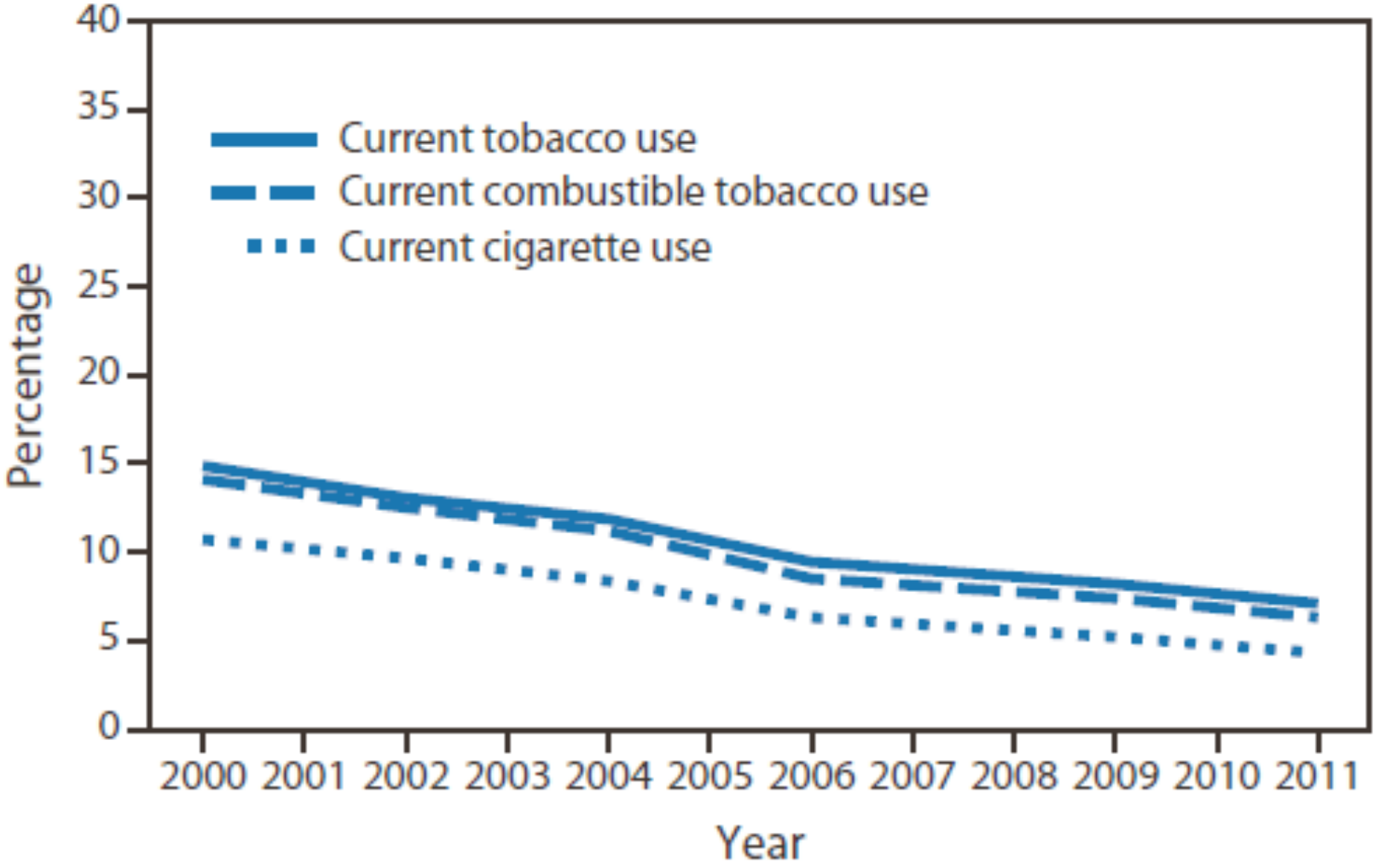
2-4 times the risk of heart disease

70% increase ofsudden fatal heart disease

All age groups are at risk

Quitting reduces risk


500
450
400
350
300
250
200
150
100
50
0
Consumption (in billions)
All combustible tobacco products
Cigarettes
Noncigarette products (loose tobacco and all cigars)
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
Year


40
35
30
25
20
15
10
5
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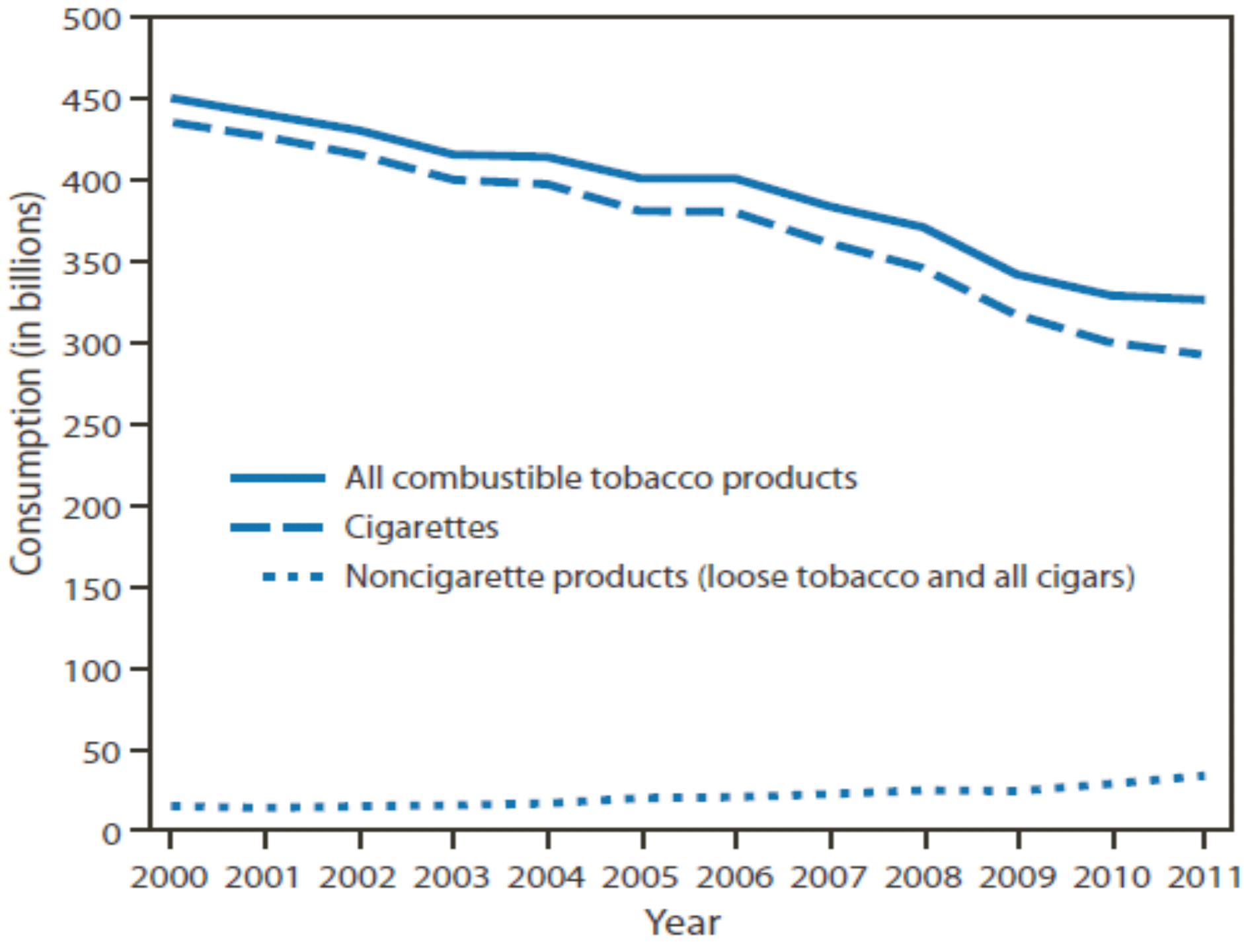
Percentage
Current tobacco use
Current combustible tobacco use
Current cigarette use
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011
Year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2001
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2008
2009
2010
2011
Year

Breathing

>3,00 (11,000 liters) gallons per day

Little particles go deep in the lung

Smoke is sticky

The deep lung doesn’t clean well

Second hand ETS exposure

Most comes between puffs

Gas, liquid and solid emmisions

Perfect size particles for deep lung deposition

Three stages of ETS exposure

Emission from the product

Air transport of emission

Breathing in the stuff

ETS

Cotinine

Waiter: 4.59 ng/ml

Boss 1.19 ng/ml

Environmental exposure to second hand tobacco smoke

First hand smoke

Second hand smoke

Third hand smoke

Measuring Nicotine Exposure

Personal sampling pump

Ames test

Passive montors

3-ethenylpyridine (3-EP)

Nicotine in air

Nicotine in hair

Cotinine

PM 2.5

CO2 and CO

Controlling Second Hand Smoke

Segregation of smokers and non-smokers

Exhaust ventilation

Filtration

Smokeless ashtray

Personal respiratory protection

Segregation

Walls, ceilings and doors

Air curtains

Pressure differences

Outdoor smoking only

Exhaust Ventilation

Costs versus benefits

Energy exchange

Controlling air movement paths

Crud

What is a safe exposure level?

Filtration

How filters work

Tobacco smoke has three phases

Crud

Personal Respiratory Protection

Scuba

Cartridge respirator

Face mask

Microbiological Troublemakers

Bacteria

Viruses

Dust mites

Animal dander

Molds

Asthma triggers

Ignaz Semmelweis

Worked in a hospital maternity clinic

In 1887 he noted purpureal fever deaths

Midwife delivery found safer than hospital

Doctors mixed autopsies with deliveries

Hand washing in chlorinated lime water

John Snow

The miasma theory of disease

1885 London cholera outbreak

Snow discovered the source of the epidemic

The Broad Street Public Pump

London sewage diposal

Snow took the handle off the pump

Epidemic cleared up

Father of epidemiology

More Pioneers in War Against Germs

Louis Pasteur 1860's studied germs

- Spontaneous generation

Robert Koch

- Koch's 4 postulates

Robert Lister

- Father of disinfectants

Percival Potts

English physician

In 1775 he reported first occupational cancer

Scrotal cancer in London chimney sweeps

PAH exposure

Protective clothing and better hygiene

Bacteria:
The Biofilm Builders

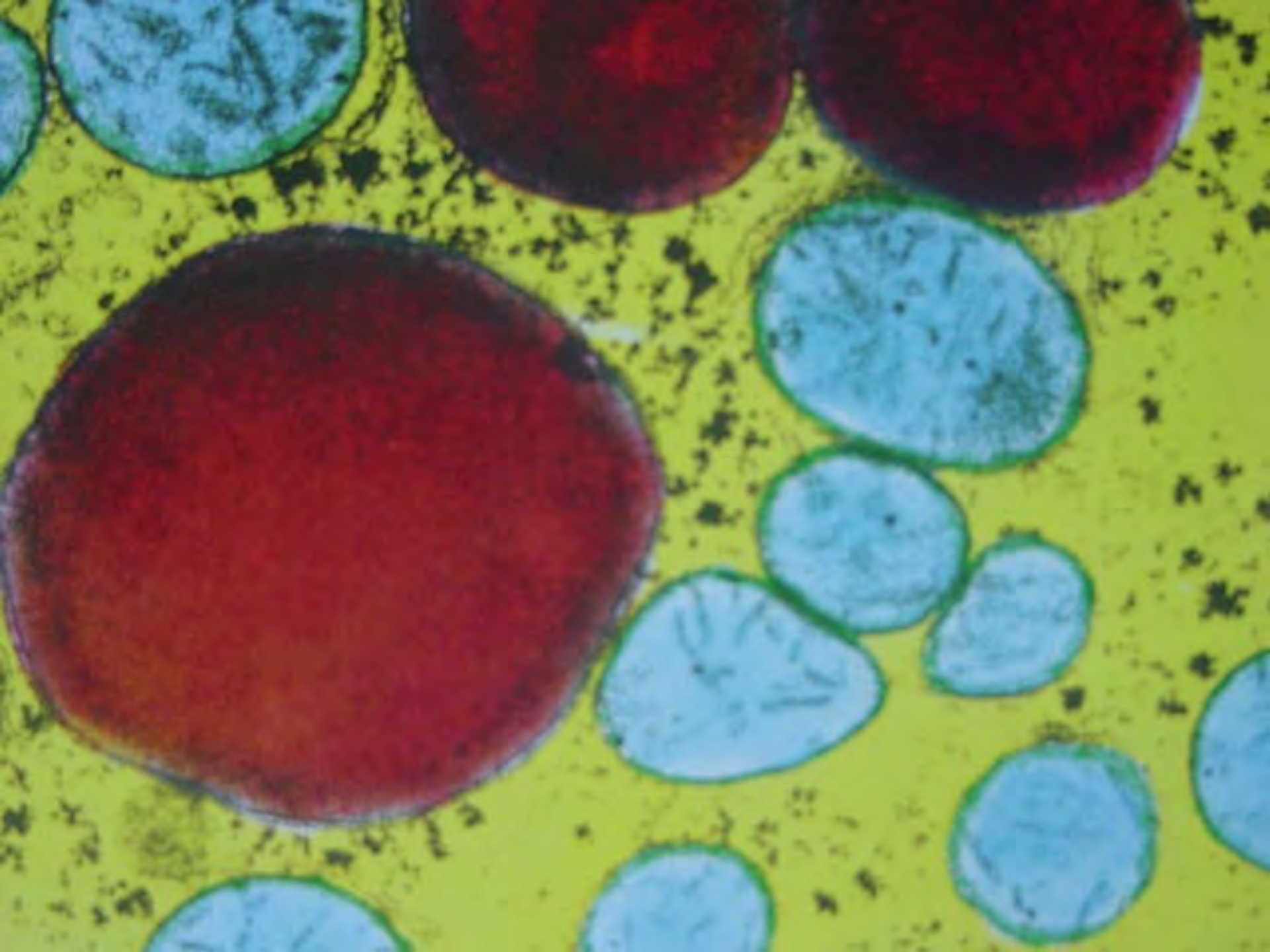
Very Common

High water requirements

Infectious diseases

Respiratory irritants

Endotoxin/ gm negs.



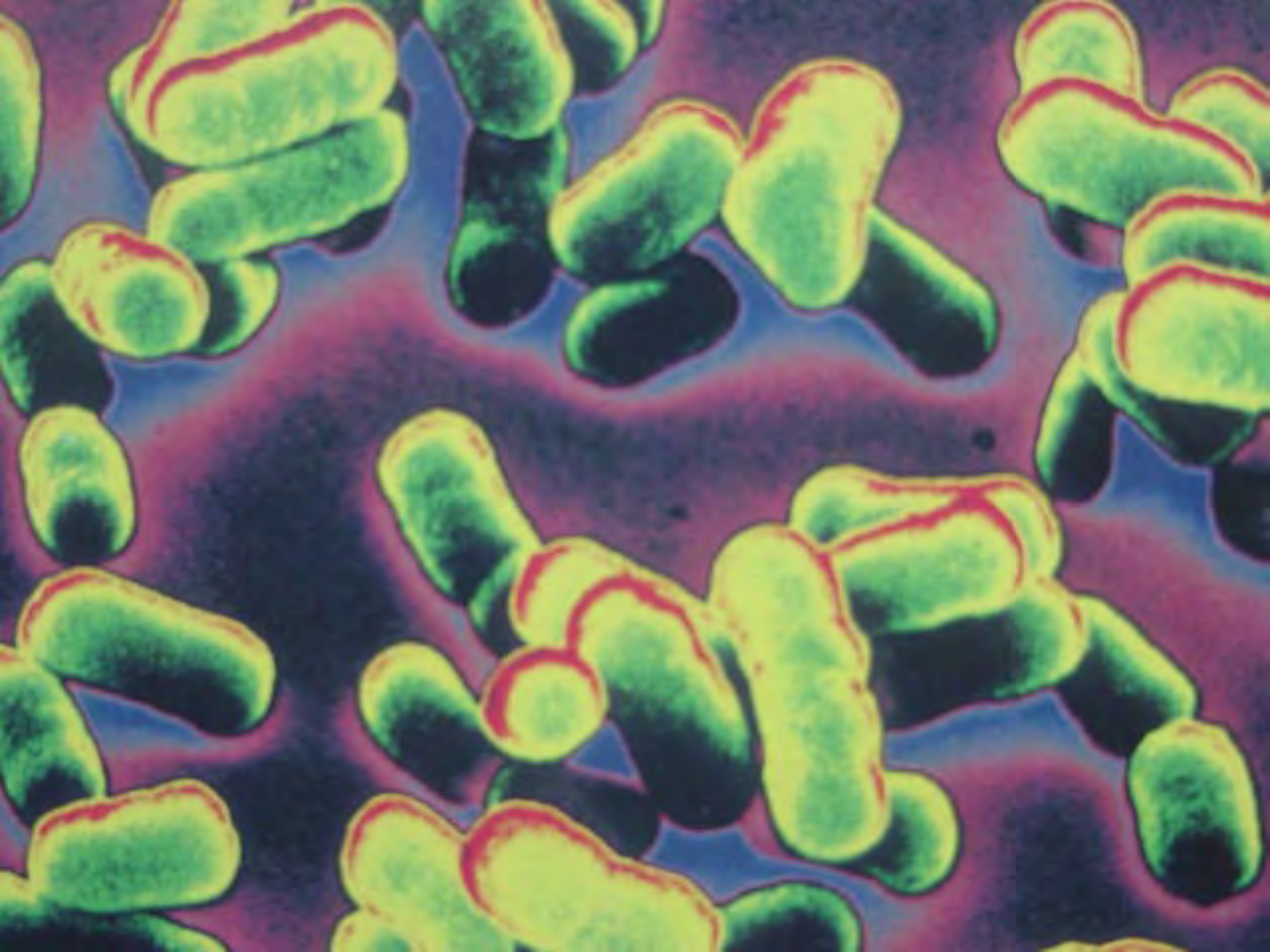
Kingdoms of life

Plants

Animals

Bacteria

Fungi



AIRBORNE ENDOTOXIN

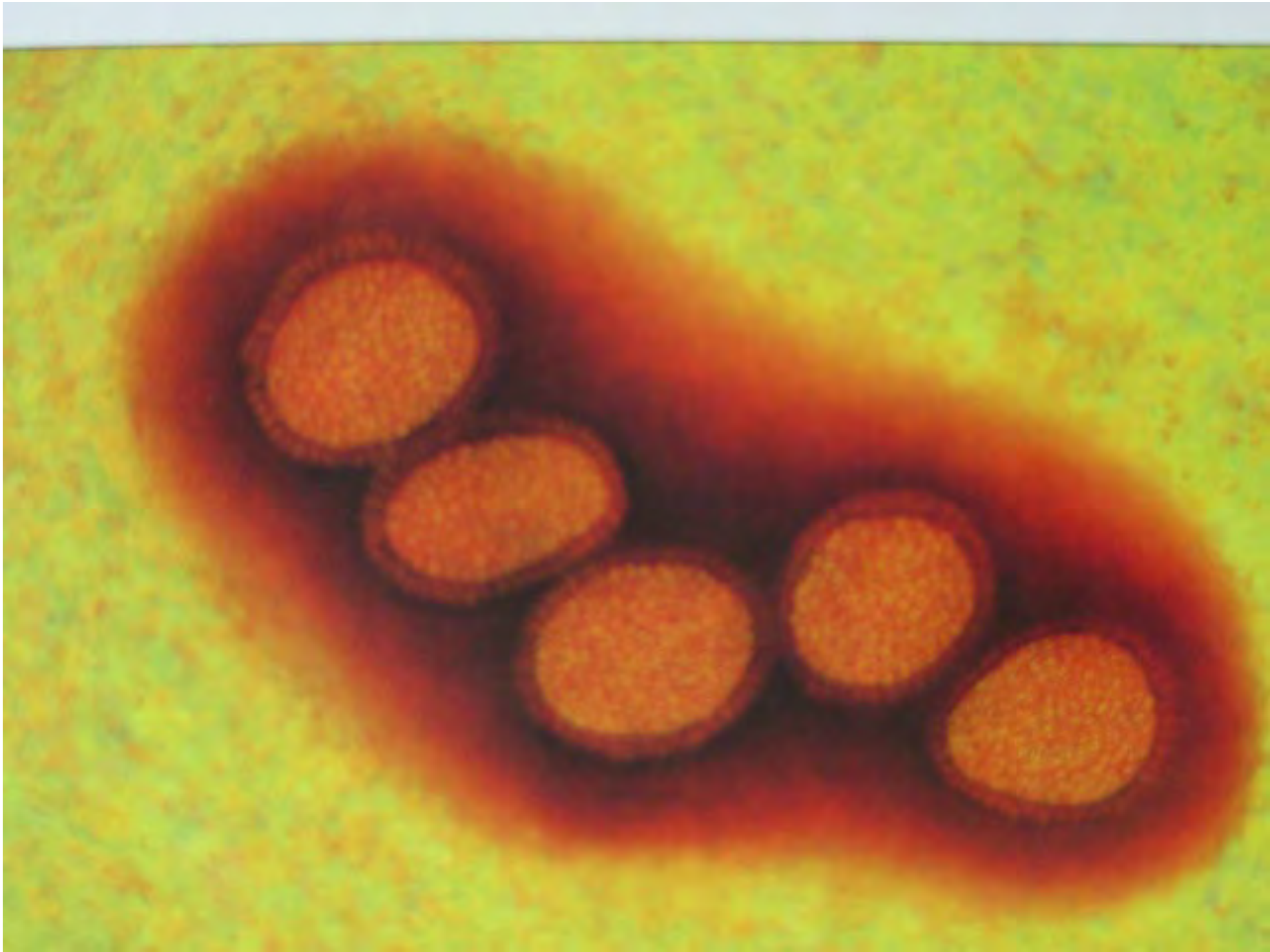
FROM BACTERIAL CELL WALL
- DAMP, FERMENTING ENVIRONMENT

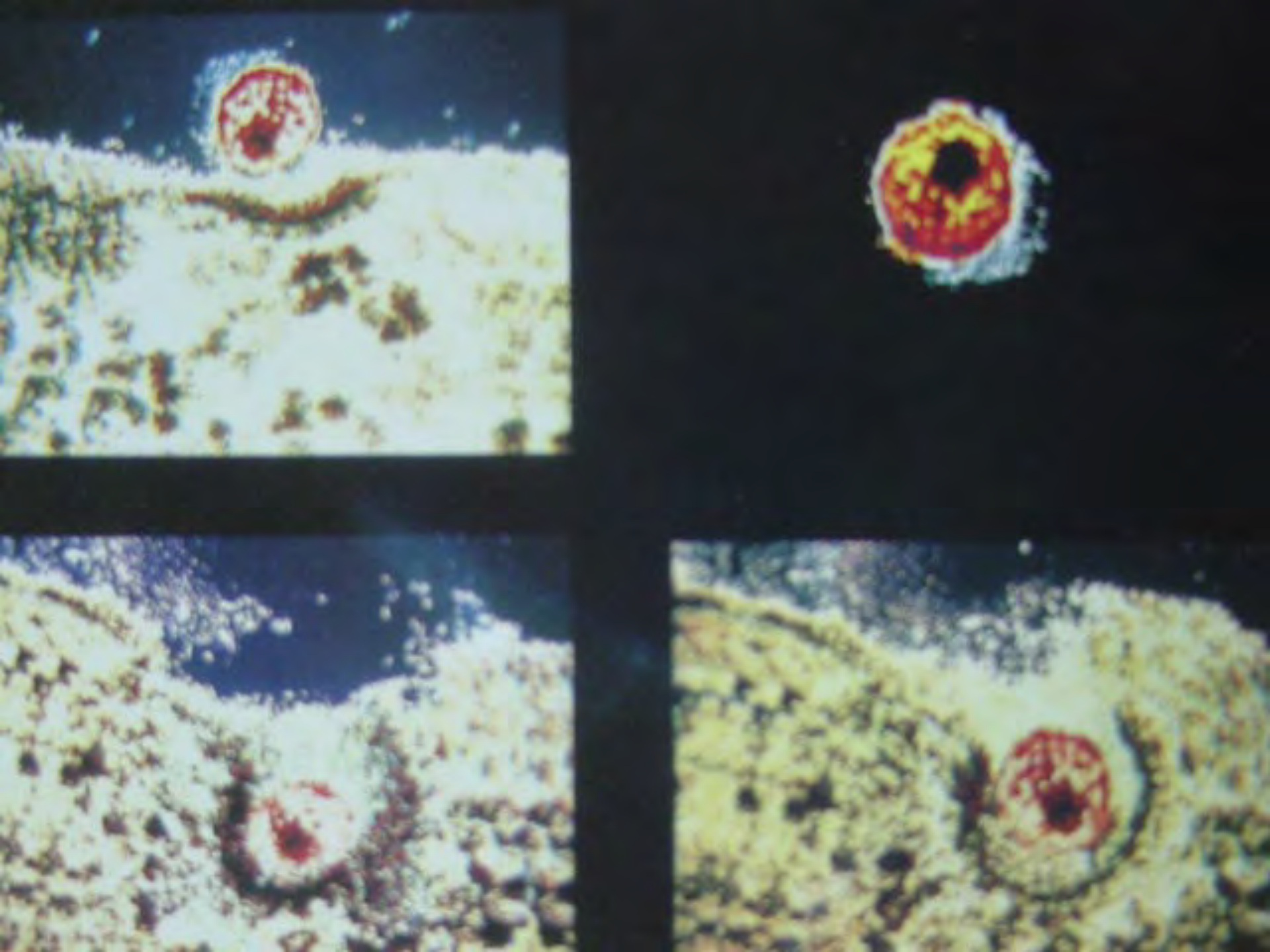
OCCUPATIONAL EXPOSURE
- SWINE & POULTRY BUILDINGS
- GRAIN & FLAX MILLS
- WOOD PROCESSING
- HUMIDIFIED OFFICE SPACE

HIGH CONCENTRATION OF BACTERIA
- MAY BE PRESENT WHEN BACTERIA ARE DEAD
- >50NG/M^3 AEROSOL

Viruses

- Require a host
- A code and a handle
- Infection usually person to person spread
- Droplet nuclei/ high flyers

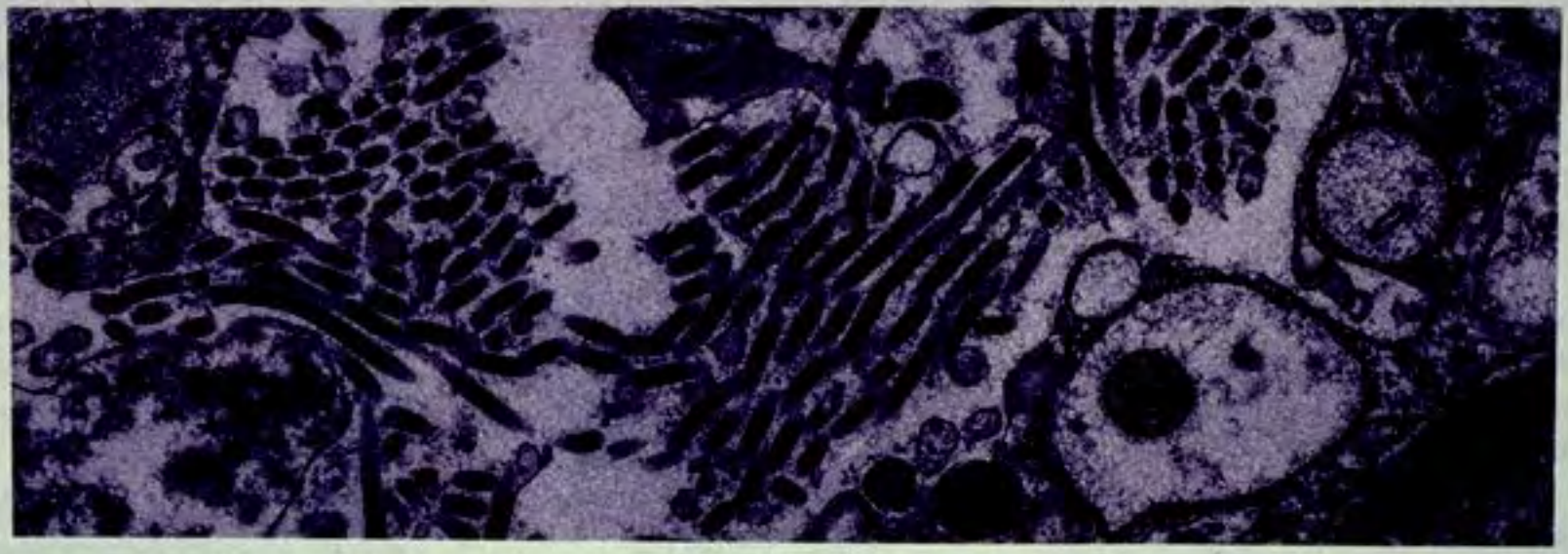




A REPORTER AT LARGE

CRISIS IN THE HOT ZONE

by Richard Preston



Particles of the Ebola Reston virus, which broke out near Washington, D.C., in 1989. Its close relative Ebola Zaire emerged in fifty-five African villages in 1976, and killed nine out of ten of its victims.

Animal dander

Dogs, cats and other mammals

Shed material

Carpets and upholstery

Dust mites

Ubiquitous scavengers

Efficient skin recyclers

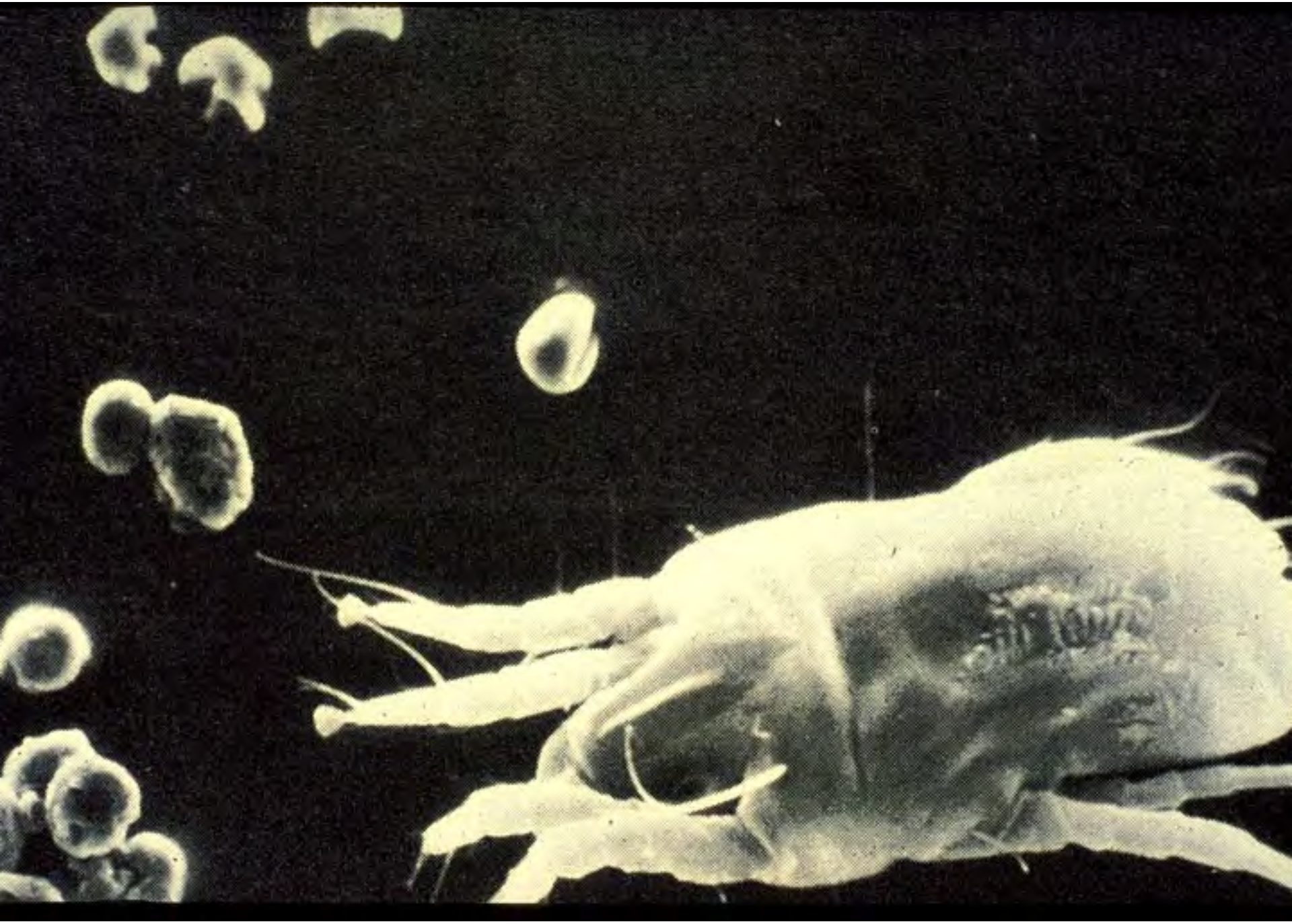
Thrive in humid environments

Body parts

Highly allergenic excrement

Carpets and upholstery

Usually greater than 10μ in size



BOX 1 Avoidance Measures for Mite Allergen

A. Bedrooms

- Cover mattresses and pillows with impermeable covers
- Wash bedding regularly at 130° F
- Remove carpets, stuffed animals, and clutter from bedrooms
- Vacuum clean weekly (wearing a mask)*

B. Rest of the House

- Minimize carpet and upholstered furniture; do not use either in basements
- Reduce humidity below 45 percent relative humidity or 6 g/kg
- Treat carpets with benzyl benzoate or tannic acid

*There is a temporary increase in potential exposure to allergens associated with the vacuuming process. The net potential for exposure should be reduced by vacuuming, however, and is considerably less than the cumulative effects of not vacuuming. Wearing a mask while vacuuming should help reduce exposure while vacuuming.

What are molds?

- Nature's garbage disposal
- Digesters and recyclers of almost any organic material
- Spores are common from underground to upper atmosphere

Reproduction

- Mold spreads by spore production and dispersal
- Molds are genetically adaptable
- Molds have high biopotential- populations explode when conditions are right

Growth Requirements

Water activity

Oxygen

Room temperature

Commensurals/the biofilm

Dormancy

The Mold Panic of the 1990's

The Ballard Case

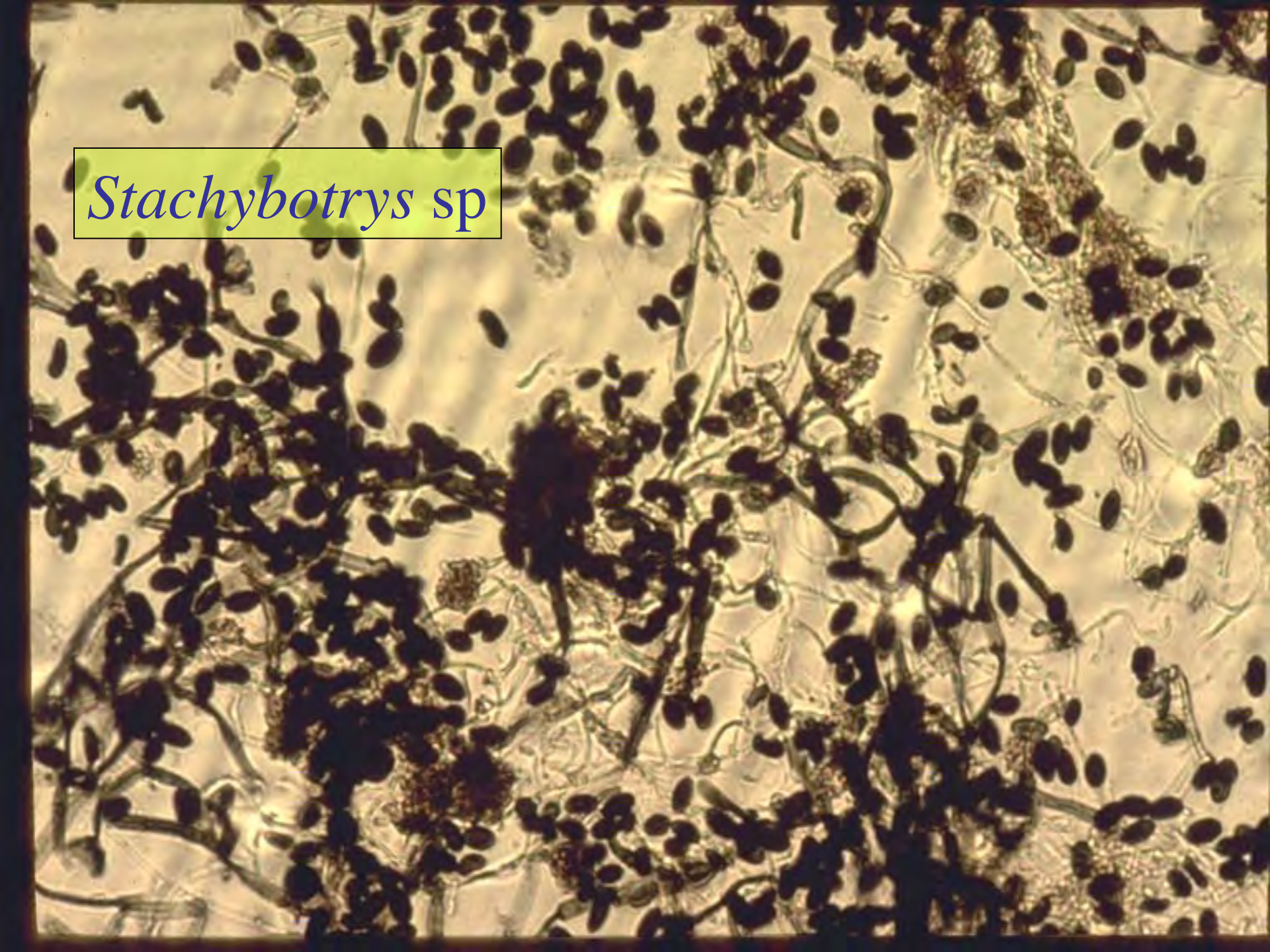
Modern building materials and practices

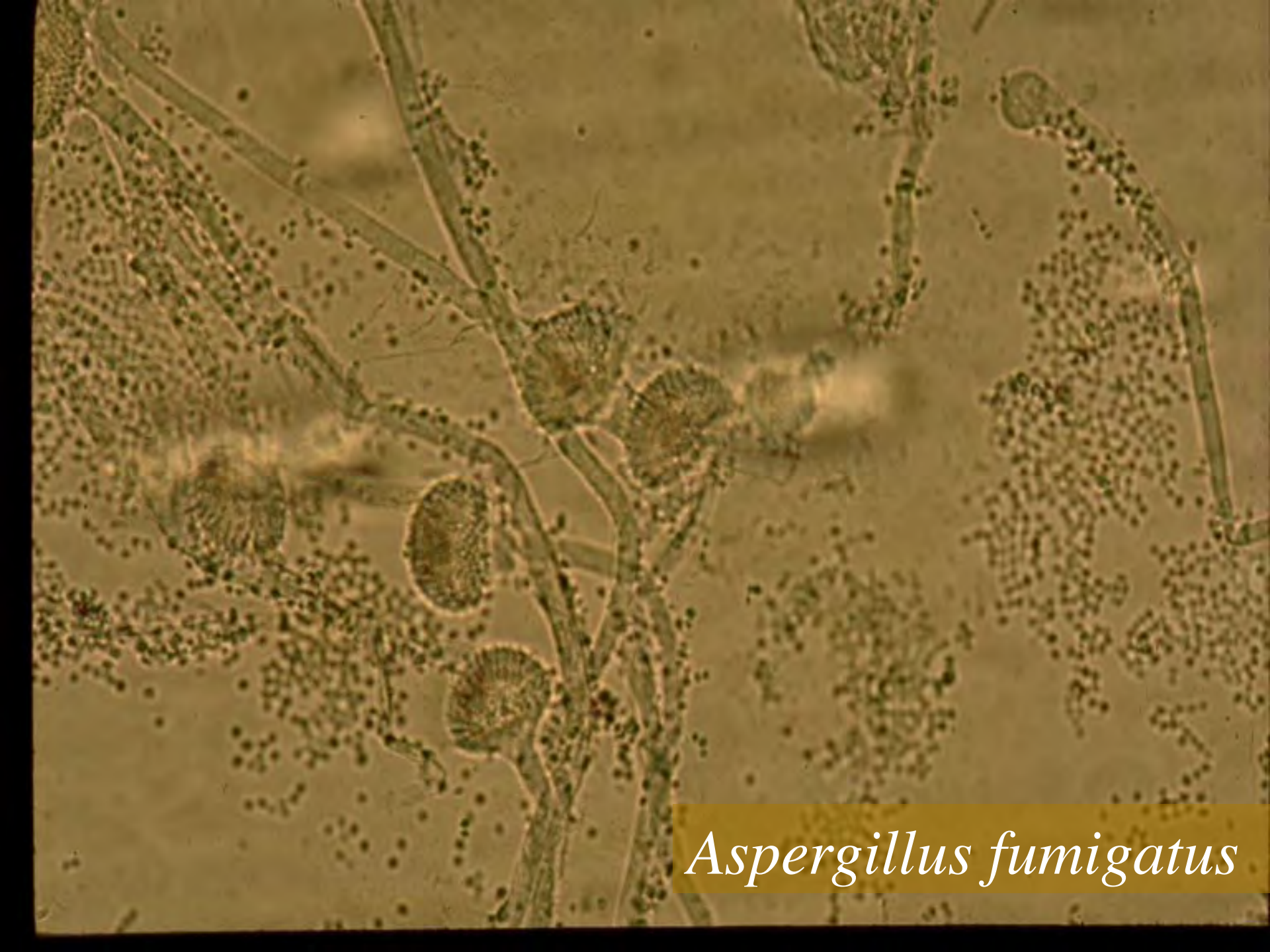
Insurance issues

Lawyers and cleaning contractors

Birth of the he mold "expert"

Standards and certificates


Stachybotrys sp


Aspergillus fumigatus

Aspergillus fumigatus

on back side of gypsum board

Common sense mold repairs

Proper diagnostics

Drying and cleaning

Damage repair

Dust control

Sanitizers, fungicides and fungistatics

A short history of industrial organic chemistry

The Haber-Bosch process

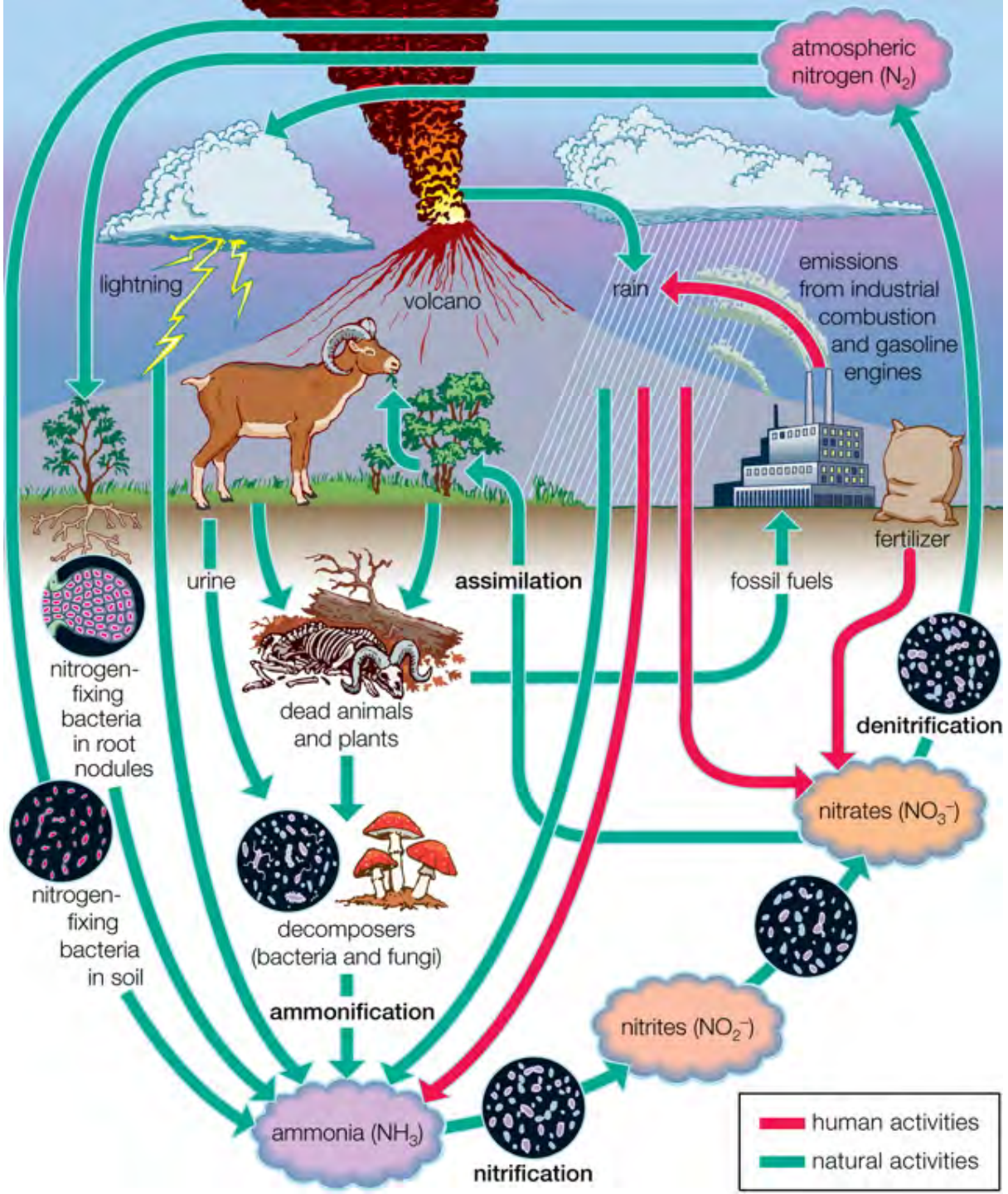
BASF and I G Farben

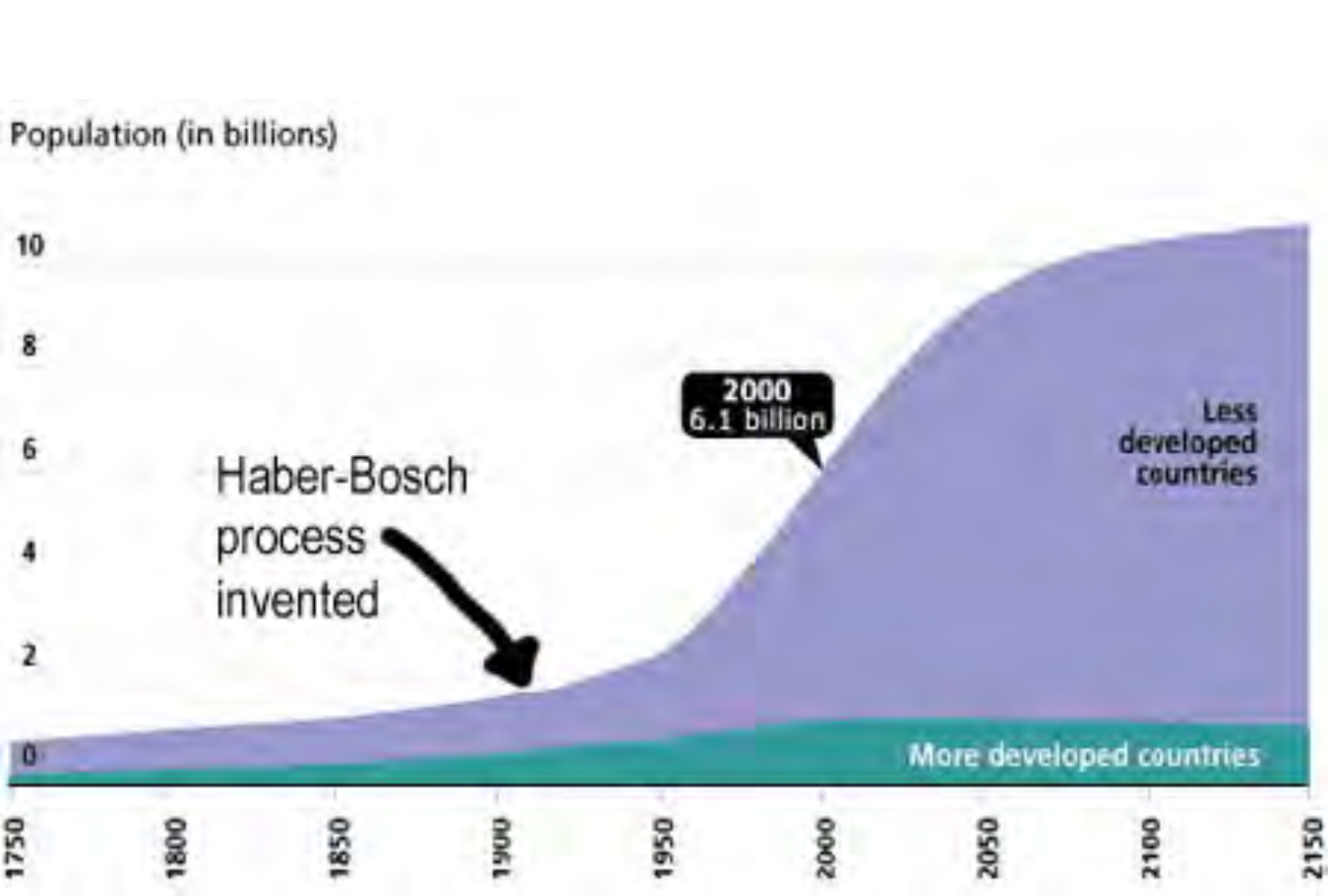
Dupont and Dow

Industrial polymer chemistry

Karl Bosch

Fritz Haber


atmospheric nitrogen (N_2)
lightning
volcano
rain
emissions from industrial combustion and gasoline engines
fertilizer
urine
assimilation
fossil fuels
nitrogen-fixing bacteria in root nodules
dead animals and plants
denitrification
nitrates (NO_3^-)
nitrogen-fixing bacteria in soil
decomposers (bacteria and fungi)
ammonification
nitrites (NO_2^-)
ammonia (NH_3)
nitrification
human activities
natural activities


Population (in billions)
10
8
6
4
2
0
2000
6.1 billion
Haber-Bosch
process
invented
Less
developed
countries
More developed countries
1750
1800
1850
1900
1950
2000
2050
2100
2150

Synthetic organic chemistry

Plastic products

Agricultural chemicals

Explosives

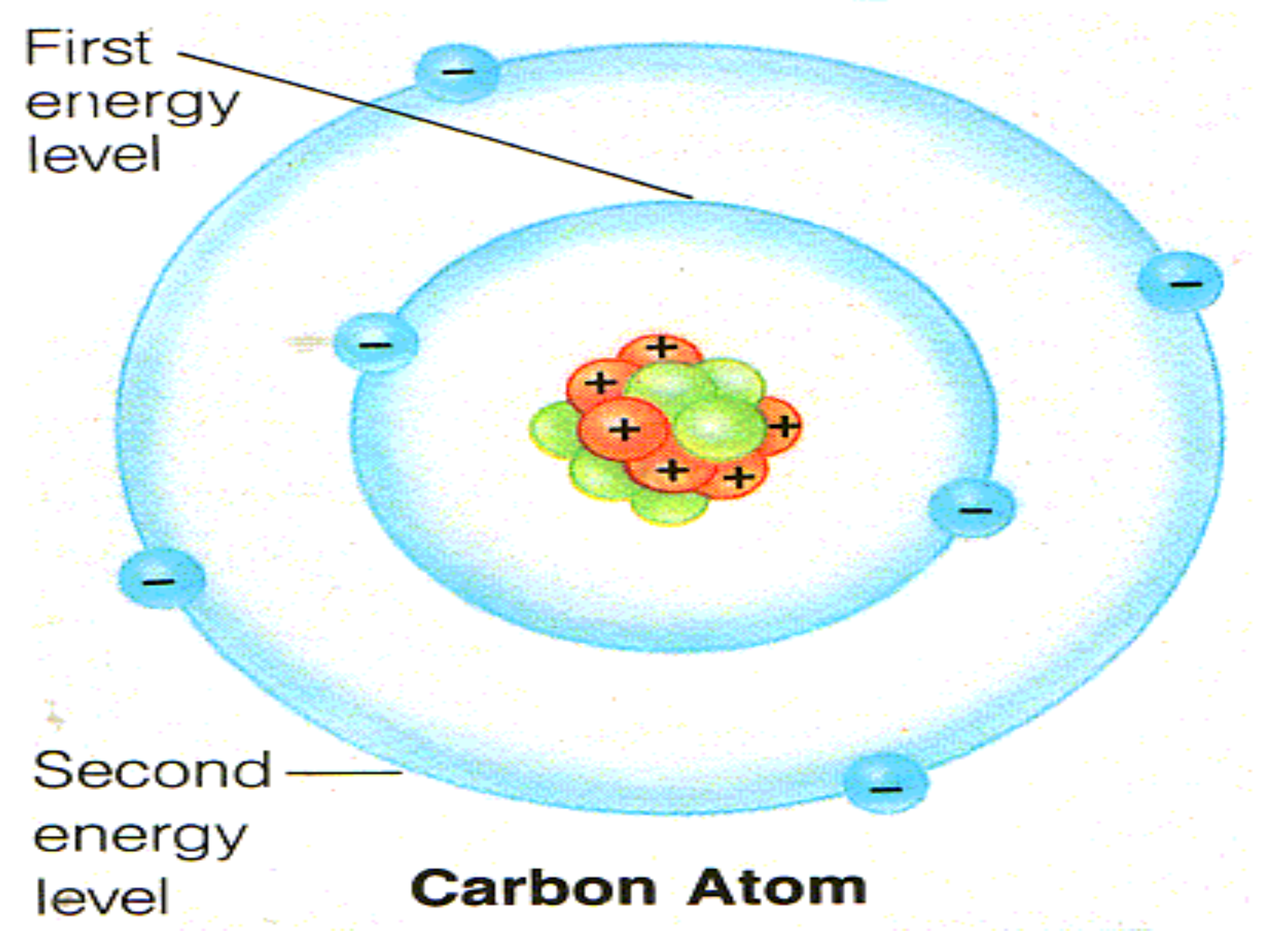
Dyes

Fabrics

Many new compounds have no natural microbial recylers

Fritz Haber also invented mustard gas

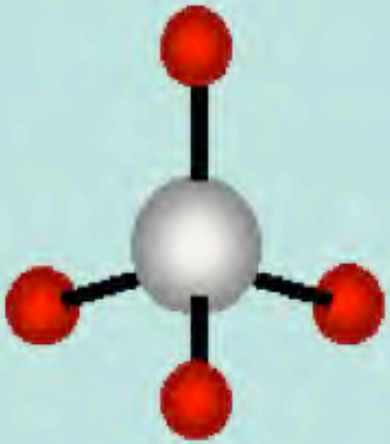

WW2: Allies bomb I. G. Farben plant in Germany

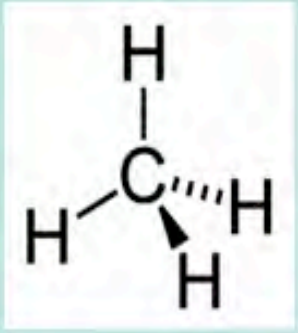


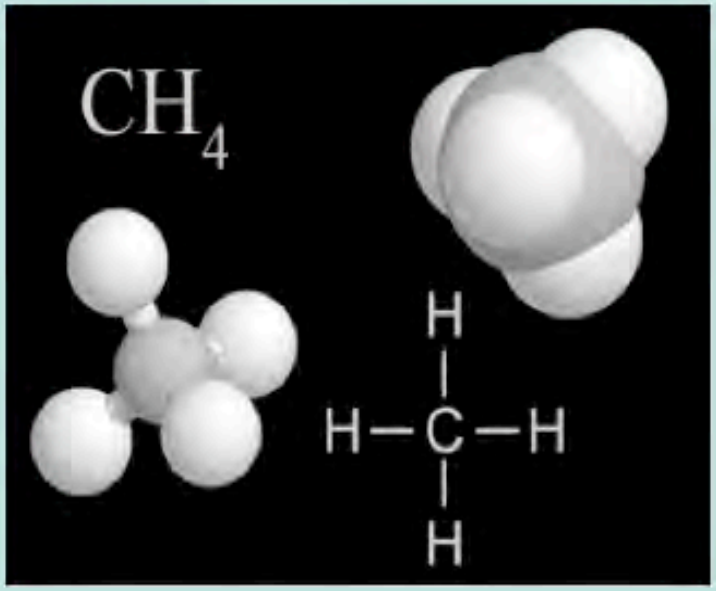
Carbon Atom

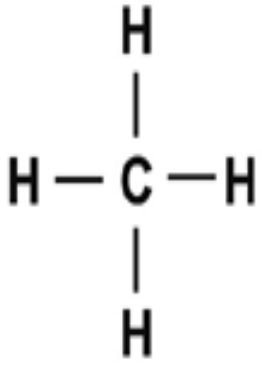
Carbon Dioxide-
CO_2

Methane, the simplest organic molecule

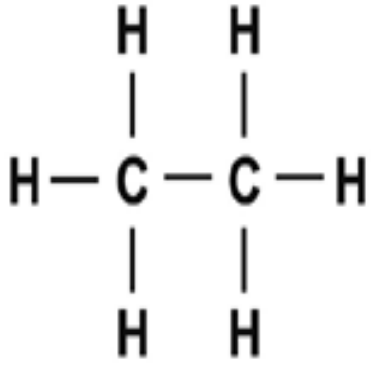




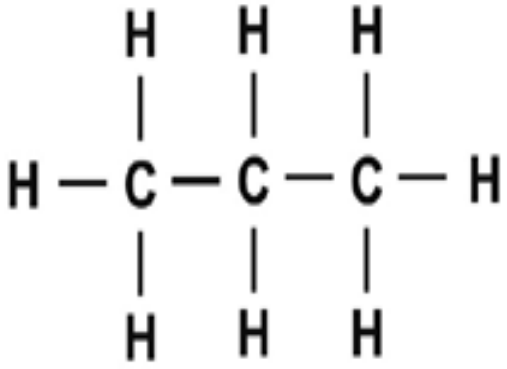




Methane

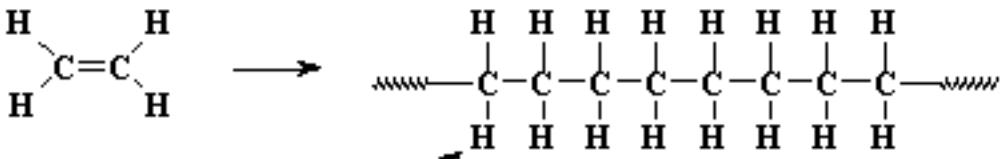


Ethane



Propane

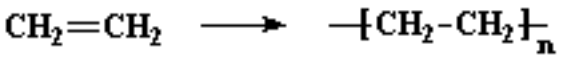
[H = Hydrogen, C = Carbon, - indicates a chemical bond between atoms]

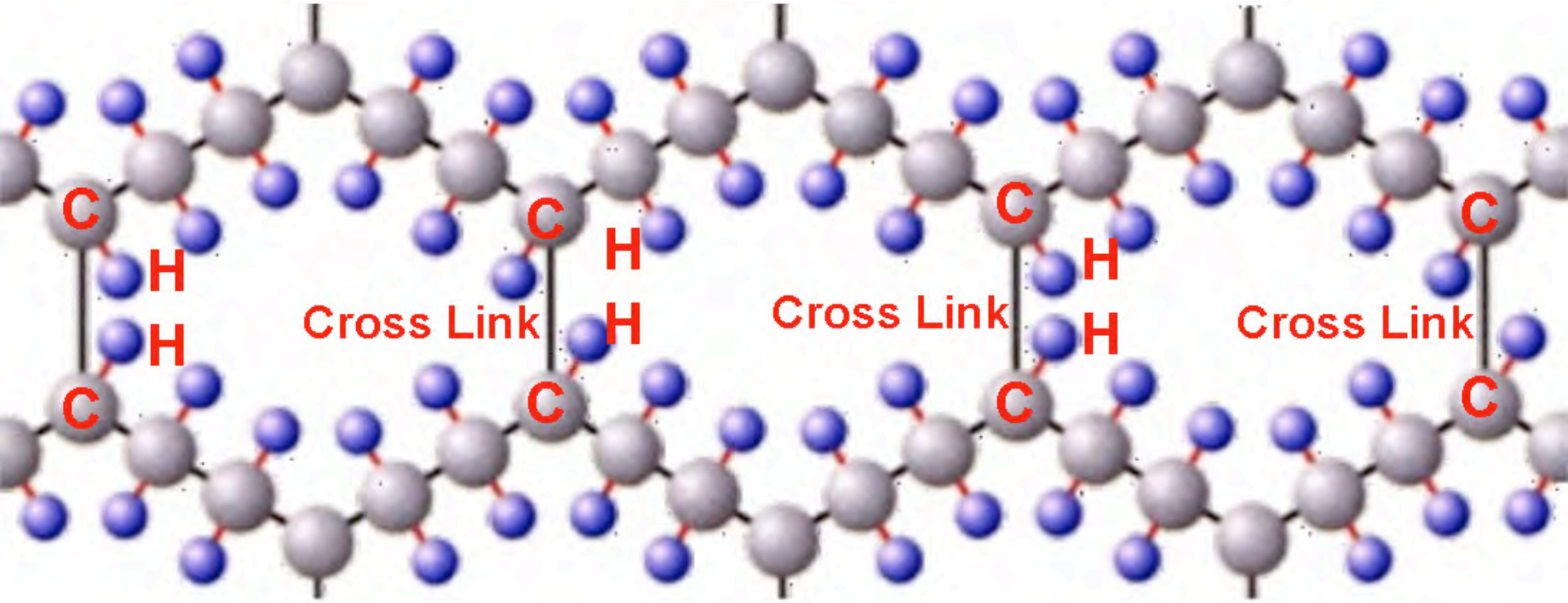


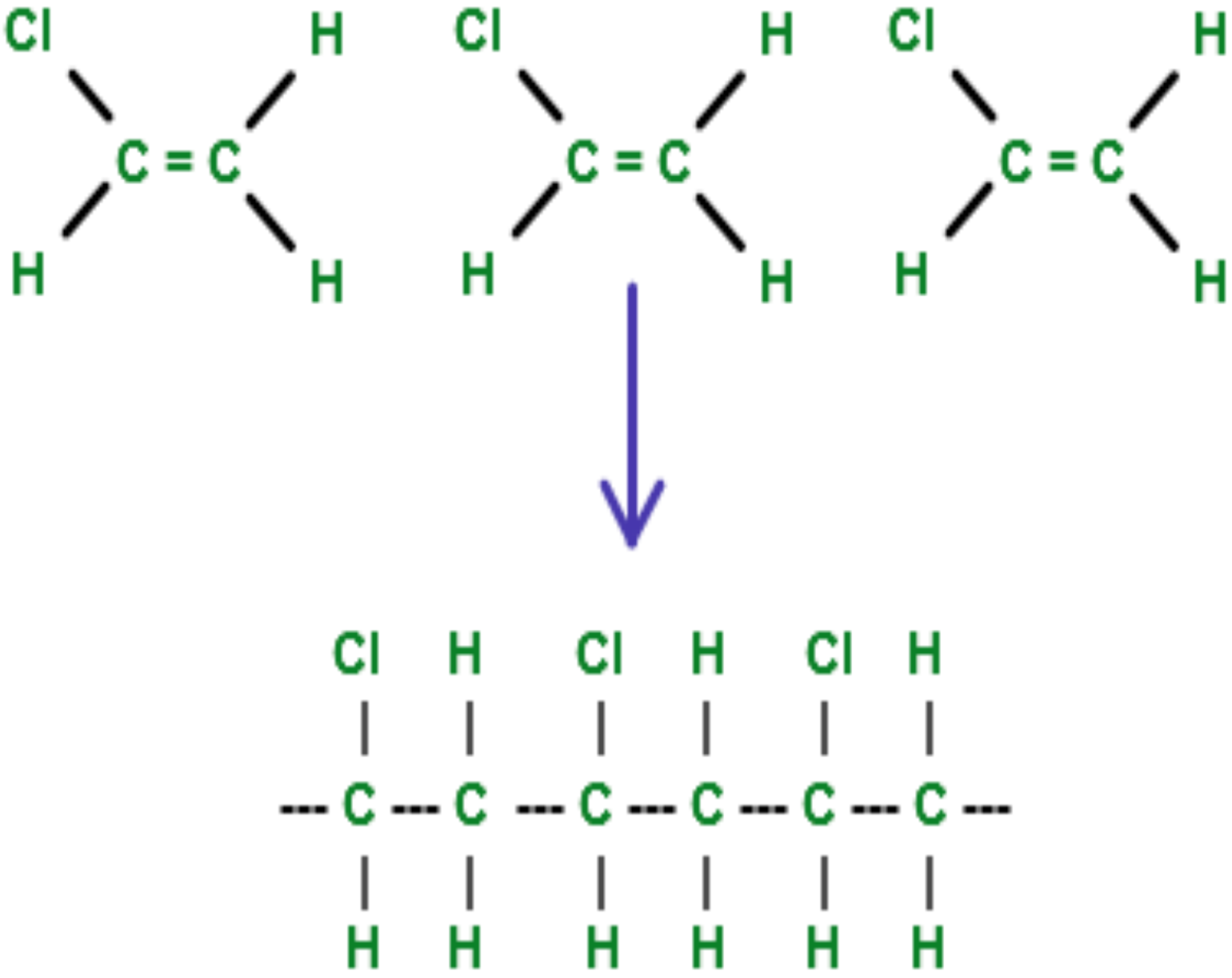
This can get tedious to draw, so we often use shorthand like this.

(Note: A line drawn between two atoms represents a pair of electrons shared by those atoms, which constitutes a chemical bond. Two lines represent two pairs of shared electrons, a double bond.)

And when we're feeling really lazy we just draw it like this:




C
H
H
C
Cross Link
C
H
H
C
Cross Link
C
H
H
C
Cross Link
C
C


Cl
H
C = C
H
H
Cl
H
C = C
H
H
Cl
H
C = C
H
H
Cl H Cl H Cl H
C C C C C C
H H H H H H

Natural Economy

Photosynthesis

Making sugar out of solar energy

$CO_2 + H_20 +$ solar energy= sugar

Respiration

Metabolizing sugar to generate life energy

Sugar + $O_2 = CO_2 + H_20 +$ bio-energy

Life is endless cycles of growth and decay

Ultimate energy efficiency-nothing is wasted

All natural waste is nourishing to something

Modern Economy

All profit is based on sales

Expired products are waste

Waste is often useless or poisonous

Reusing waste products is often expensive

This is Not a Sustainable System

Modern Economy

Making money on money makes the most money

Company, workers, customers or shareholders

Which sector makes the most money?

Which one could the economy do without?

Conclusion:

Only losers make real products or work for a living

Garbage
We are making more, not less

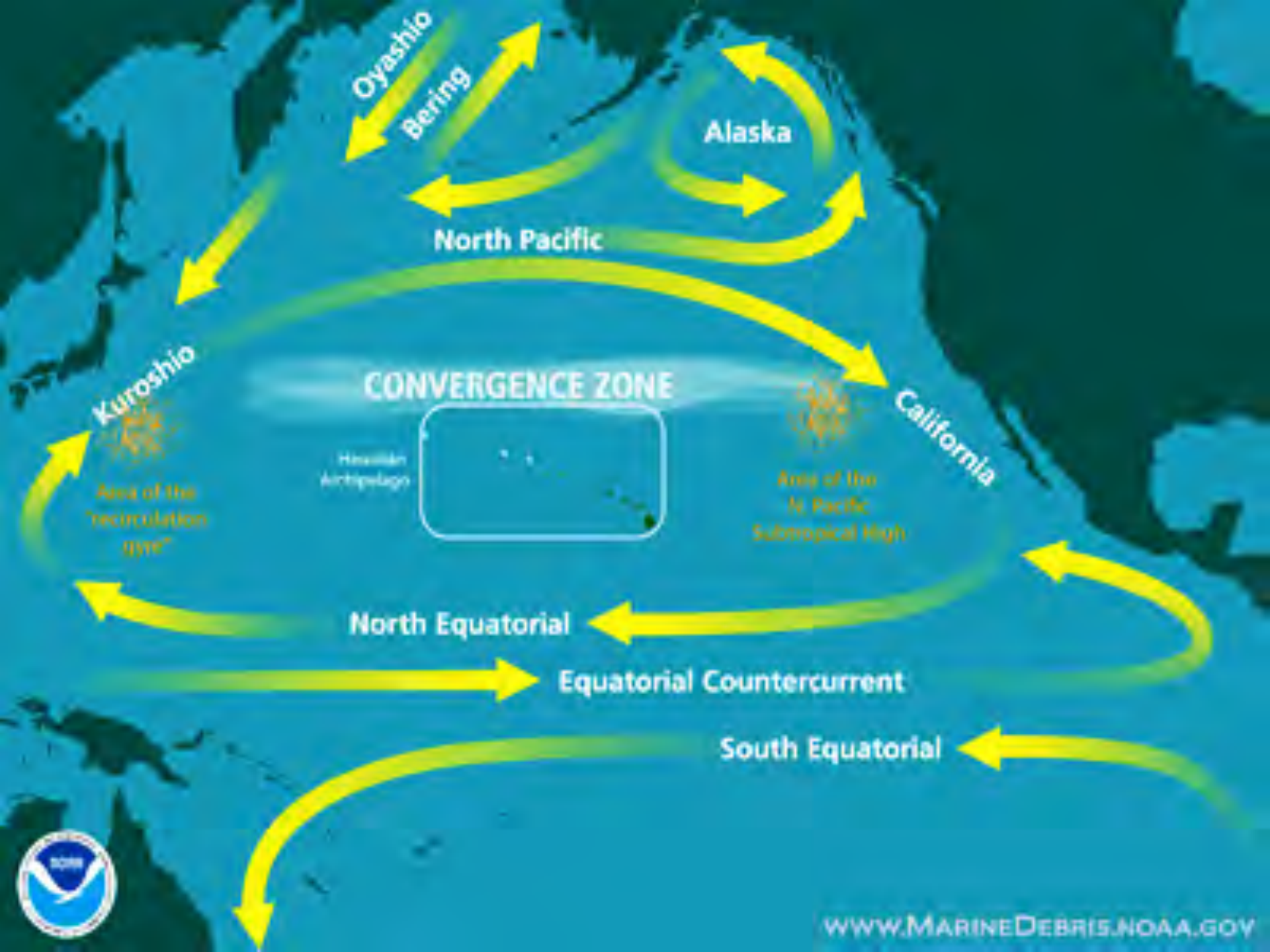
Cell phone chargers

Old computers

Broken appliances

Electronic toys

Microdebris


Oyashio
Bering
Alaska
North Pacific
Kuroshio
CONVERGENCE ZONE
California
Area of the "recirculation gyre"
Hawaiian Archipelago
Area of the N Pacific Subtropical High
North Equatorial
Equatorial Countercurrent
South Equatorial
WWW.MARINEDEBRIS.NOAA.GOV