Health Risks posed by Cement Kilns burning Waste

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Barletta , Nov 8, 2014

- **Grazie a Rossano Ercolini (Ambiente e Futuro) per avere organizzato la mia # 64 visita in Italia**

Rossano Ercolini

Ambientefuturo@interfree.it

338-28-66-215

Paul Connett ha parlato in 250 citta’


BAR
NON BRUCIAMOCI
IL FUTURO


NO INCENERITORE
SÌ RIFIUTI ZERO
NO INCENERITORE
SÌ RIFIUTI ZERO
NO INCENERITORE
SÌ RIFIUTI ZERO


PAUL CONNETT
RIFIUTI ZERO
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PAUL CONNETT
RIFIUTI ZERO

PAUL CONNETT

con Rossano Ercolini e Patrizia Lo Sciuto

RIFIUTI ZERO

una rivoluzione in corso

introduzione di Tommaso Sodano

DISSENSI

Published March 2012

Published
Oct. 2013

Subtitle of the Book:
"Untrashing the Planet One Community at a Time."

Foreword written by Jeremy Irons

TRASHED
NO PLACE FOR WASTE

JEREMY IRONS & CANDIDA BRADY
INVITE YOU TO A PRIVATE SCREENING OF

TRASHED

ON FRIDAY, SEPTEMBER 7TH 2012

AT TRIBECA CINEMAS
54 VARICK STREET, NEW YORK, NY 10013
(NEAR CANAL STREET)

JOIN US AT 3PM FOR A SHORT Q&A SESSION
SCREENING AT 3.30PM
AND AFTERWARDS FOR A PANEL DISCUSSION ON WASTE SOLUTIONS

PLEASE RSVP TO HOLLY@BLENHEIMFILMS.COM BY AUGUST 10TH

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The biggest obstacle to achieving Zero Waste is the use of Cement Kilns to burn waste

The arguments against burning waste in Cement Kilns

Here are two technical documents that represent the two extremes as far as the dangers posed by cement kilns burning waste are concerned

CEMENT KILN INCINERATION OF HAZARDOUS WASTE: A CRITIQUE

Edward W. Kleppinger, Ph.D.
Richard A. Carnes, M.S.

September 1990

EWK CONSULTANTS INC.
407 N STREET S.W.
WASHINGTON, D.C. 20024

Formation and Release of POPs in the Cement Industry

Second edition

World Business Council for Sustainable Development

Cement Sustainability Initiative

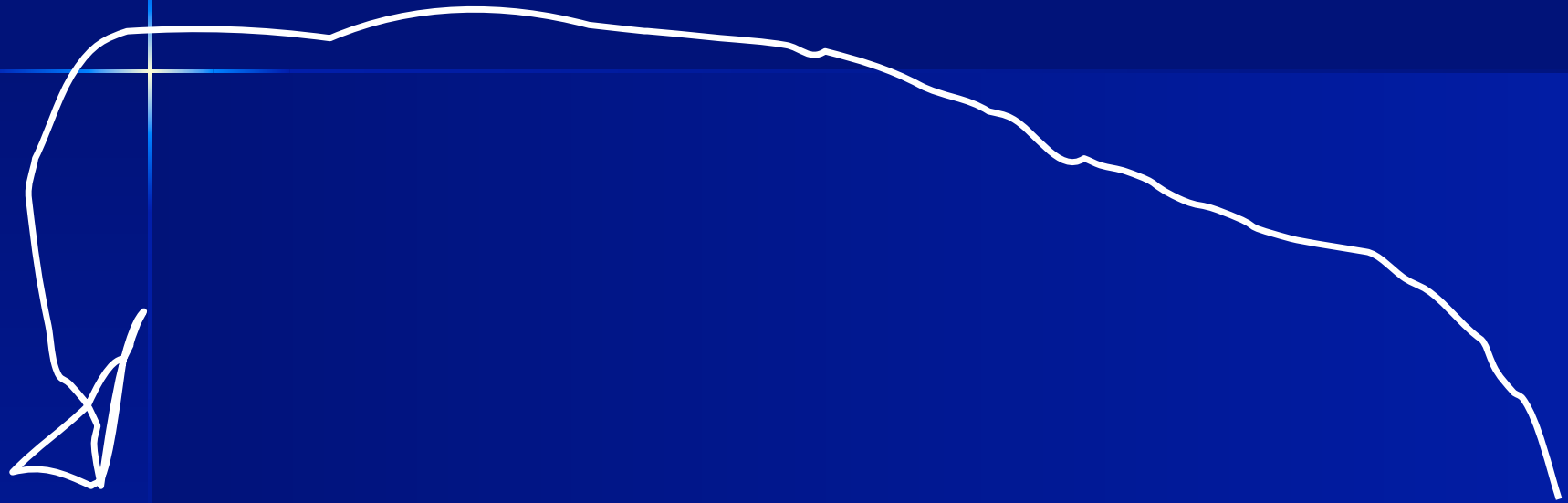
23 January 2006

SINTEF

The arguments against burning waste in cement kilns

- 1) It is not sustainable

INCINERATION



Extraction | **Production** | **Consumption** | Waste

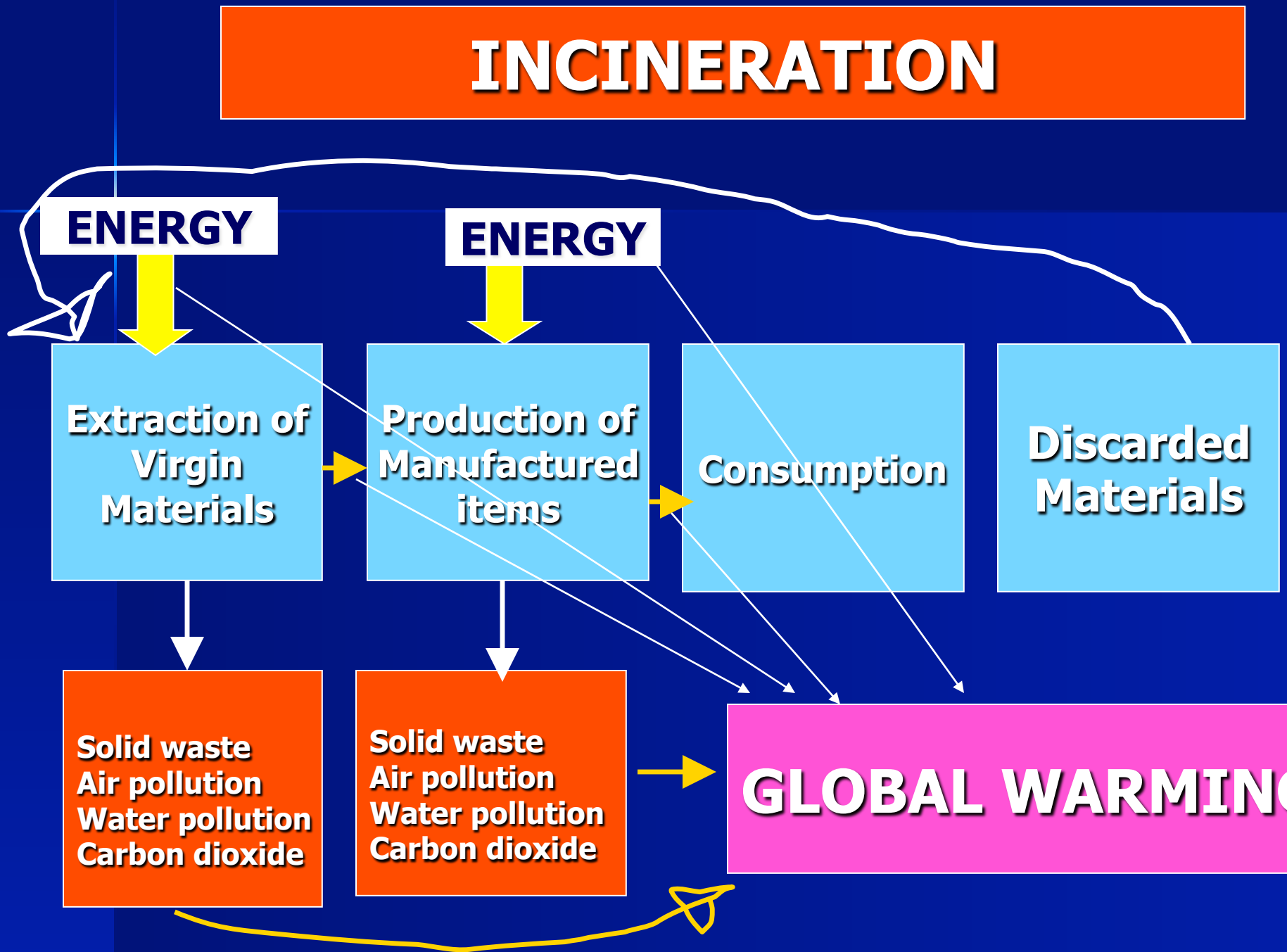
The Linear Society

INCINERATION

Every time you burn something you have to go back to square 1

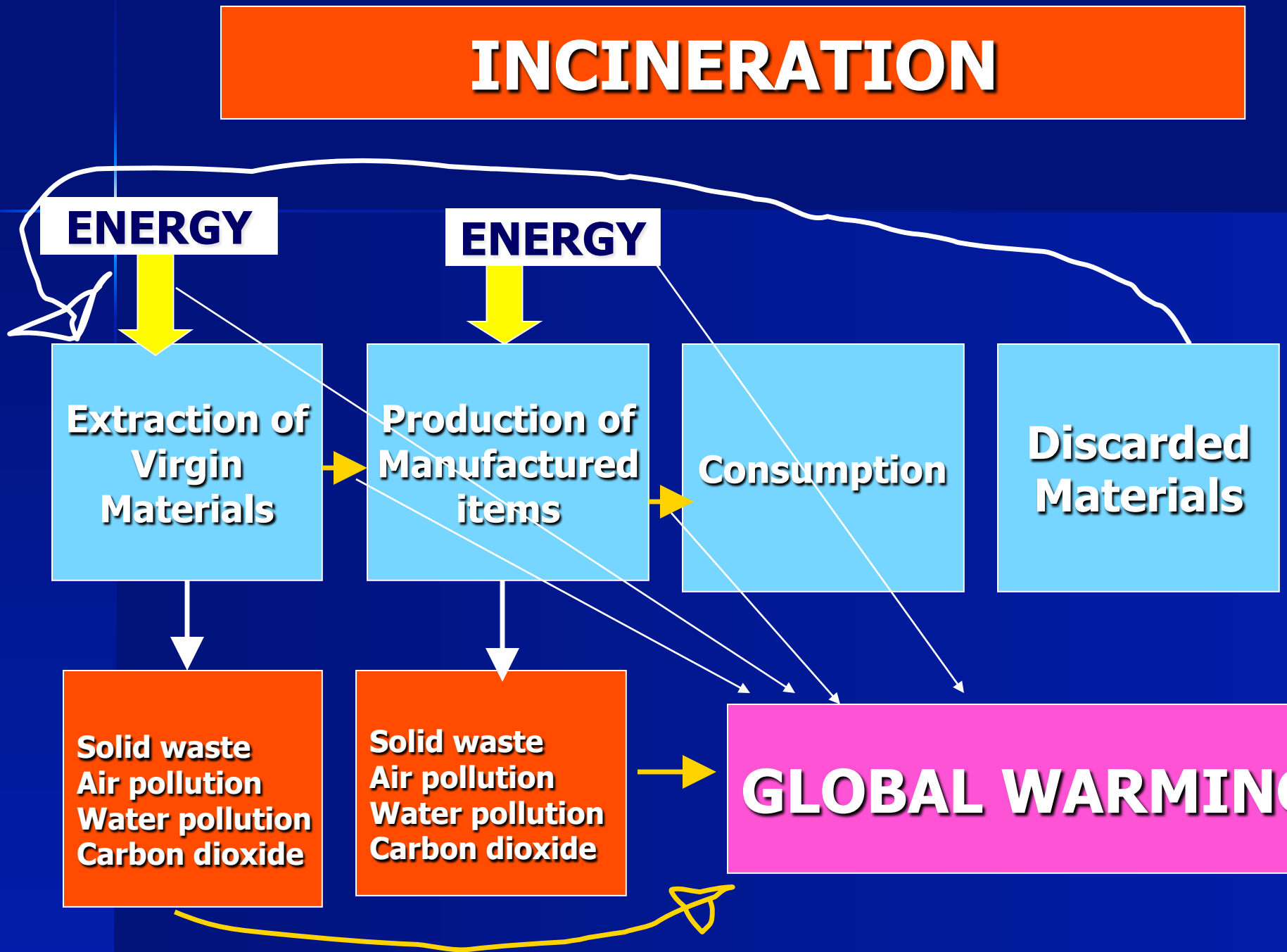
Extraction | **Production** | **Consumption** | Waste

The Linear Society


INCINERATION
ENERGY
ENERGY
Extraction of Virgin Materials
Production of Manufactured items
Consumption
Discarded Materials
Solid waste
Air pollution
Water pollution
Carbon dioxide
Solid waste
Air pollution
Water pollution
Carbon dioxide
GLOBAL WARMING

The arguments against burning waste in cement kilns

- 2) It is a waste of energy – more energy saved by recycling, reusing and composting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Solid waste
Air pollution
Water pollution
Carbon dioxide
GLOBAL WARMING

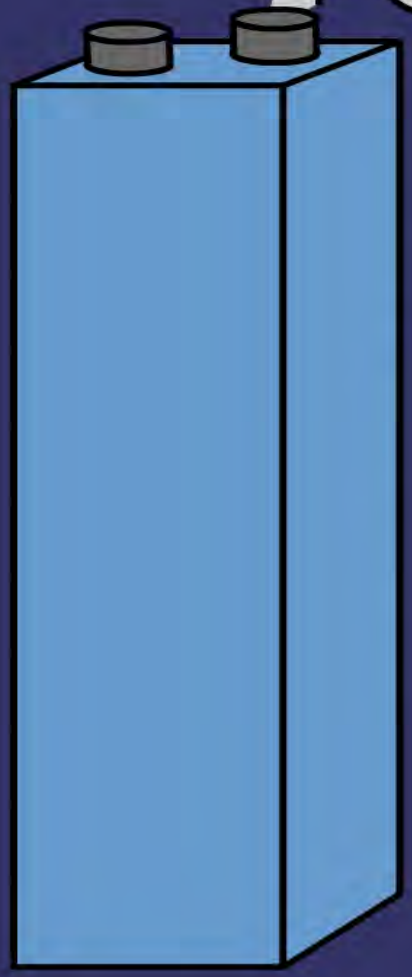
Energy Comparison: Recycling versus incineration (ICF consulting, 2005)

material	Energy savings from recycling GJ/tonne	Energy output from incineration GJ/tonne	Energy savings recycling versus incineration
Newsprint	6.33	2.62	2.4
Fine paper	15.87	2.23	7.1
Cardboard	8.56	2.31	3.7
Other paper	9.49	2.25	4.2
HDPE	64.27	6.30	10.2
PET	85.16	3.22	26.4
Other plastic	52.09	4.76	10.9

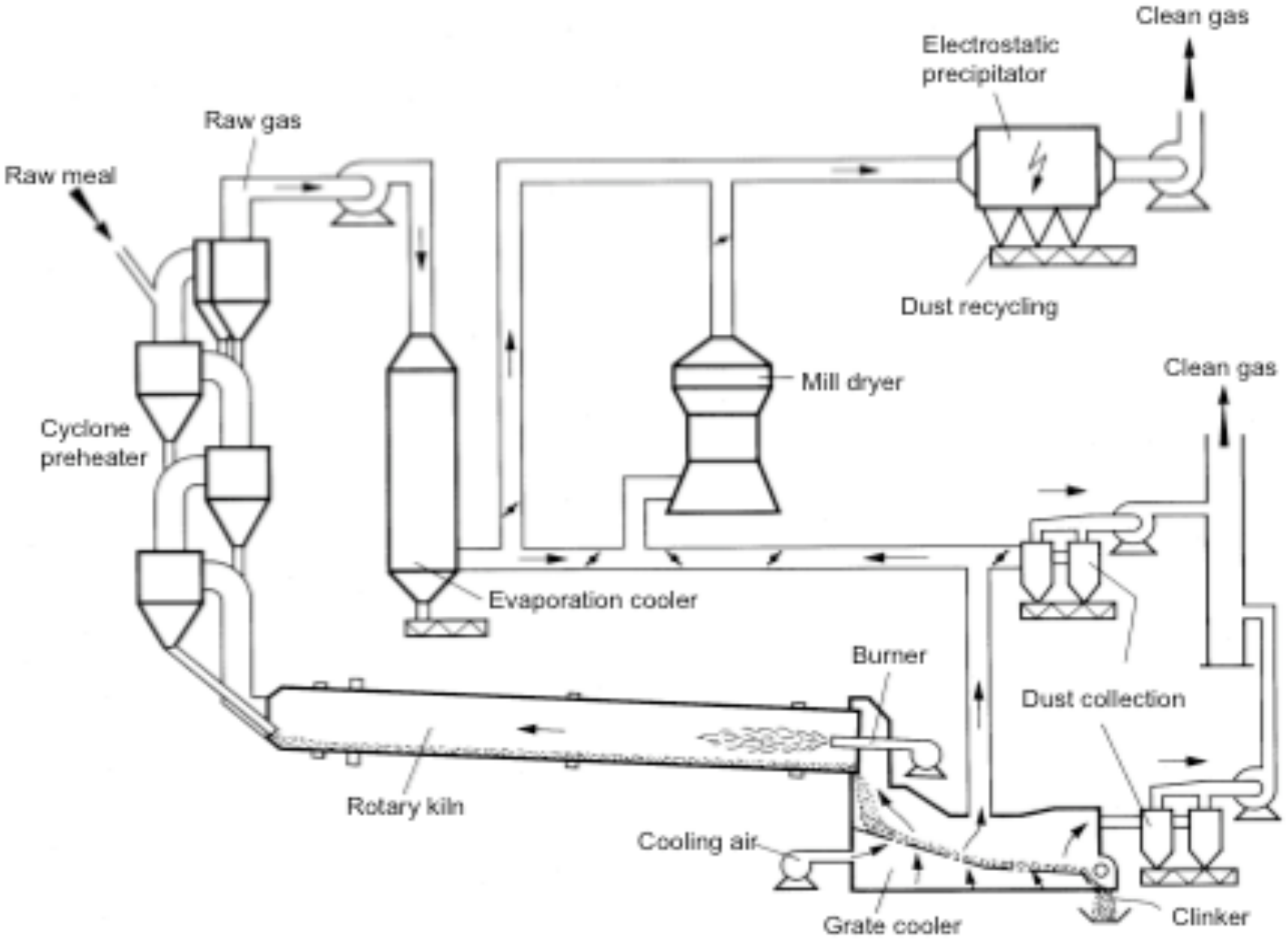
The arguments against burning waste in cement kilns

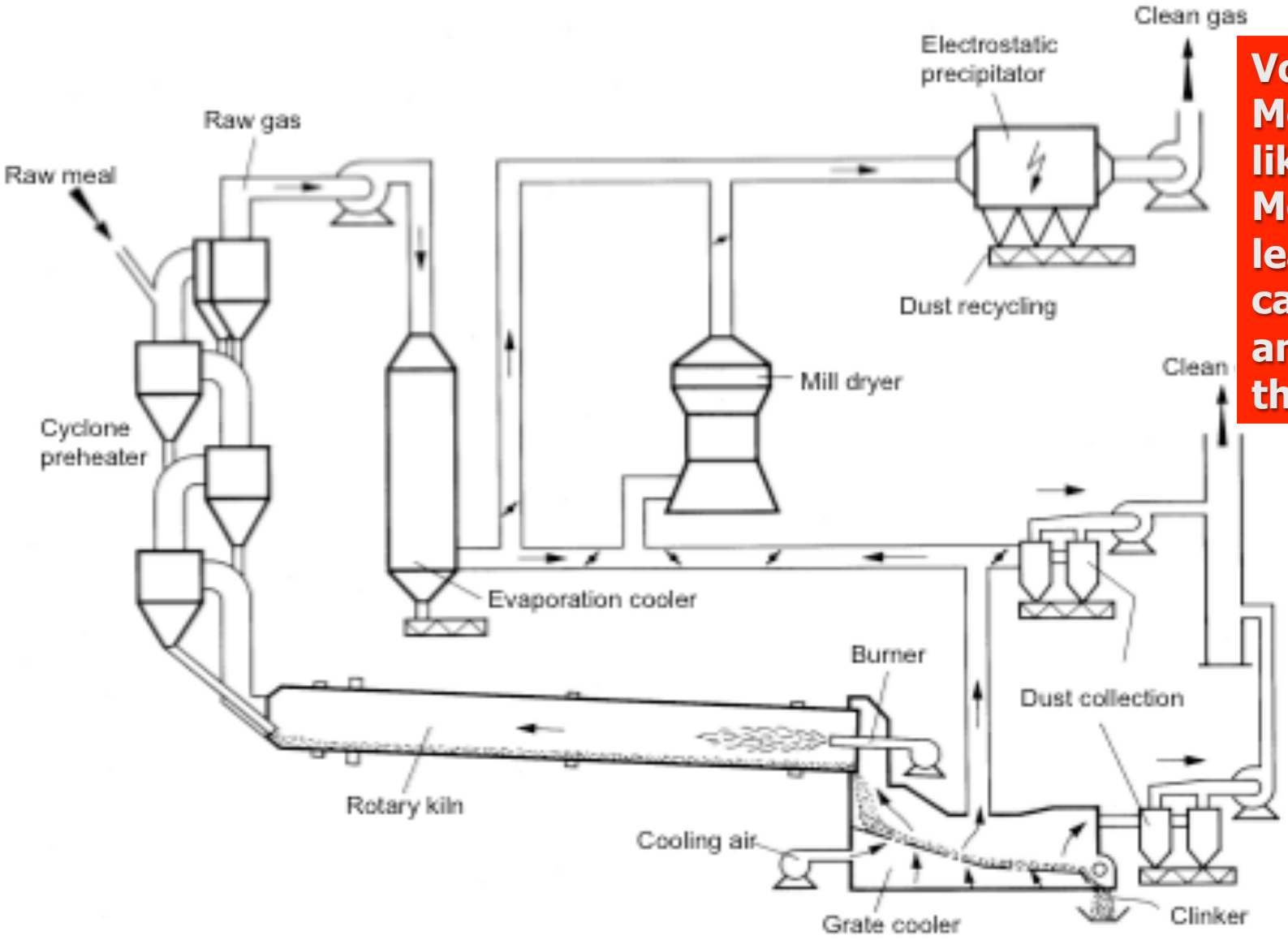
- 3) It puts toxic metals into the air –
- Mercury
- Cadmium
- Lead
- Thallium

AIR EMISSIONS



- CO2 + H2O
- ACID GASES:
  HCl, HF, SO_2
  NO_x
- **TOXIC METALS:**
  Pb, Cd, Hg, As, Cr etc


Clean gas
Electrostatic precipitator
Raw gas
Raw meal
Dust recycling
Mill dryer
Clean gas
Cyclone preheater
Evaporation cooler
Burner
Dust collection
Rotary kiln
Cooling air
Grate cooler
Clinker

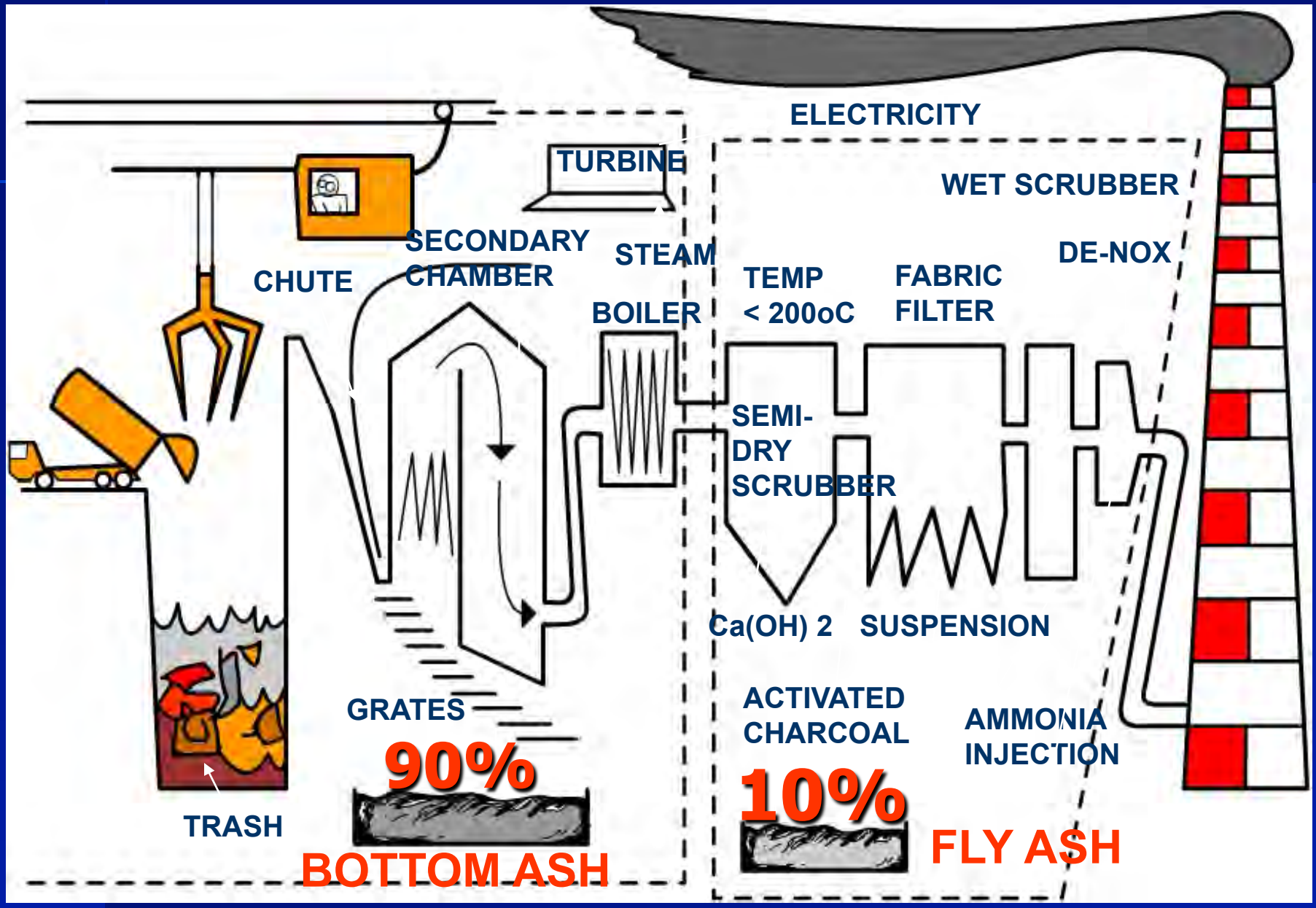


Volatile Metals like Mercury, lead, cadmium and thallium

The arguments against burning waste in cement kilns

- 4) By recycling the fly ash back into the kiln it puts toxic metals and other persistent pollutants either into the cement product or into the air

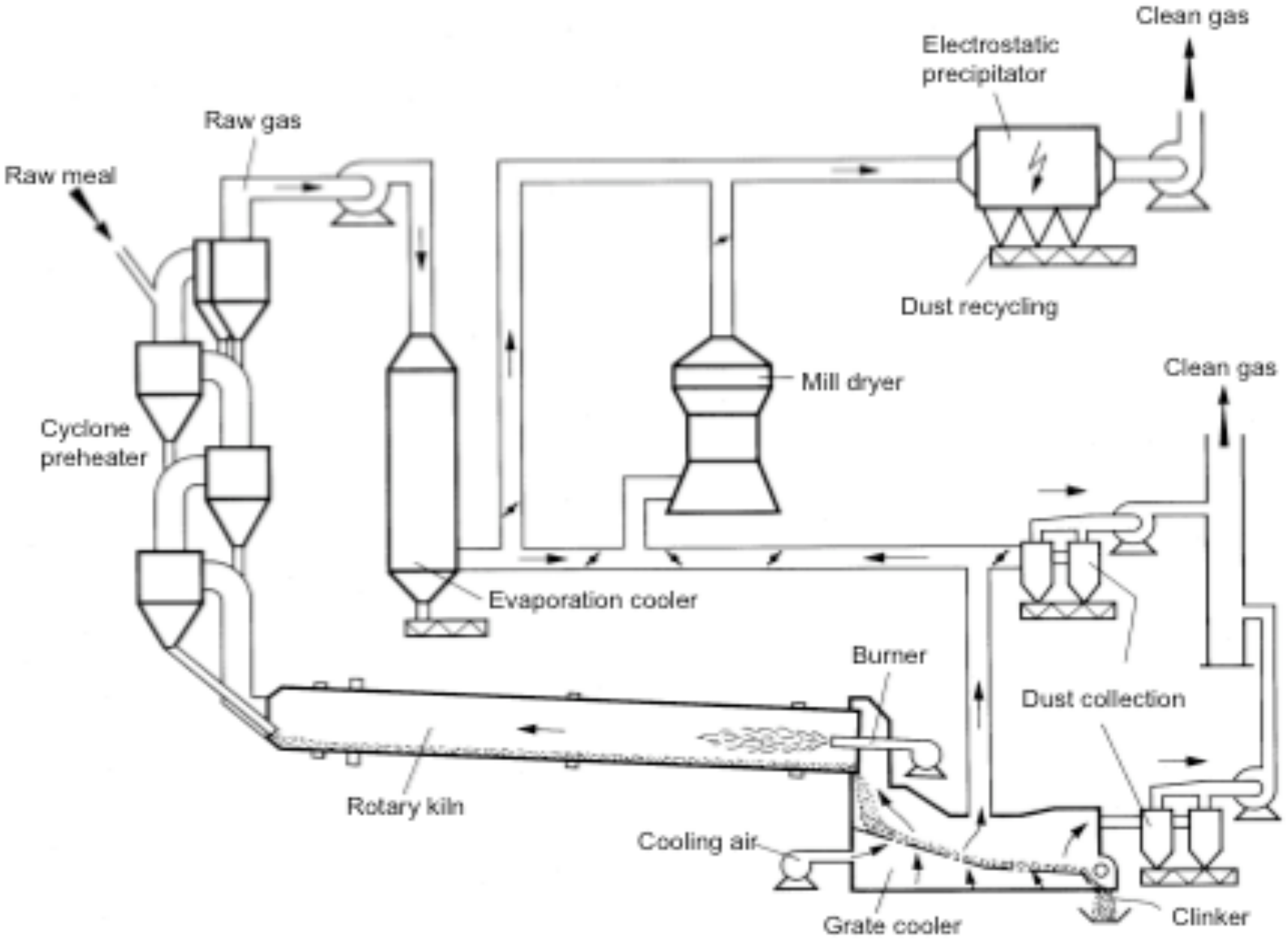
For every 4 tons of trash you get about one ton of ash



- In Germany & Switzerland fly ash put into nylon bags and placed in salt mines
- In Japan some incinerators vitrify the ash
- In Denmark…
- They send all the ash to Norway!
- In the UK fly ash goes to landfills…


CAT

40 mph road sign covered in ash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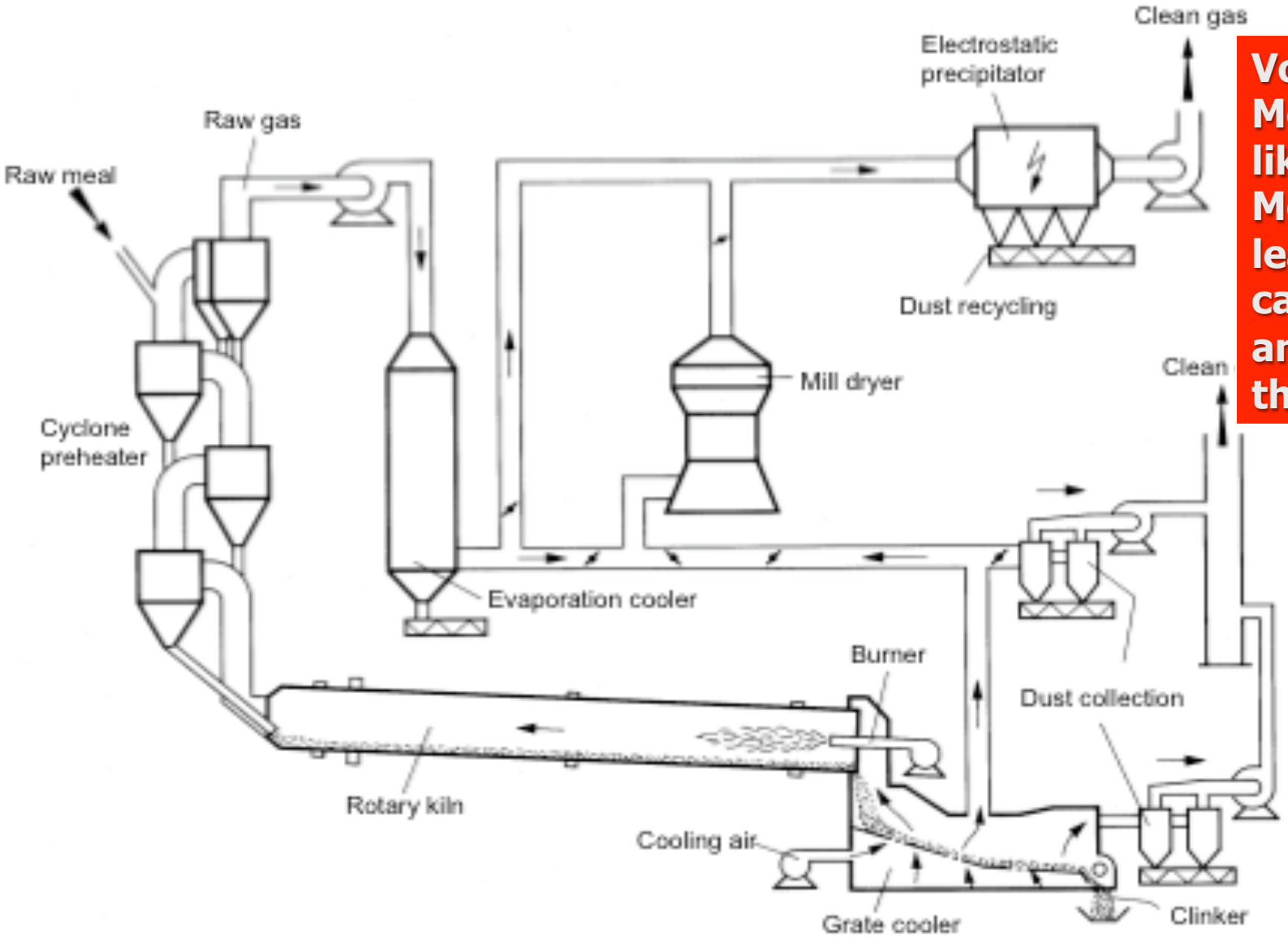
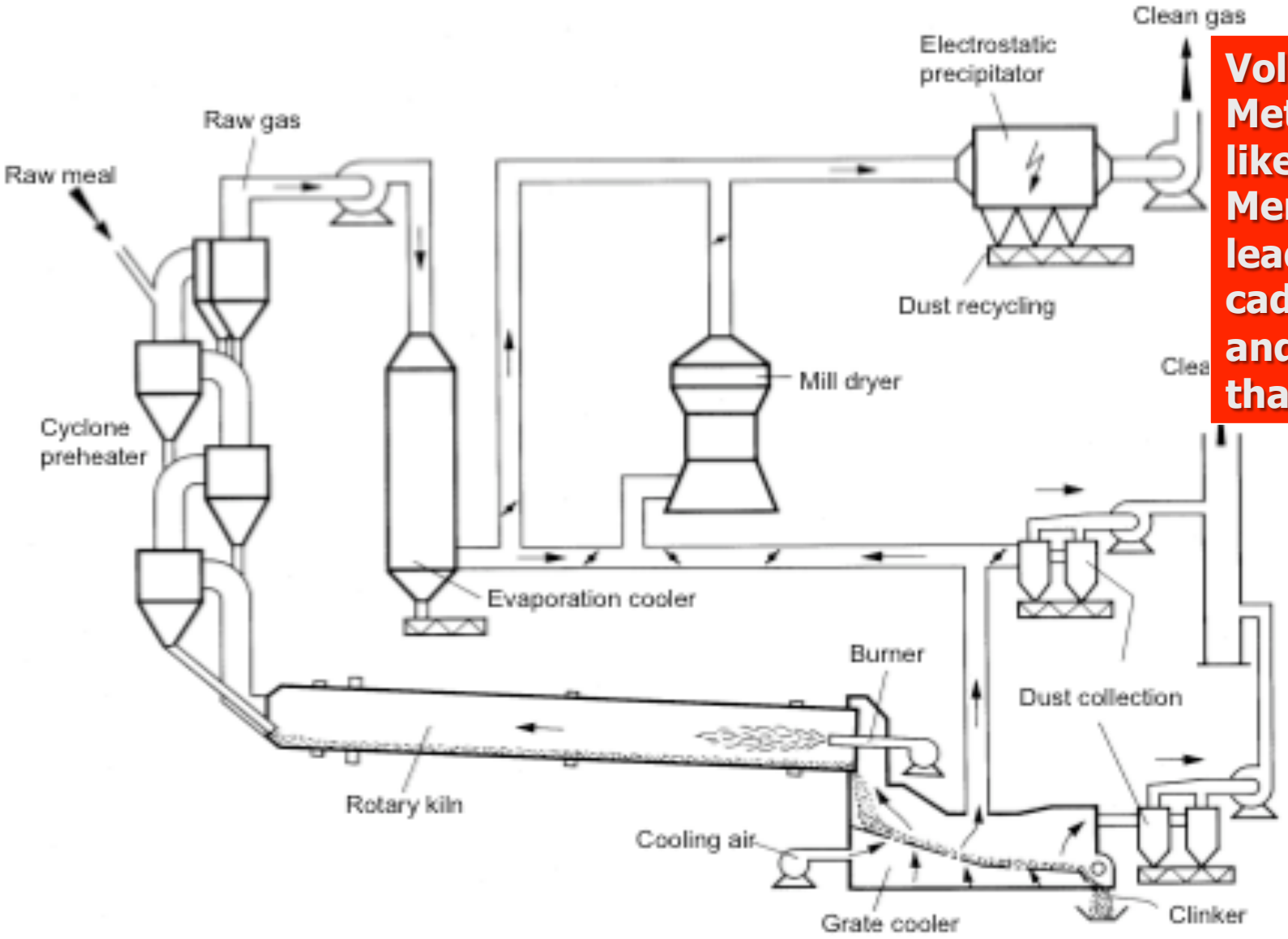


Volatile Metals like Mercury, lead, cadmium and thallium

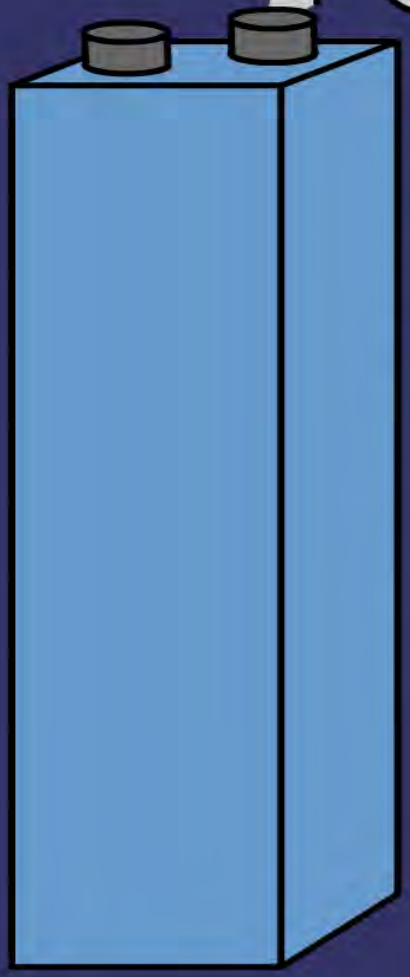


Volatile Metals like Mercury, lead, cadmium and thallium

Other toxic metals go to clinker

- In cement kilns both the bottom ash and the fly ash goes into the cement

AIR EMISSIONS



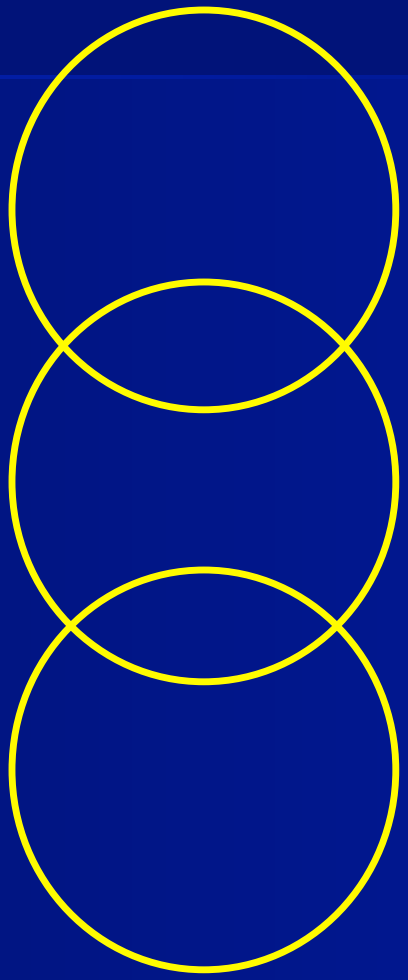
- CO2 + H2O
- ACID GASES:
  HCl, HF, SO_2
  NO_x
- **TOXIC METALS:**
  Pb, Cd, Hg, As, Cr etc
- **NEW COMPOUNDS:**

  PCDDs (DIOXINS)
  PCDFs (FURANS)
  PCB's
  ETC

The arguments against burning waste in cement kilns

- 5) As far as dioxins and related compounds are concerned you are hostage to:
- A) how well the plant is run
- B) how well the plant is monitored and
- C) how aggressively your government enforces regulations

YOU NEED THREE THINGS TO PROTECT THE PUBLIC FROM TOXIC EMISSIONS.



STRONG REGULATIONS

ADEQUATE MONITORING

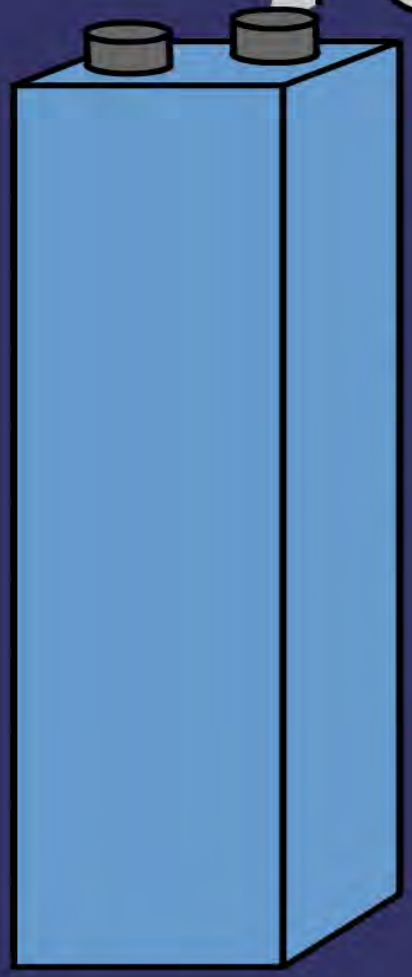
TOUGH ENFORCEMENT

IF ANY LINK IS WEAK THE PUBLIC IS NOT PROTECTED

The arguments against burning waste in cement kilns

- 6) There is no monitoring or regulation of nanaoparticles

AIR EMISSIONS



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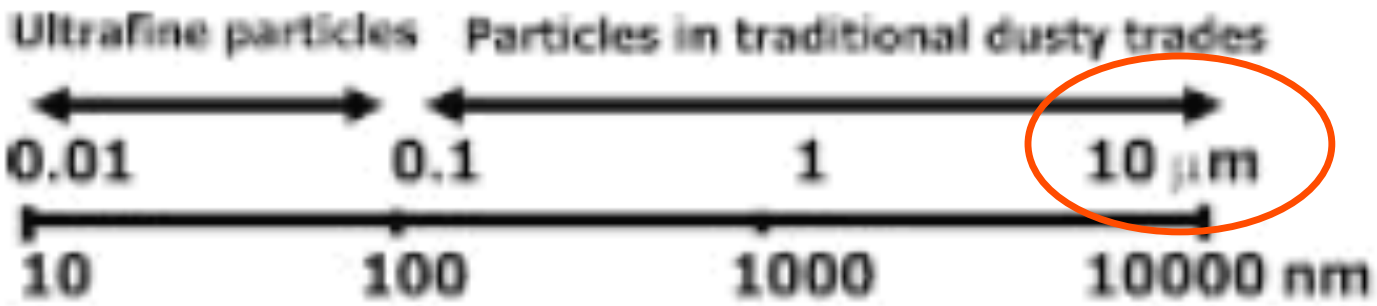
  ETC

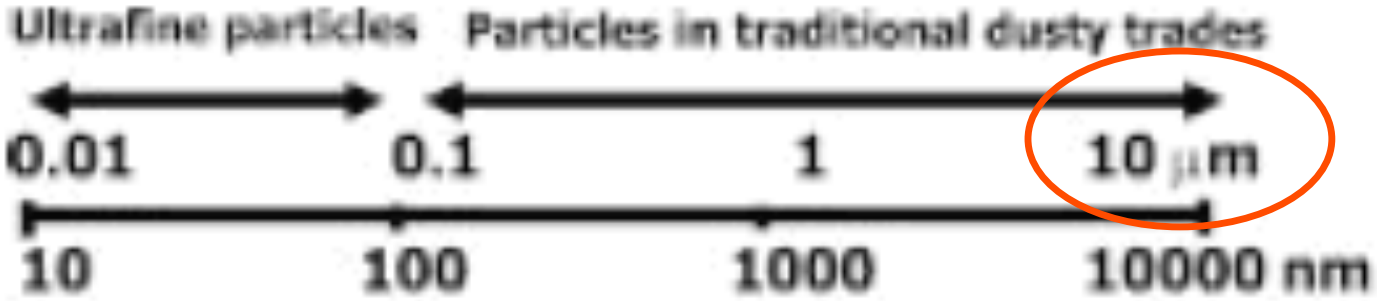
NANO PARTICLES



NANOPARTICLES

Size of Particle regulated in incinerator emissions

Figure 3 Relative size of ultrafine particles compared with particles in traditional dusty trades.



Size of Particle regulated in incinerator emissions

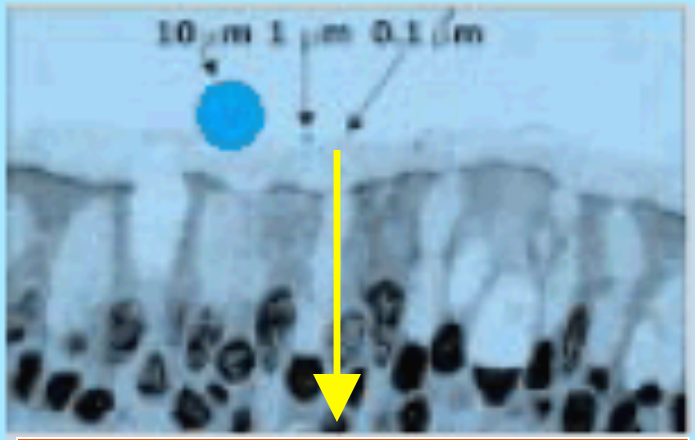
NANOPARTICLES

$PM_{2.5}$

Figure 3 Relative size of ultrafine particles c
particles in traditional dusty trades.

Incineration and nanoparticles

- Nanoparticles are not efficiently captured by air pollution control devices
- Travel long distances
- Remain suspended for long periods of time
- Penetrate deep into the lungs



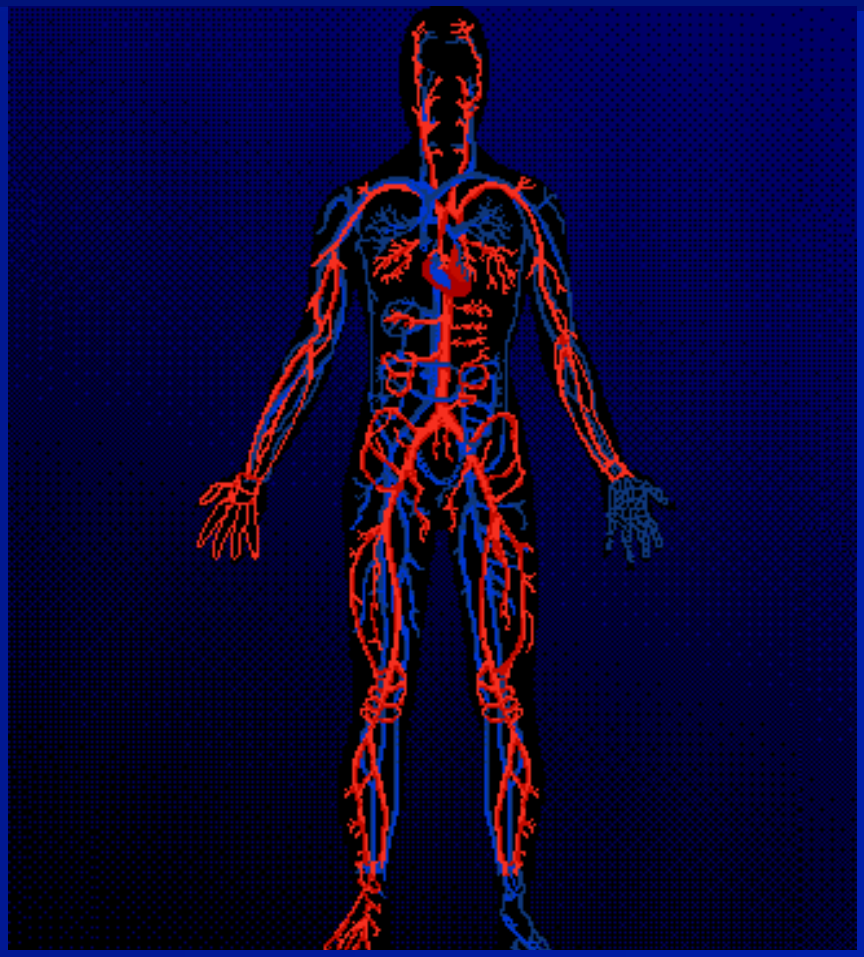
BLOOD

Nano particles are so small they can easily cross the lung membrane

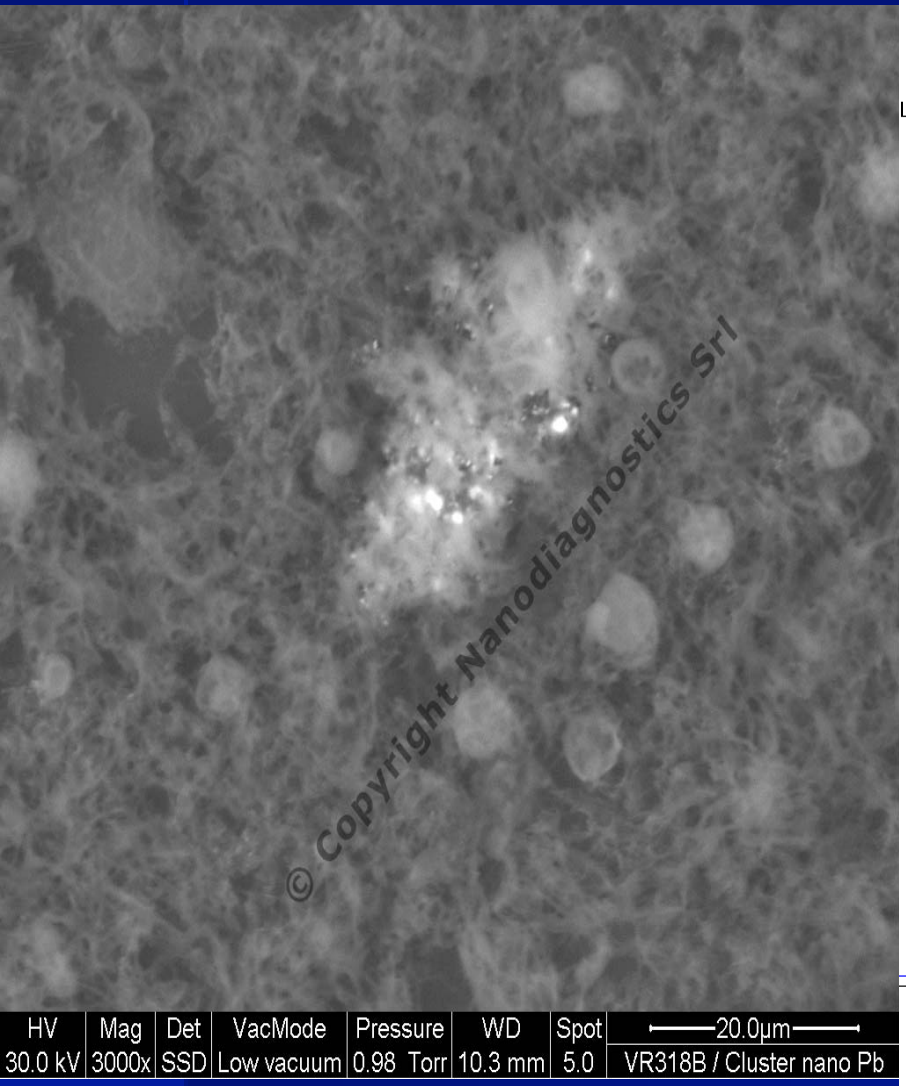
Figure 1 Relation between ultrafine particles and cellular structures in the lung. Idealised particles of 10, 1, and 0.1 µm are shown compared with a bronchial epithelium; note that the top end of the range of ultrafine particles (0.1 µm, 100 nm) is not really visible. On the right are shown the same three particles relative to cilia.

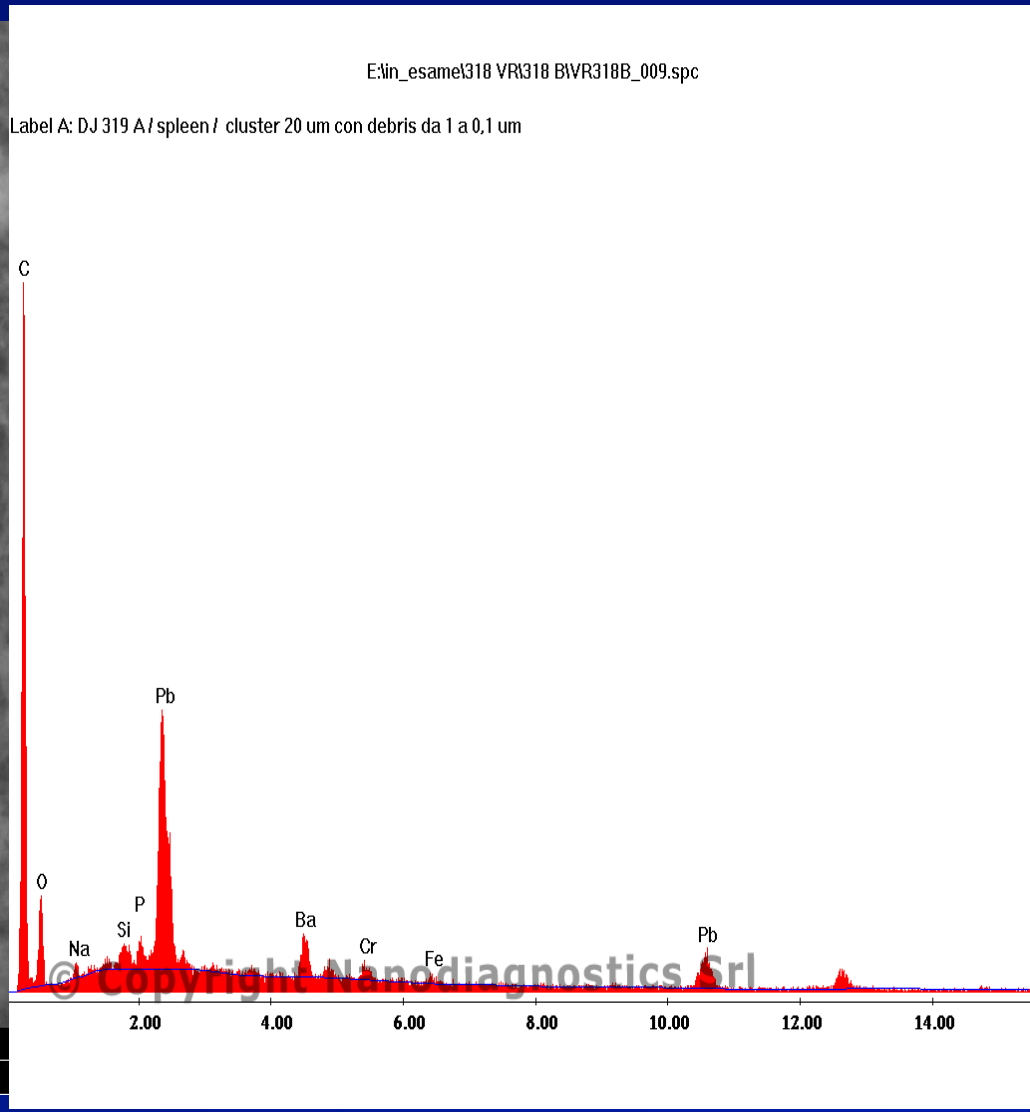
Nano Pathology

- Once nanoparticles have entered the bloodstream they can easily cross the membranes of every tissue in the body.



Aggregati di Piombo, Bario, Cromo, Ferro **e** Silicio **in** Cervello**.**





www.stefanomontanari.net

Review

Origin and Health Impacts of Emissions of Toxic By-Products and Fine Particles from Combustion and Thermal Treatment of Hazardous Wastes and Materials

Stephania A. Cormier,[1] Slawo Lomnicki,[2] Wayne Backes,[3] and Barry Dellinger[2]

[1]Department of Biological Science, and [2]Department of Chemistry, Louisiana State University, Baton Rouge, Louisiana, USA; [3]Department of Pharmacology, Louisiana State University Health Sciences Center, Baton Rouge, Louisiana, USA

VOLUME 114 | NUMBER 6 | June 2006 • Environmental Health Perspectives

Incineration, nanoparticles & Health

Statement of Evidence

Particulate Emissions and Health

Proposed

Ringaskiddy Waste-to-Energy Facility

Professor C. Vyvyan Howard MB. ChB. PhD. FRCPath. June 2009

VYV.howard@googlemail.com

I have seen no scientific response to Cormier's paper or Howard's statement from either the incinerator industry or government agencies promoting incineration.

The arguments against burning waste in cement kilns

- 7) When the clinker is ground into cement it produces a great deal of dust, which will be highly toxic.
- This dust get into workers' lungs, onto their clothes and skin and into the surrounding environment.

The arguments against burning waste in cement kilns

- 8) I am opposed to waste incineration in purpose-built facilities,
- but when you burn the waste in cement kilns you are taking it out of the hands of professionals and giving it to amateurs

The arguments against burning waste in cement kilns

- 9) This is good business for the cement company but it is not good for the health of the community
- For the cement company instead of paying for a fuel they get paid for receiving a waste that no one else wants!
- The more toxic the waste the more they get paid!

The arguments against burning waste in cement kilns

- It is one thing for workers to take risks with their own health,
- But it is another to take risks with the health of their families – especially young children and the babies born 20 years from now

Dioxins - major health concerns

- **Dioxins accumulate in animal fat. One liter of cows' milk gives the same dose of dioxin as breathing air next to the cows for EIGHT MONTHS (Connett and Webster, 1987).**
- **In one day a grazing cow puts as much dioxin into its body as a human being would get in 14 years of breathing (McLachlan, 1995)!**
- **Dioxins steadily accumulate in human body fat. The man cannot get rid of them BUT A woman can…**
- **…by having a baby!**
- **Thus the highest dose of dioxin goes to the fetus and then to the new born infant via breastfeeding…**

Effects of dioxins on thyroid function of new born babies

- H.J. Pluim et al., The Lancet, May 23, 1992. (Volume 339, 1303)
- Examined 38 new born babies, divided them into 2 groups:
- Low-exposed (mothers had average 18.6 ppt dioxins in milk fat, range 8.7 - 28)
- High-exposed (mothers had average 37.5 ppt dioxins in milk fat, range 29 - 63)

Effect of Dioxins on Neonatal Thyroid Function after Low-exposure and High-exposure at various ages

		Low-exposure (mean)	High-exposure (mean)	P*
At birth	T4	122.5	134.3	0.071
	T4/TBG	0.240	0.232	0.45
	TSH	10.4	11.9	0.58
1 week	T4	154.5	178.7	0.006*
	T4/TBG	0.291	0.332	0.006*
	TSH	2.93	2.56	0.51
11weeks	T4	111.1	122.2	0.033*
	T4/TBG	0.220	0.247	0.040*
	TSH	1.81	2.50	0.044*

Dioxins interfere with fetal and infant devlopment

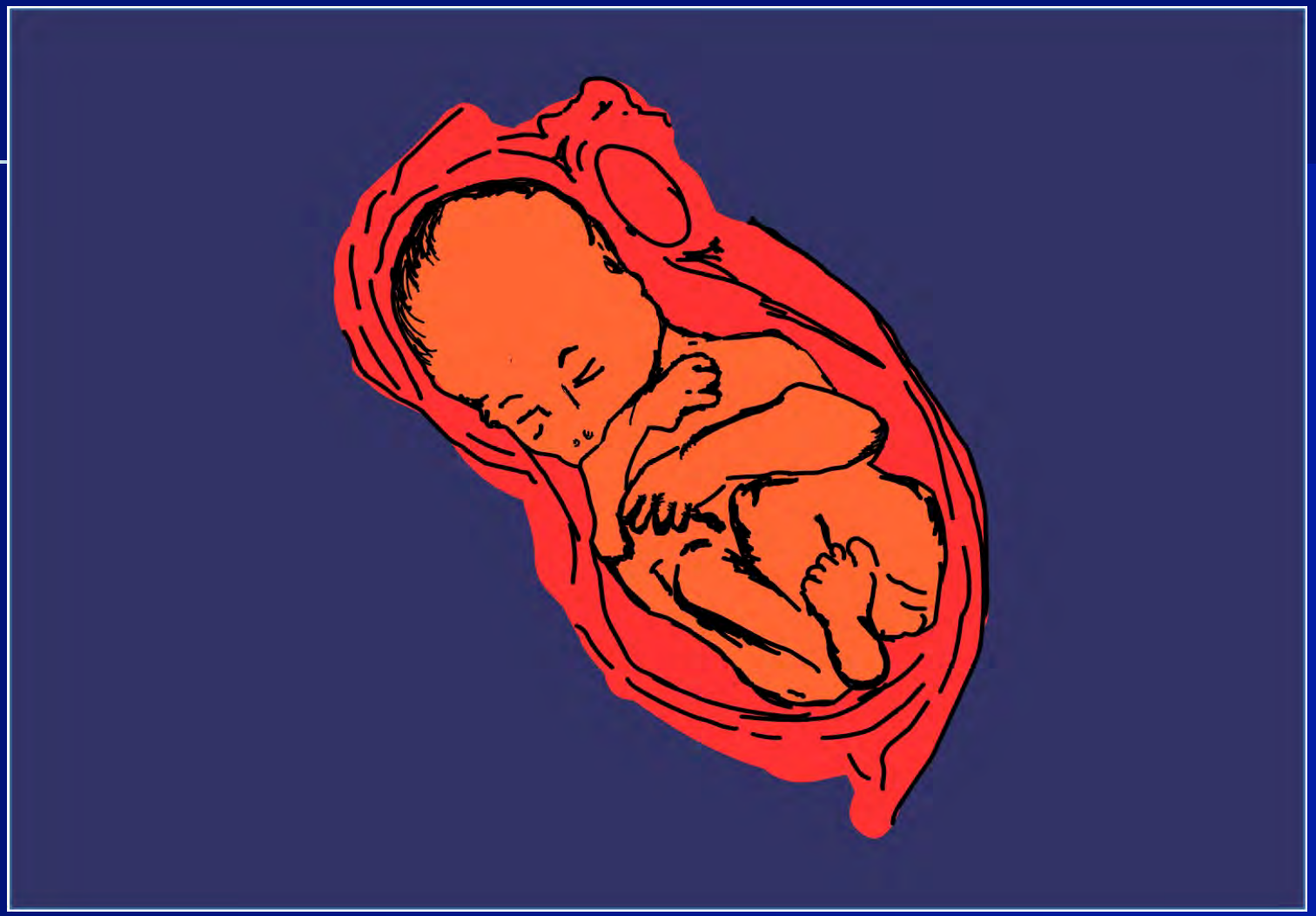
- Dioxins act like fat soluble hormones
- Disrupt at least six different hormonal systems: male and female sex hormones; thyroid hormones; insulin; gastrin and gluocorticoid.
- **Linda S. Birnbaum (**Health Effects Research Laboratory, US EPA) Developmental Effects of Dioxins *Environmental Health Perspectives*, 103: 89-94, 1995

Our Stolen Future

How Man-made Chemicals are Threatening our Fertility, Intelligence and Survival

Theo Colborn
John Peterson Myers
Dianne Dumanoski
1994

WE WANT DIOXIN



OUT OF OUR BABIES!

Institute of Medicine, 2003

Dioxins and Dioxin-like Compounds in the Food Supply

Strategies to Decrease Exposure

July 1, 2003

Institute of Medicine, 2003

- Fetuses and breastfeeding infants may be at particular risk from exposure to dioxin like compounds (DLCs) due to their potential to cause adverse neurodevelopmental, neurobehavioral, and immune system effects in developing systems…

Institute of Medicine, 2003

- …The committee recommends that the government place a high public health priority on reducing DLC intakes by girls and young women in the years well before pregnancy is likely to occur.

- (by) Substituting low-fat or skim milk, for whole milk, (and)… foods lower in animal fat…

The dioxin problem for cement kilns

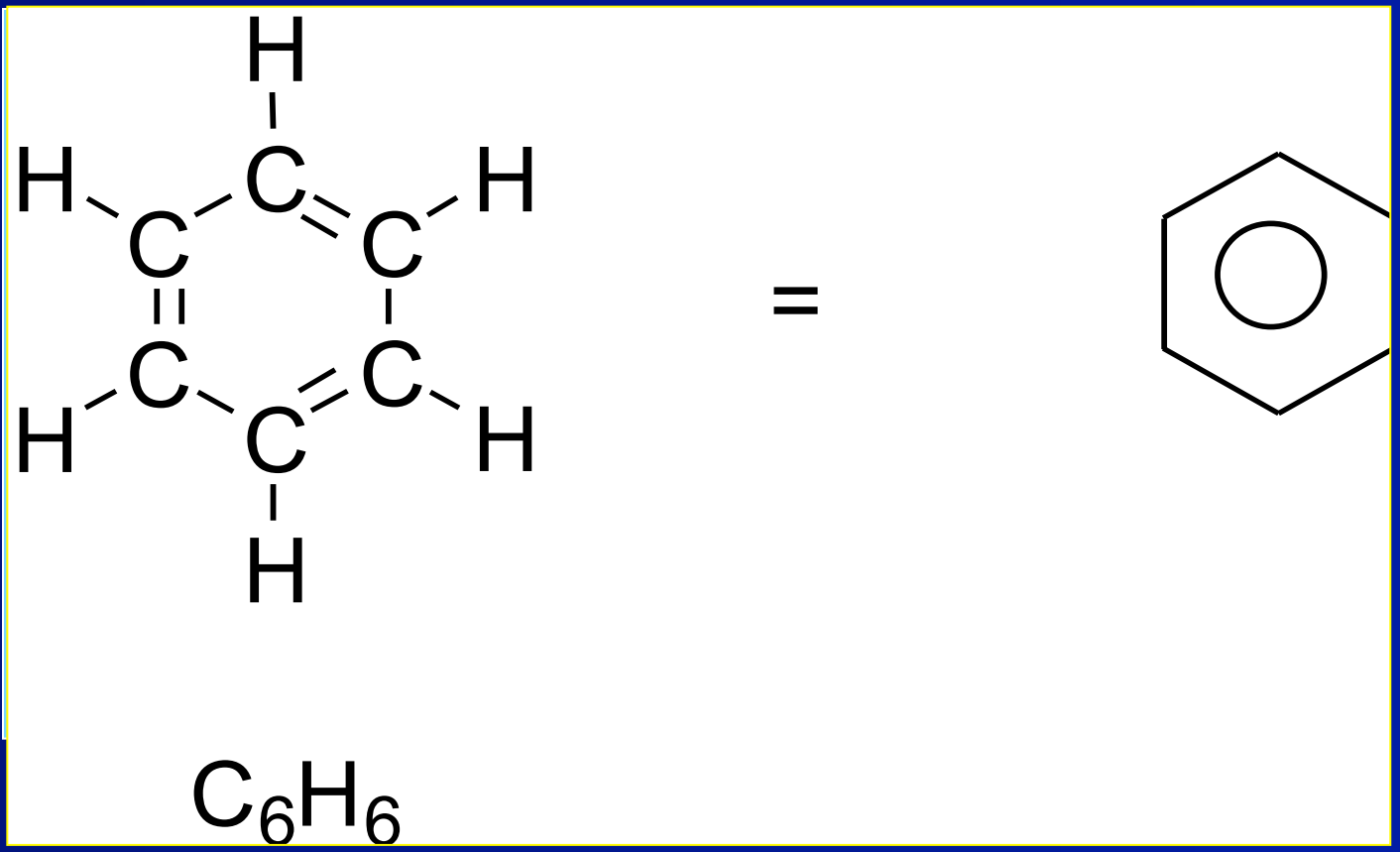
- 1) Emissions can vary dramatically - even within a few hours can change by a factor x80.
- 2) Emissions increase with upset conditions and during start-up and shut down. Need continuous sampling.
- 3) Very few measurements made (once a year?).
- 4) Measurements made under ideal conditions.
- 5) Use average instead of 95% upper confidence level.
- 6) Misleading to compare concentrations with other combustion sources because of the huge volume of gases emitted – we need total emissions for year.
- 7) Only measure a fraction of the dioxin-like compounds. Need to see structures to understand this.

The dioxin problem for cement kilns

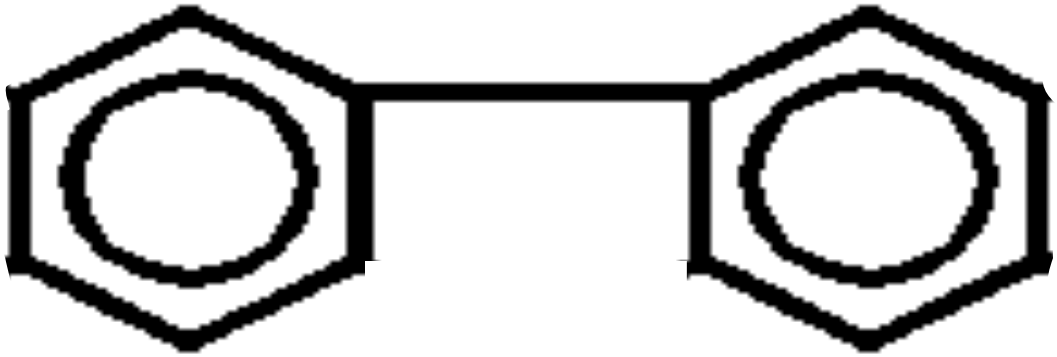
- Waste burners only consider:
- PCBs (chlorinated biphenyls)
- PCDDs (chlorinated dioxins)
- PCDFs (chlorinated furans)
- **BUT**
- We also have brominated biphenyls, dioxins and furans
- We also have mixed chlorinated and brominated versions
- We also have nitrogen and sulfur analogues
- We also have chlorinated and brominated diphenyl ethers and napthalenes
- **These are seldom measured**

The chemistry is not as complicated as it sounds

Benzene

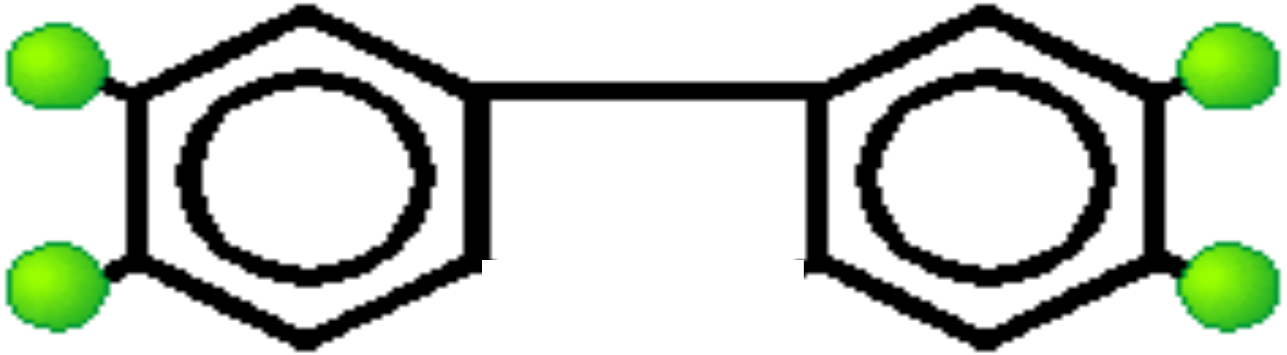


BENZENE



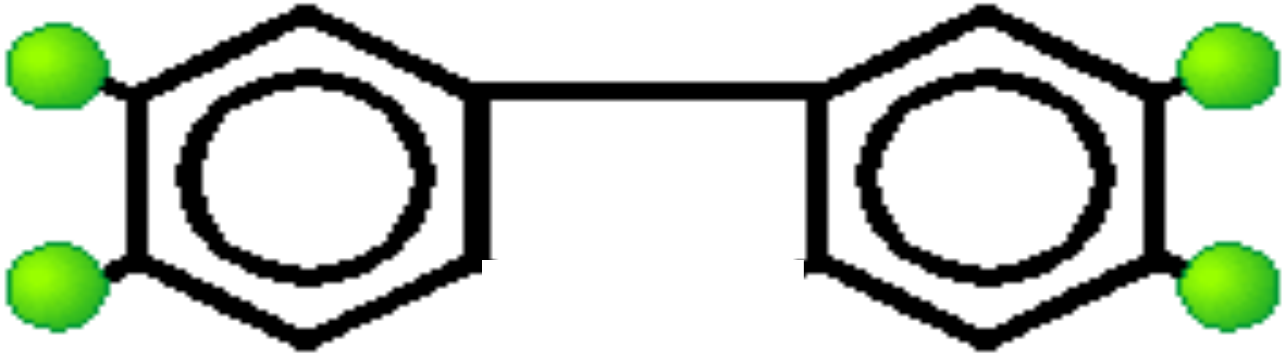
BIPHENYL

Polychlorinated biphenyls



PCBs = a family of compounds in which chlorine atoms are substituted for hydrogen at 1 to 10 positions on the BIPHENYL .

Polychlorinated biphenyls



This is one of 209 PCBS

PCBs = a family of compounds in which chlorine atoms are substituted for hydrogen at 1 to 10 positions on the BIPHENYL .

Furans (or PCDFs)

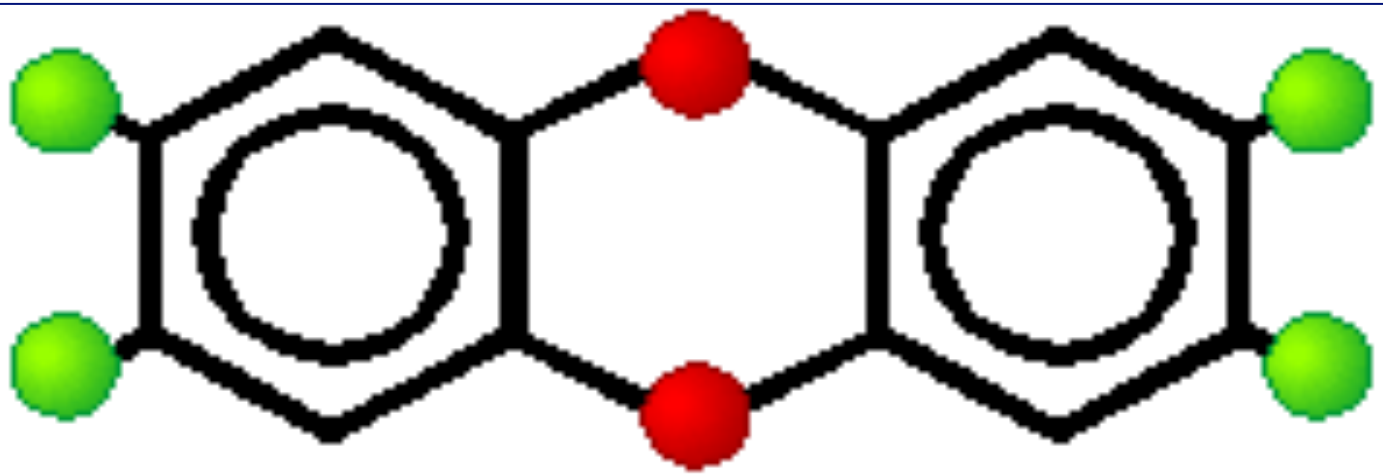
One of 135 chlorinated Furans

Furans (or PCDFs)

One of 135 chlorinated Furans

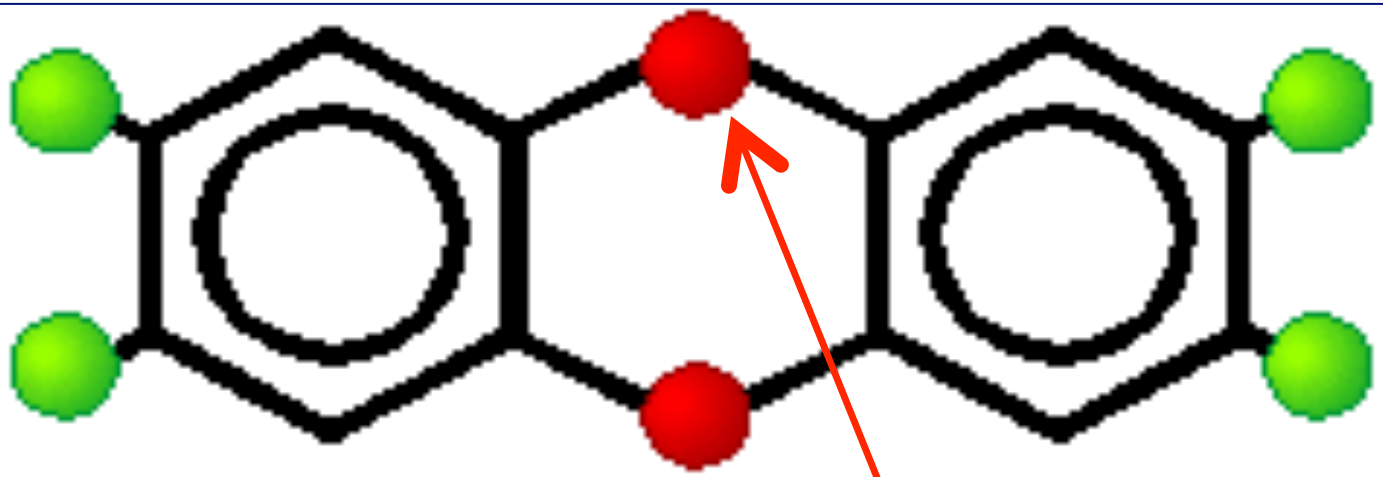
The Furans have an oxygen atom between the two benzene rings.

Dioxins (or PCDDs)



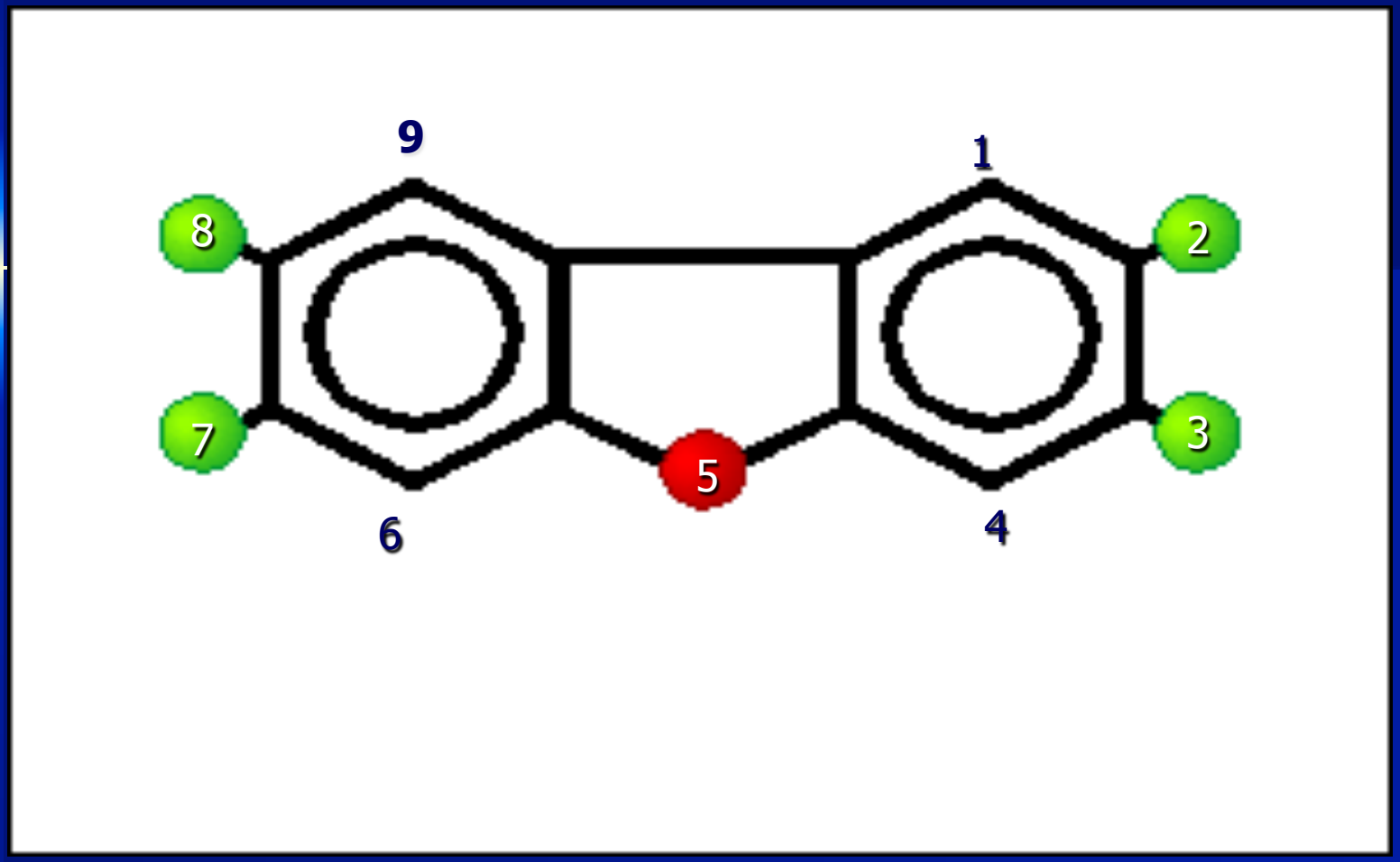
One of 75 chlorinated Dioxins

Dioxins (or PCDDs)

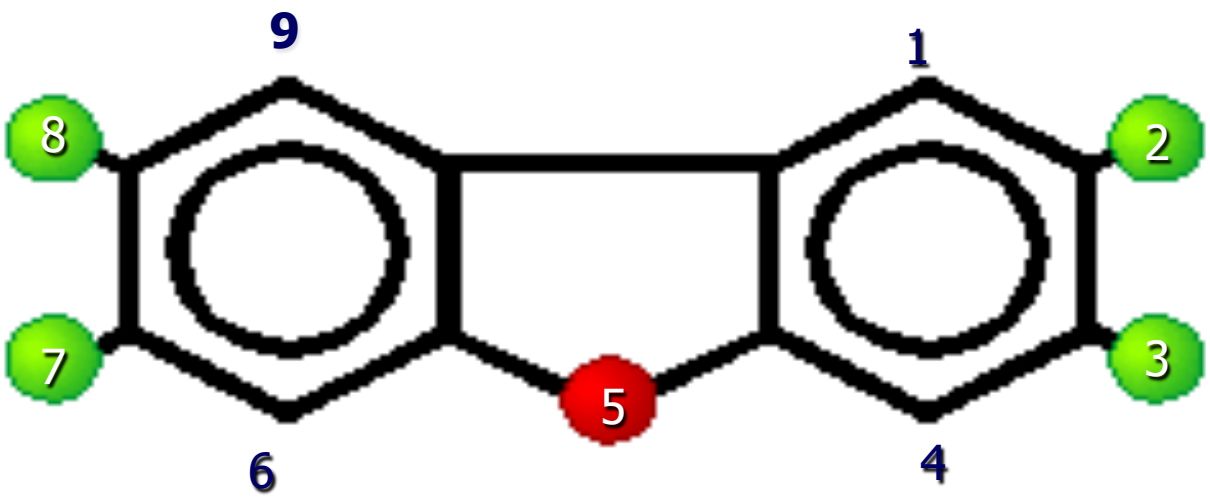


One of 75 chlorinated Dioxins

The Dioxins have two oxygen atoms linking the two benzene rings.



We number the ring positions to identify where the chlorine atoms are located. The 17 most toxic dioxins and furans have chlorine atoms at the 2,3,7 and 8 positions.

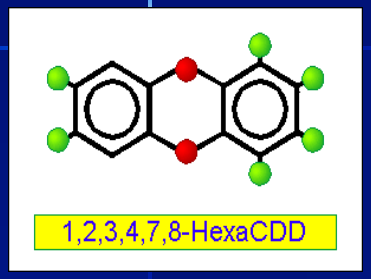


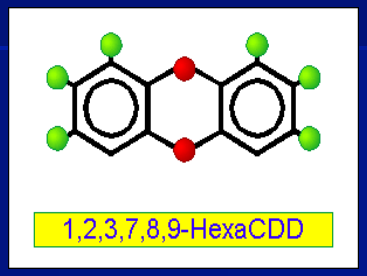
2,3,7,8-TetraCDF

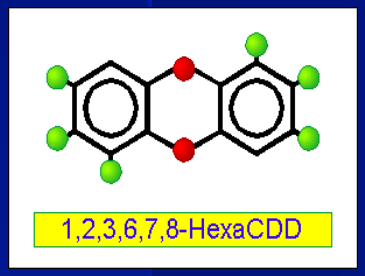
We number the ring positions to identify where the chlorine atoms are located. The 17 most toxic dioxins and furans have chlorine atoms at the 2,3,7 and 8 positions.

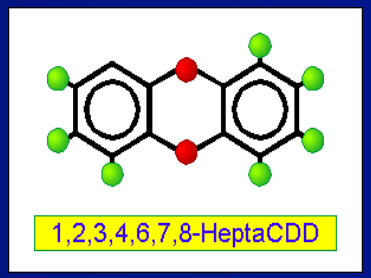
There are 17 extremely toxic dioxins and furans. They have chlorine at the 2,3,7 and 8 positions:

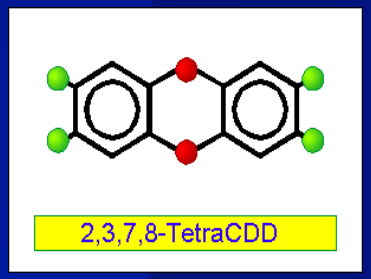
7 Dioxins and 10 Furans

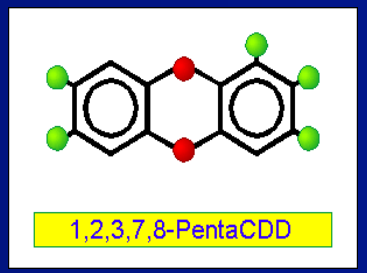


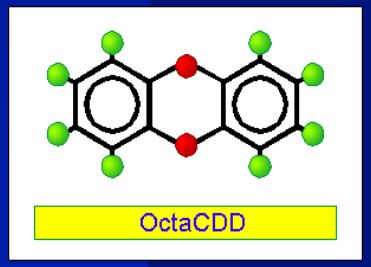


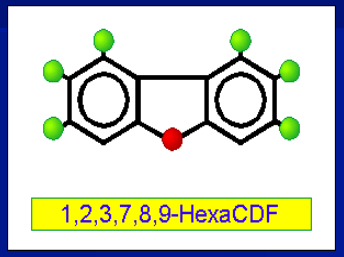


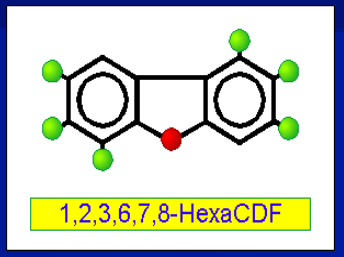


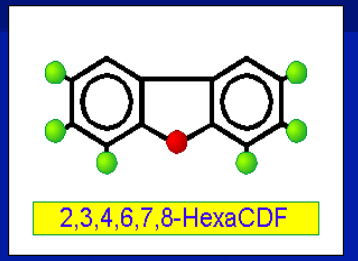


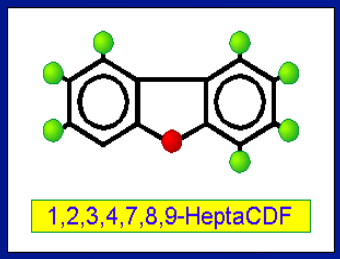


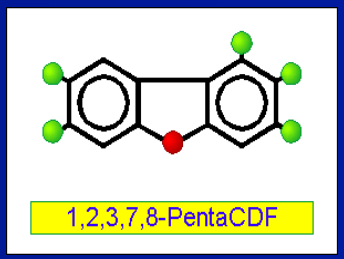


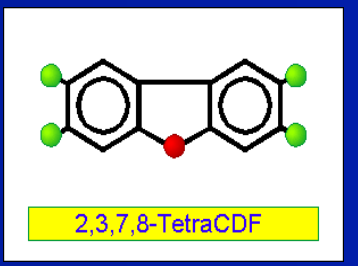


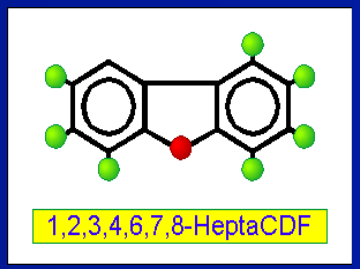


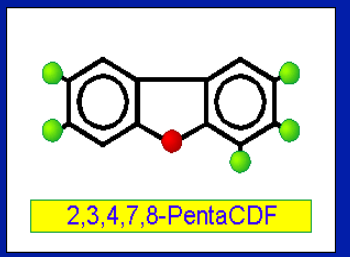


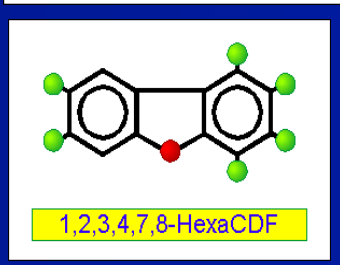


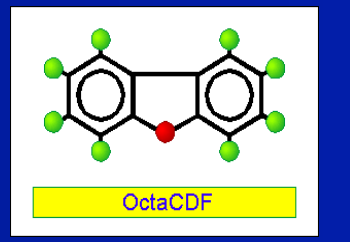






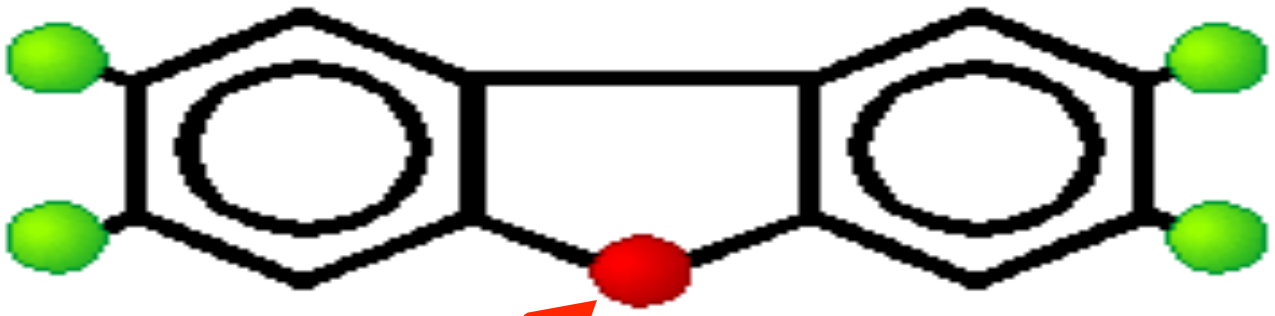




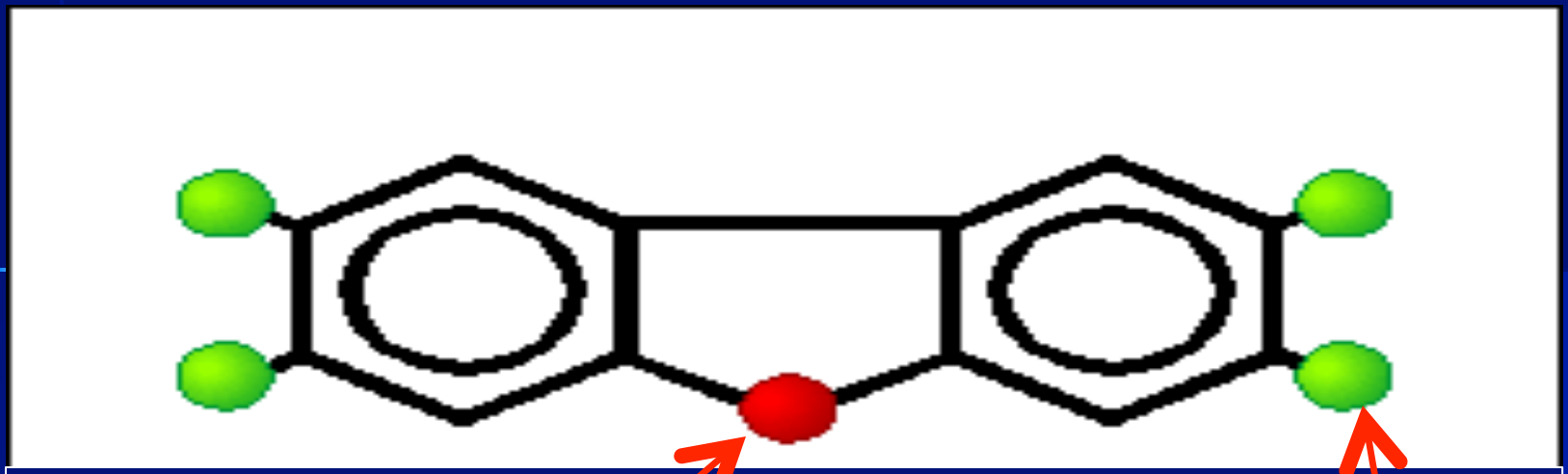


Other Dioxin like compounds

- PBBs (poly brominated biphenyls)
- PBDFs (poly brominated dibenzo furans)
- PBDDs (poly brominated dibenzo dioxins)
- PBCDDs and PBCDFs (mixed brominated and chlorinated dibenzo dioxins and furans)
- Nitrogen and sulfur analogues!
- PBDPE (poly brominated diphenyl ethers)
- Poly brominated and chlorinated napthalenes

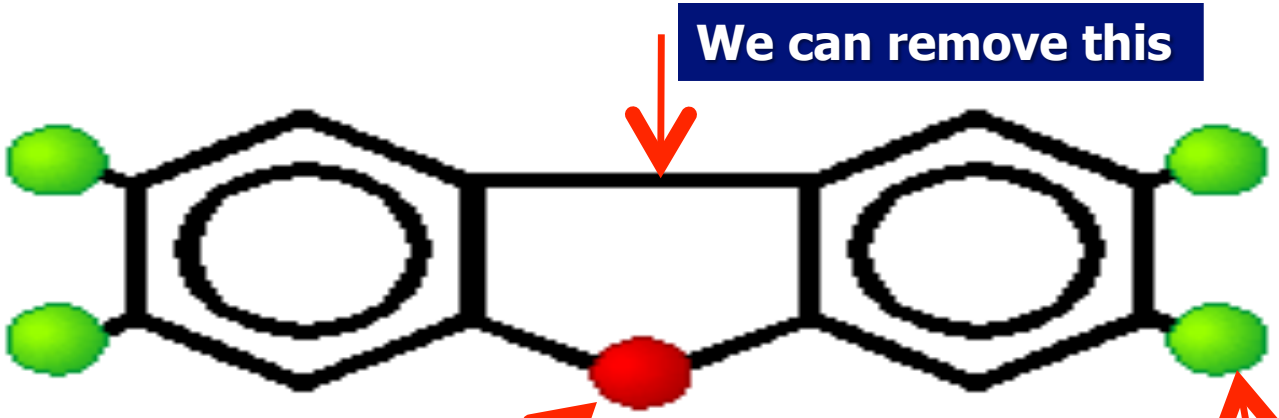


We can put a Nitrogen or Sulfur atom in place of oxygen here



We can put a Nitrogen or Sulfur atom in place of oxygen here

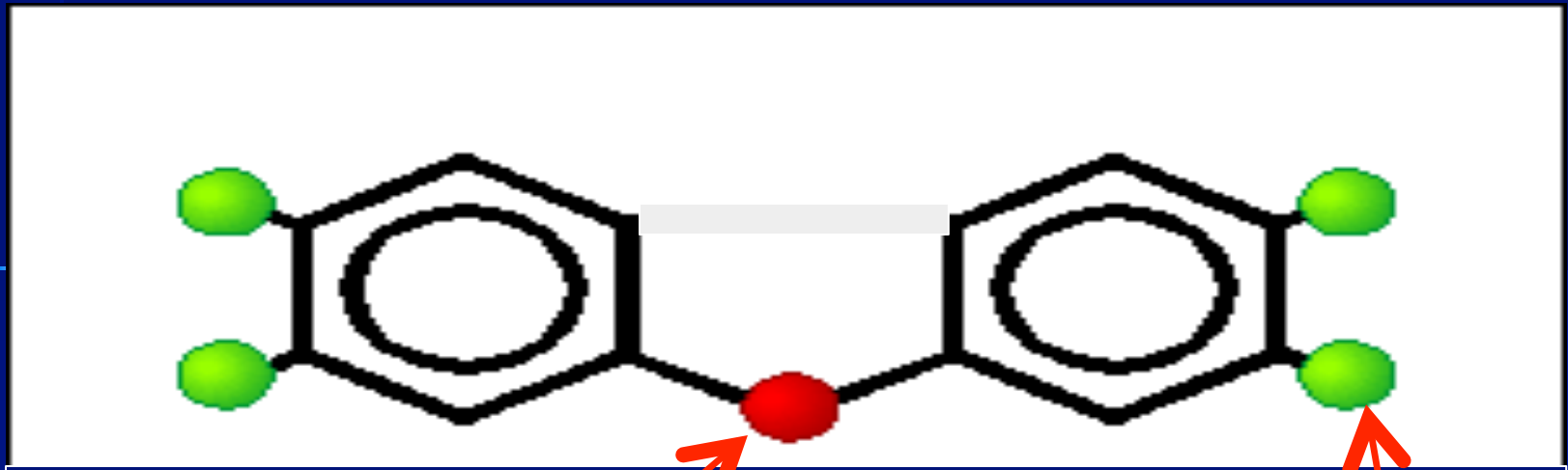
We can put a bromine of a chorine atom here



We can put a Nitrogen or Sulfur atom in place of oxygen here

We can put a bromine of a chorine atom here

We can arrange the benzene rings differently



We can put a Nitrogen or Sulfur atom in place of oxygen here

We can put a bromine of a chorine atom here

We can arrange the benzene rings differently (this would be called a poly chlorinated or brominated diphenyl ether)

But even if we made incinerators (or cement kilns burning waste) safe we would never make them sensible

The arguments against burning waste in cement kilns

- 10) There are better ways – and more sustainable ways - of handling waste

The modern incinerator is attempting to perfect a bad idea

- Our task in the 21st Century is not to find better ways to destroy discarded materials
- **But to stop making packaging and products that have to be destroyed!**

The Waste problem will not be solved with better technology

- But with
- Better organization
- Better education
- and better industrial design

An alternative strategy
ZERO WASTE

PAUL CONNETT

con Rossano Ercolini e Patrizia Lo Sciuto

RIFIUTI ZERO

una rivoluzione in corso

introduzione di Tommaso Sodano

DISSENSI

Published March 2012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THE
ZERO
Untrashing the Planet One Community at a Time
WASTE
How cities and towns around the world are saying no to incinerators and wasteful product design
SOLUTION
and yes to radical recycling, reuse entrepreneurs, and the jobs they create
PAUL CONNETT

Subtitle of the Book:
"Untrashing the Planet One Community at a Time."

TRASHED
NO PLACE FOR WASTE

JEREMY IRONS & CANDIDA BRADY
INVITE YOU TO A PRIVATE SCREENING OF

TRASHED

ON FRIDAY, SEPTEMBER 7TH 2012

AT TRIBECA CINEMAS
54 VARICK STREET, NEW YORK, NY 10013
(NEAR CANAL STREET)

JOIN US AT 3PM FOR A SHORT Q&A SESSION
SCREENING AT 3.30PM
AND AFTERWARDS FOR A PANEL DISCUSSION ON WASTE SOLUTIONS

PLEASE RSVP TO HOLLY@BLENHEIMFILMS.COM BY AUGUST 10TH

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Foreword written by Jeremy Irons

ZERO WASTE IS A NEW DIRECTION

THE BACK END OF WASTE MANAGEMENT

THE
BACK END
OF
WASTE
MANAGEMENT

THE
FRONT END
OF
INDUSTRIAL
DESIGN

We need THREE thngs to get to ZERO WASTE

1) INDUSTRIAL RESPONSIBILITY at the FRONT END (upstream)

2) COMMUNITY RESPONSIBILITY at the BACK END (downstream), and

3) GOOD POLITICAL LEADERSHIP to bring these two together

ZERO WASTE

ZERO WASTE

Community Responsibility = Reduce, Reuse, Recycle/ Compost

ZERO WASTE

Community Responsibility = Reduce, Reuse, Recycle/ Compost

Industrial Responsibility = Re-Design

TEN STEPS
TO
ZERO WASTE

Source Separation

Door to Door Collection

Composting

Recycling

Reuse, Repair & Community Center

Waste Reduction Initiatives

Economic Incentives

Residual Separation & Research Center

Better Industrial Design

Temporary Landfill

2020

70 - 80%

COMMUNITY RESPONSIBILITY

Residual Separation & Research Facility

Better Industrial Design

2020

INTERIM LANDFILL

70-80%

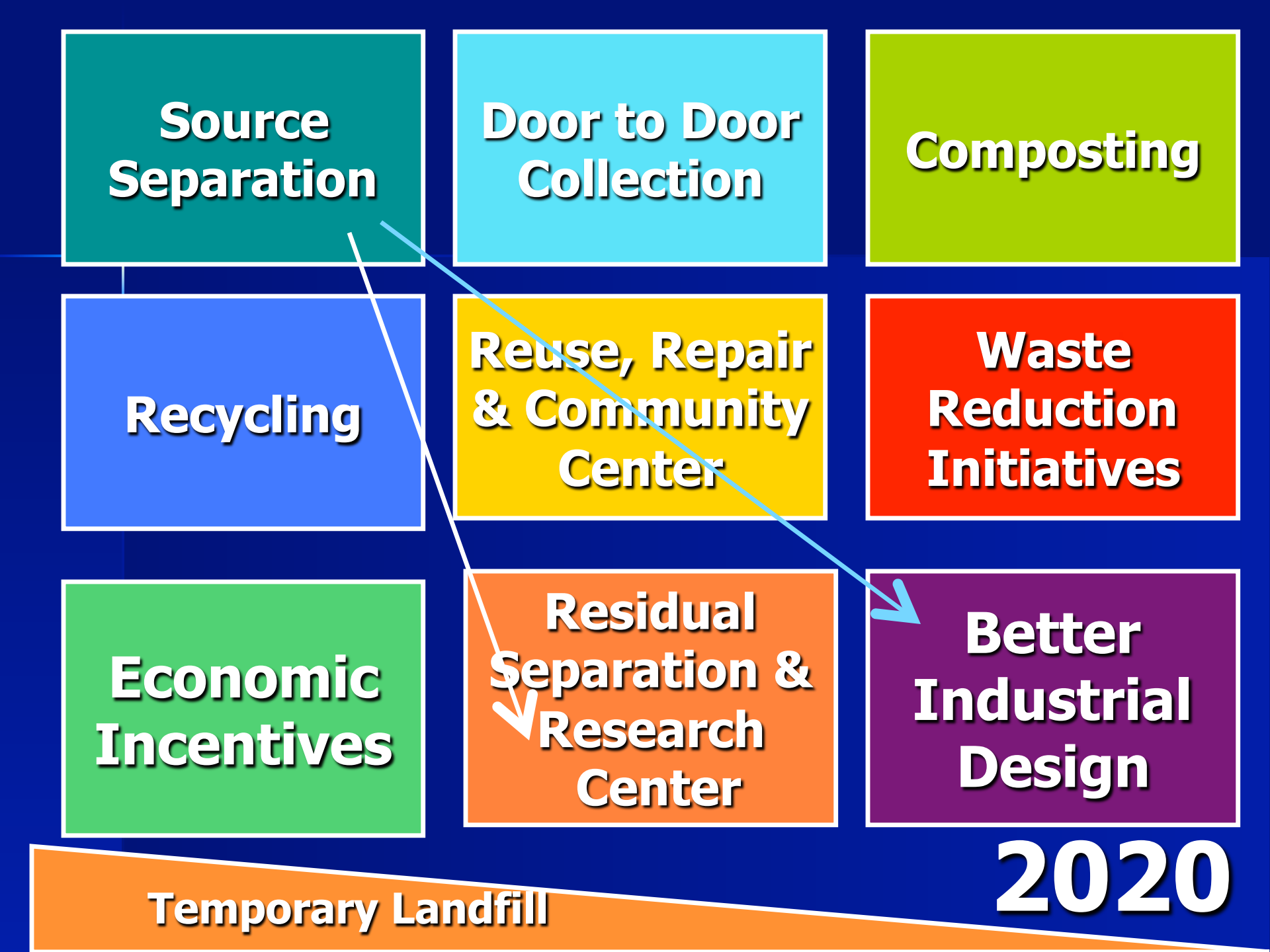
COMUNITY RESPONSIBILITY

20-30%

INDUSTRIAL
RESPONSIBILITY

2020

INTERIM LANDFILL


Source Separation
Door to Door Collection
Composting
Recycling
Reuse, Repair & Community Center
Waste Reduction Initiatives
Economic Incentives
Residual Separation & Research Center
Better Industrial Design
Temporary Landfill
2020

This plan

1) Is better for the Economy…

MORE JOBS

2) Is better for our HEALTH…

LESS TOXICS

3) Is better for our UNIVERSITIES

MORE MEANING

4) Is better for the PLANET…

MORE SUSTAINABLE

5) Is better for our CHILDREN…

MORE HOPE

The Battle Hymn of Garbage

(Chorus)

We don't want incineration

We don't want incineration

We don't want incineration

We know there's a better way!

The Battle Hymn of Garbage

Mine eyes have seen the garbage
That's a smoldering on the grate
We must stop incineration
Before it is too late
Unless we wish the dangers
We had better separate
And we must do it now!

The Battle Hymn of Garbage

(Chorus)

We don't want incineration

We don't want incineration

We don't want incineration

We know there's a better way!

God recycles, the devil burns

Extra Slides

Dioxins & Incineration

OUTLINE

- Dioxins & incineration:
- A) history
- B) chemistry
- C) biology
- D) health threat

History

- 1960s, 1970s Most people hear of dioxins in relation to use of Agent Orange in Vietnam
- 1949 - 1976 dioxins produced in industrial accidents in plants making 2,4,5 Trichlorophenol. Most famous Seveso, Italy in 1976.
- 1977 dioxins found in trash incinerator emissions (Olie et al)
- 1977 -'85 Engineers argue that dioxin problem solved by running incinerator furnaces at high temps. They were wrong
- 1985 - Ozvacic et al. find dioxins formed after the furnace.

Dioxin 1980s - 1990s

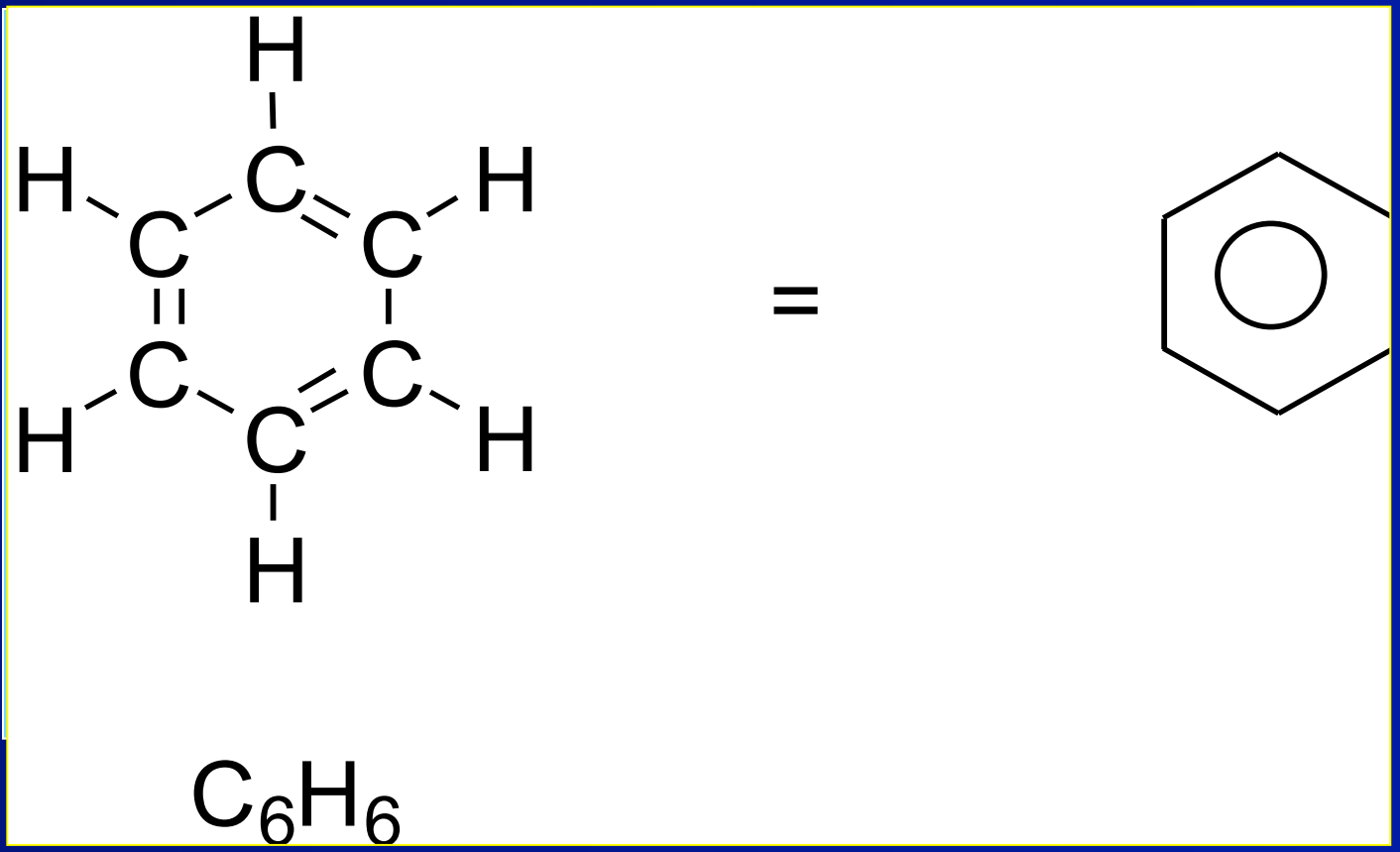
- Biggest source of dioxin is from food, particularly animal fat.
- Biggest source of dioxin entering food chains = combustion
- Medical, municipal and hazardous waste incineration, cement kilns burning waste, backyard burning (PVC), Fires (PVC), copper recycling (PVC), metal smelting
- 1990's better dioxin control from incineration. Many plants retrofitted and older plants closed down.

DIOXINS
The chemical structures

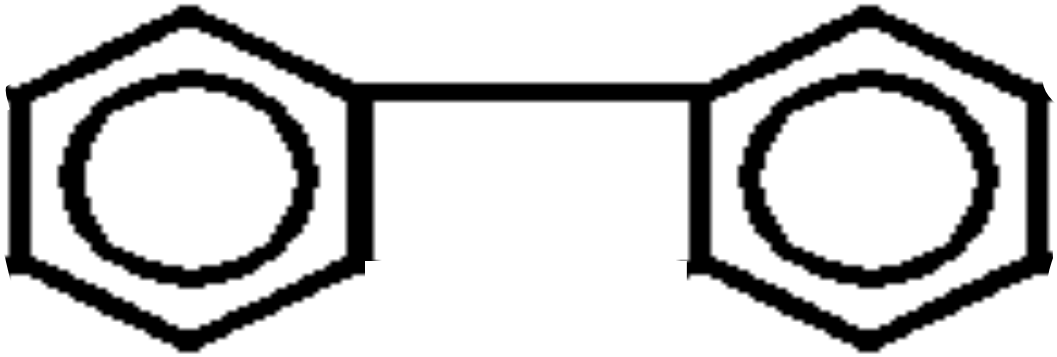
Dioxin like compounds (DLC)

- 3 families
- PCBs
- PCDFs (furans)
- PCDDs (dioxins)

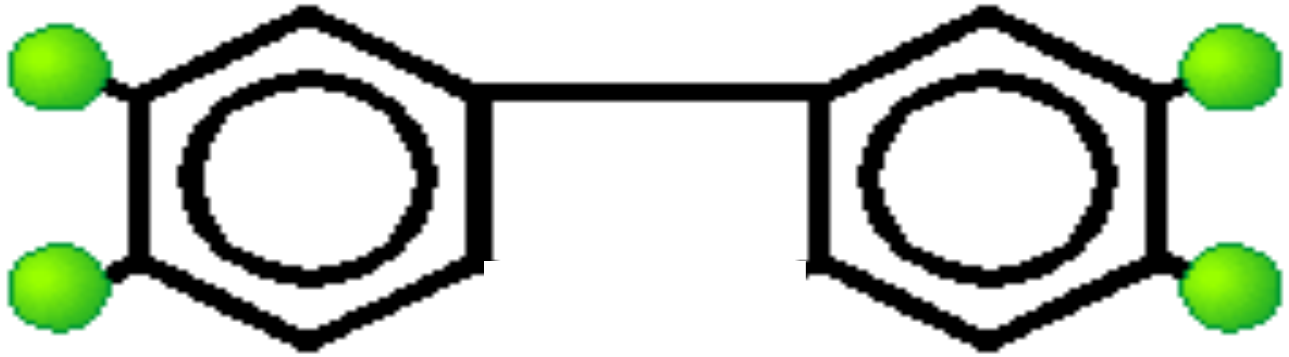
Benzene



BENZENE

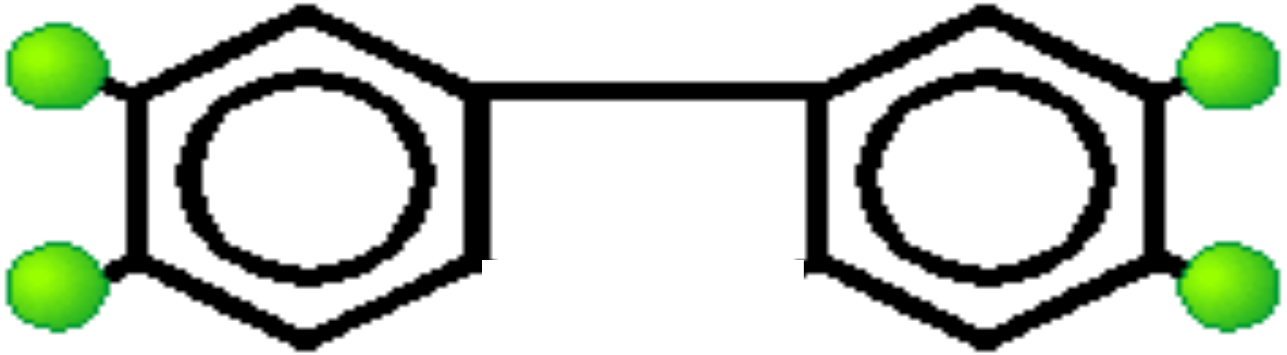


BIPHENYL



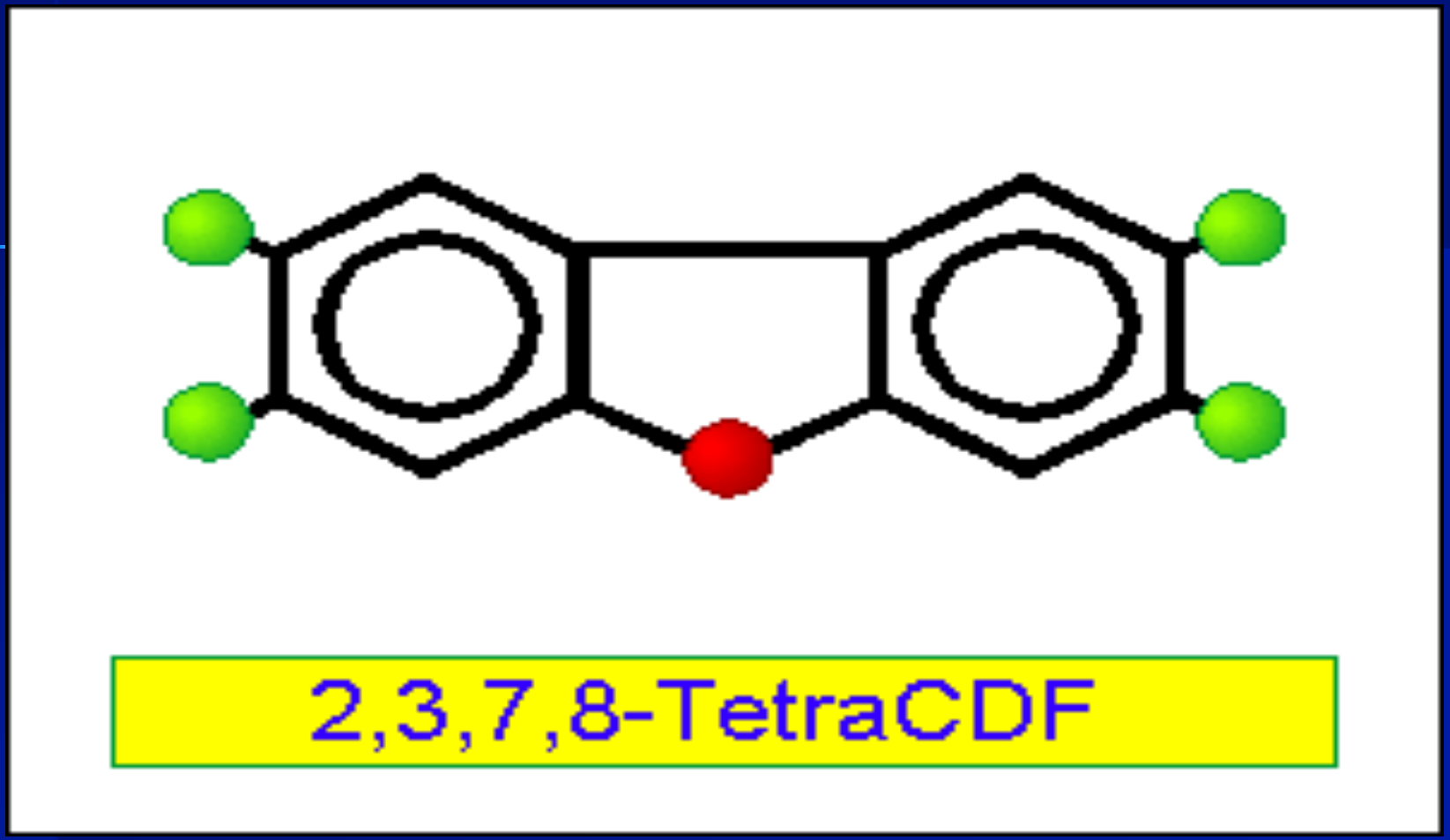
One of 209 PCBS

Polychlorinated biphenyls



One of 209 PCBS

PCBs = a family of compounds in which chlorine atoms are substituted for hydrogen at 1 to 10 positions of BIPHENYL .



Furans (or PCDFs) have an oxygen atom forming a five membered ring (the furan) between the two benzenes of PCBs. There are 135 furans.

Furans (or PCDFs)

2,3,7,8-TetraCDF

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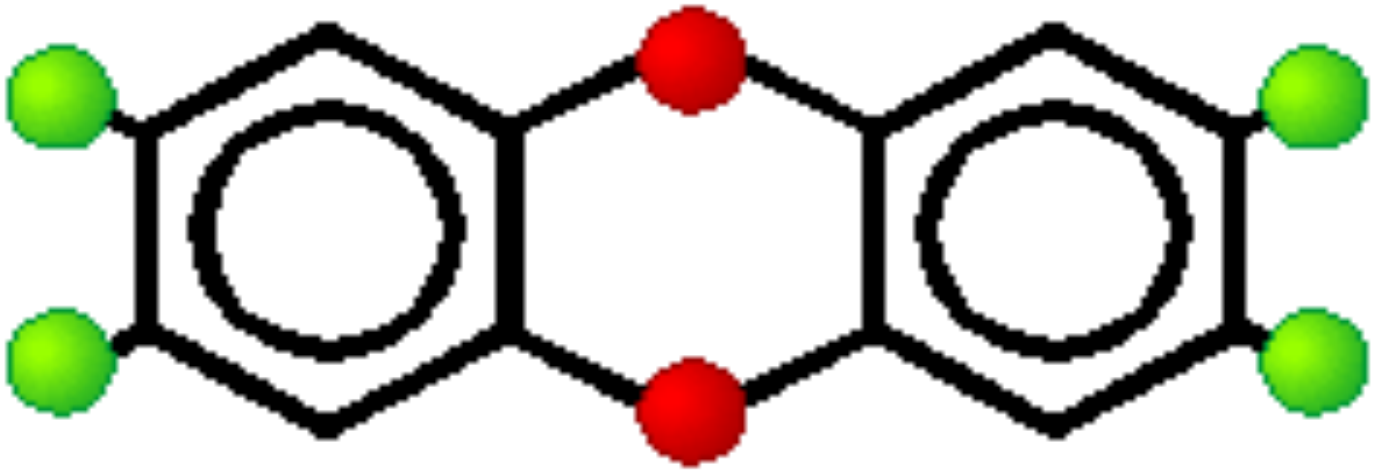
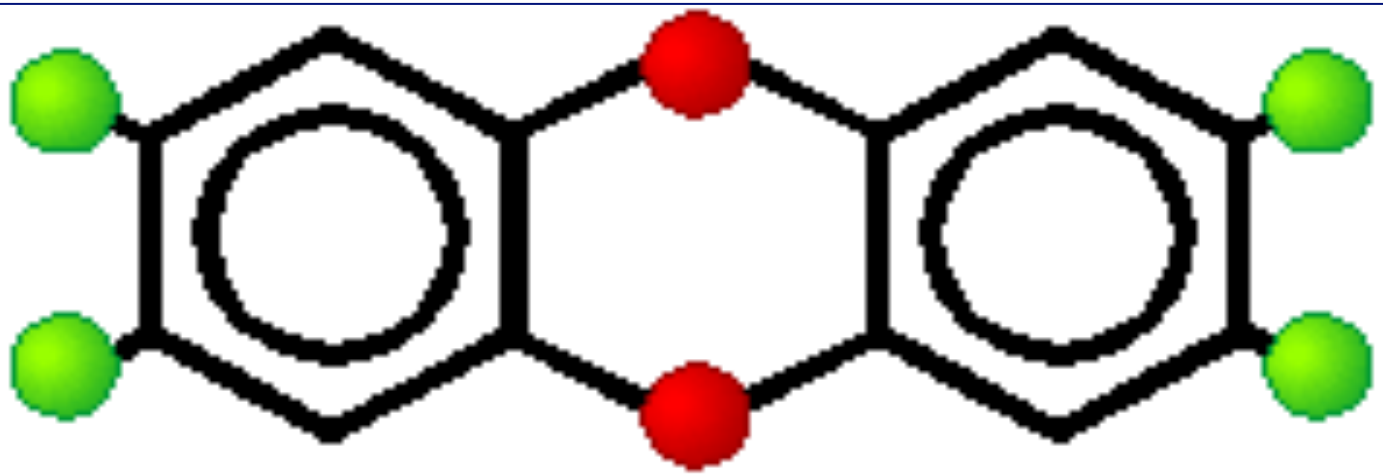


2,3,7,8-TetraCDD

Dioxins (or PCDDs) have two oxygen atoms linking the two benzene rings, forming the dioxin ring. There are 75 dioxins.

Dioxins (or PCDDs)



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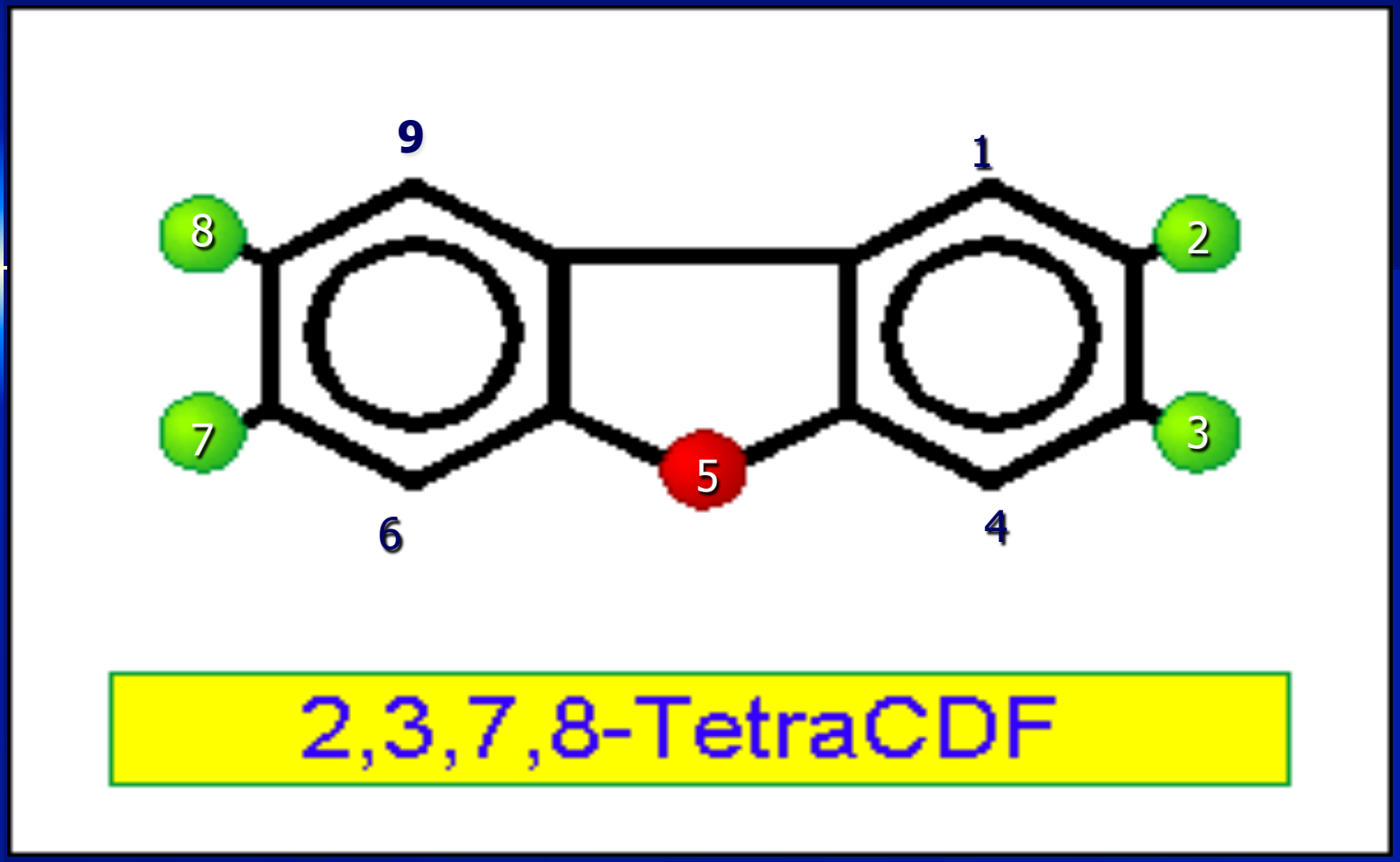
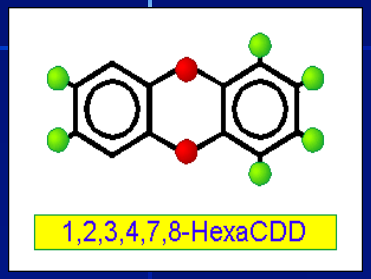
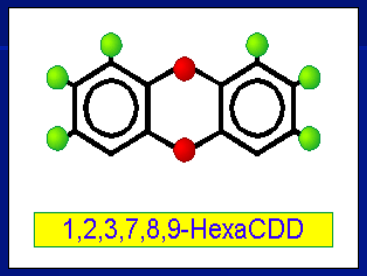


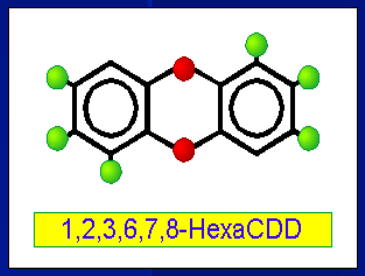
2,3,7,8-TETRA CHLORO DIBENZO FURAN

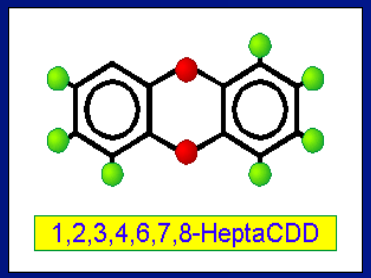
There are 17 extremely toxic dioxins and furans. They have chlorine at the 2,3,7 and 8 positions:

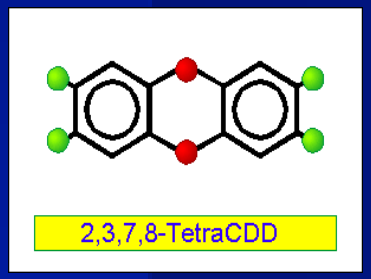
7 Dioxins and 10 Furans

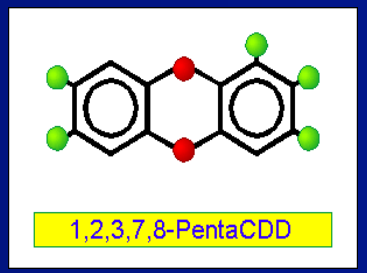


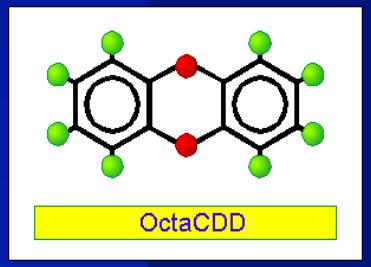


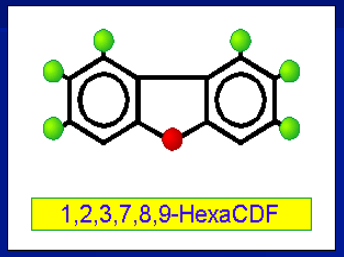


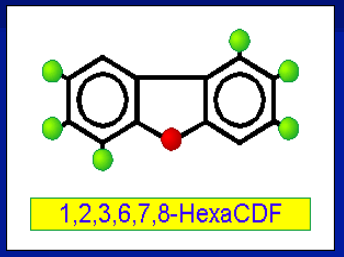


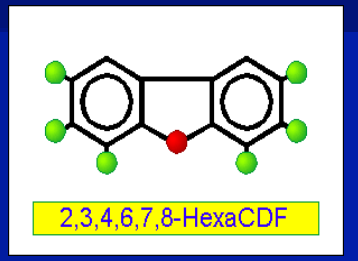


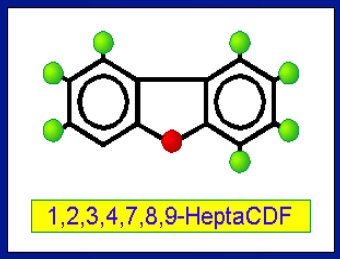


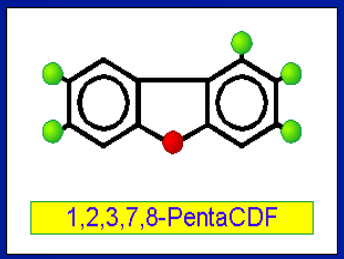


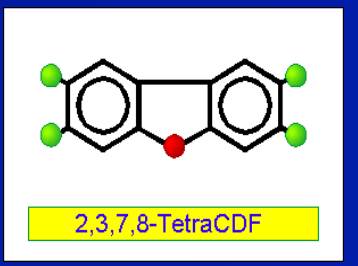


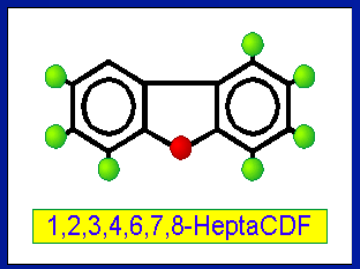


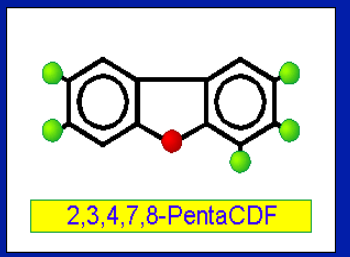


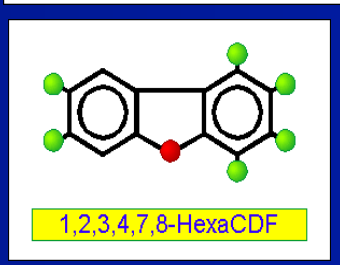


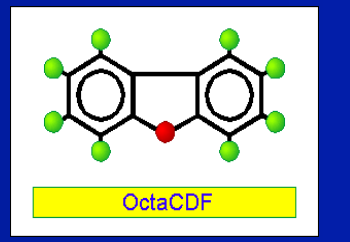










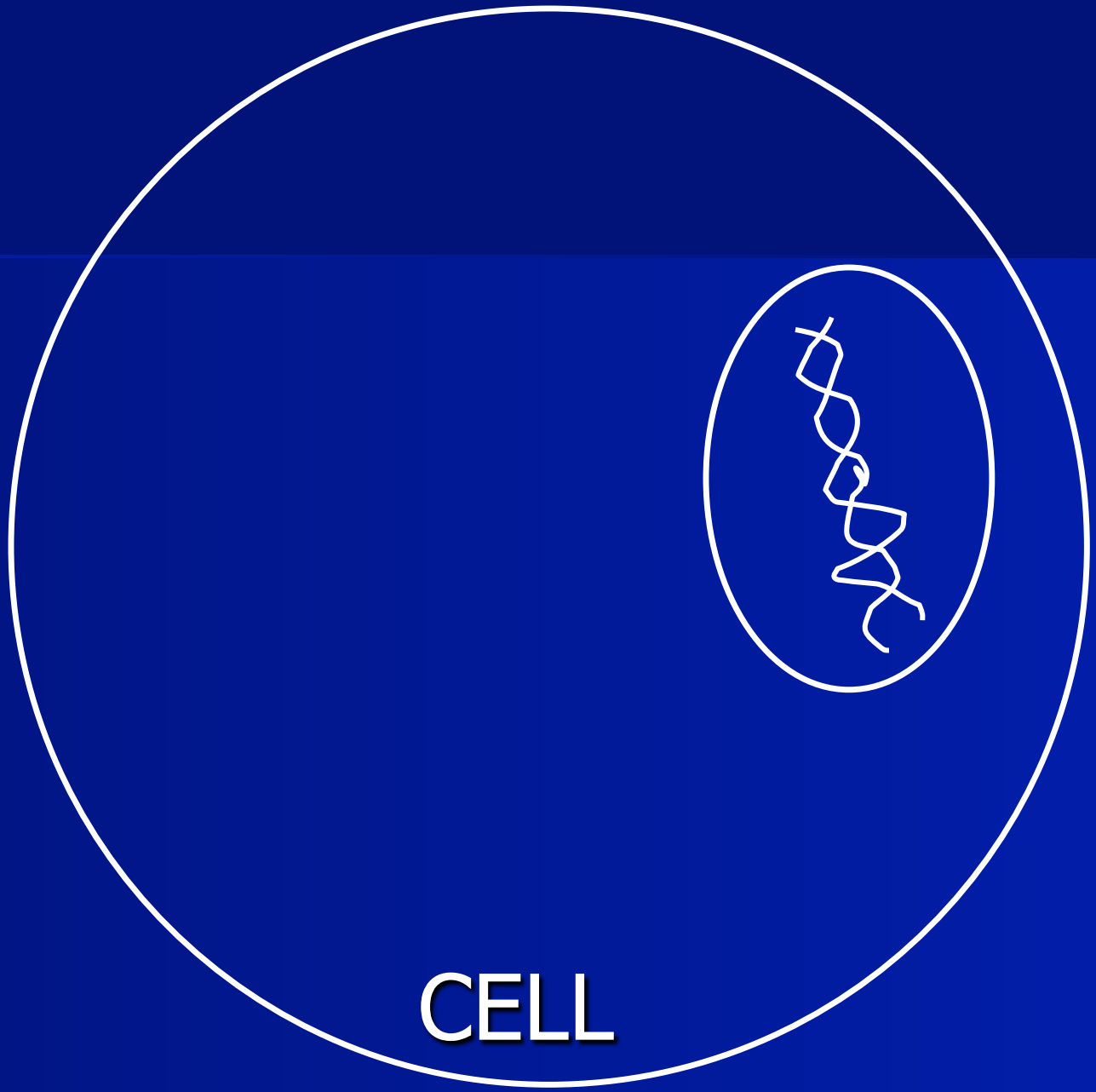


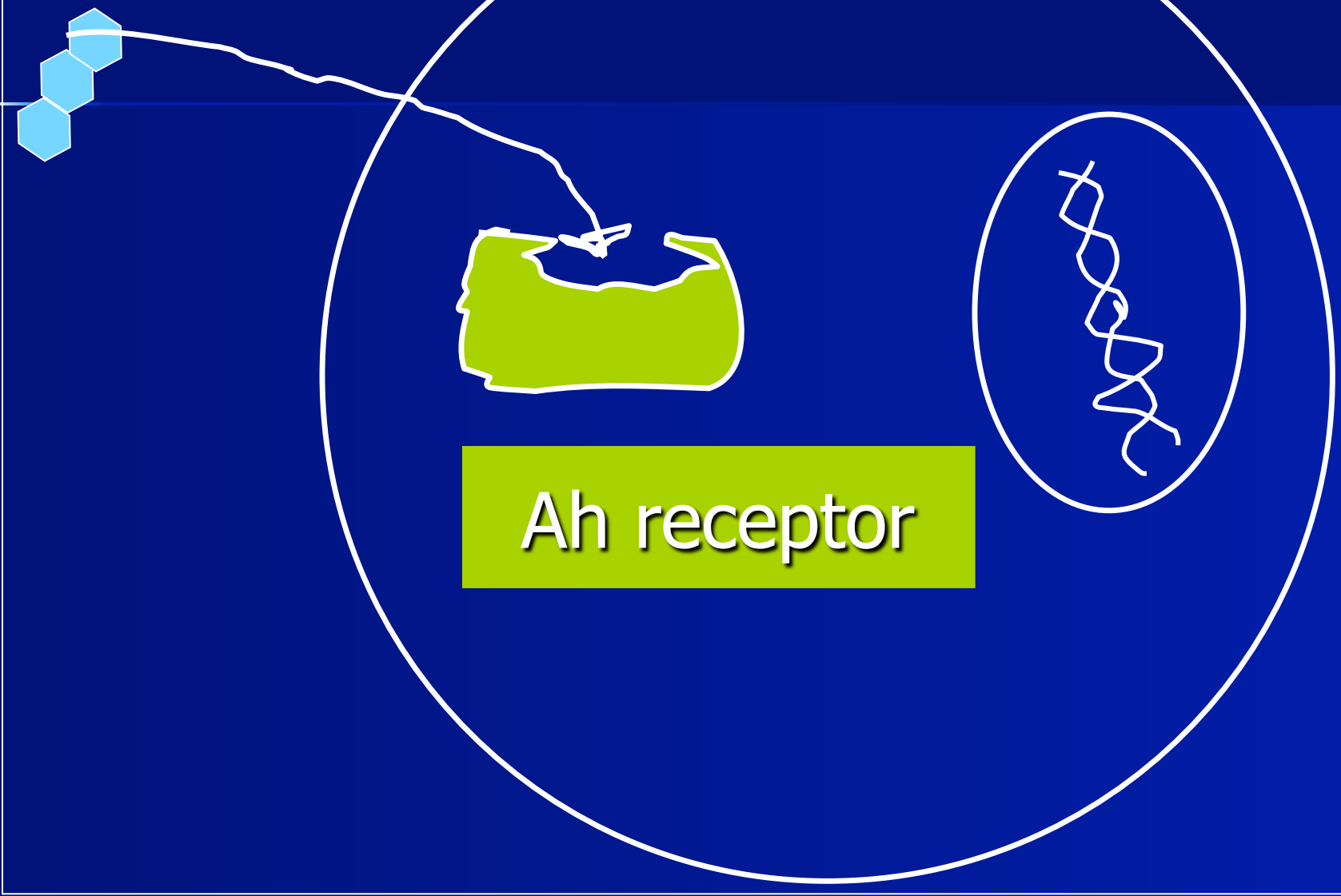
Other Dioxin like compounds

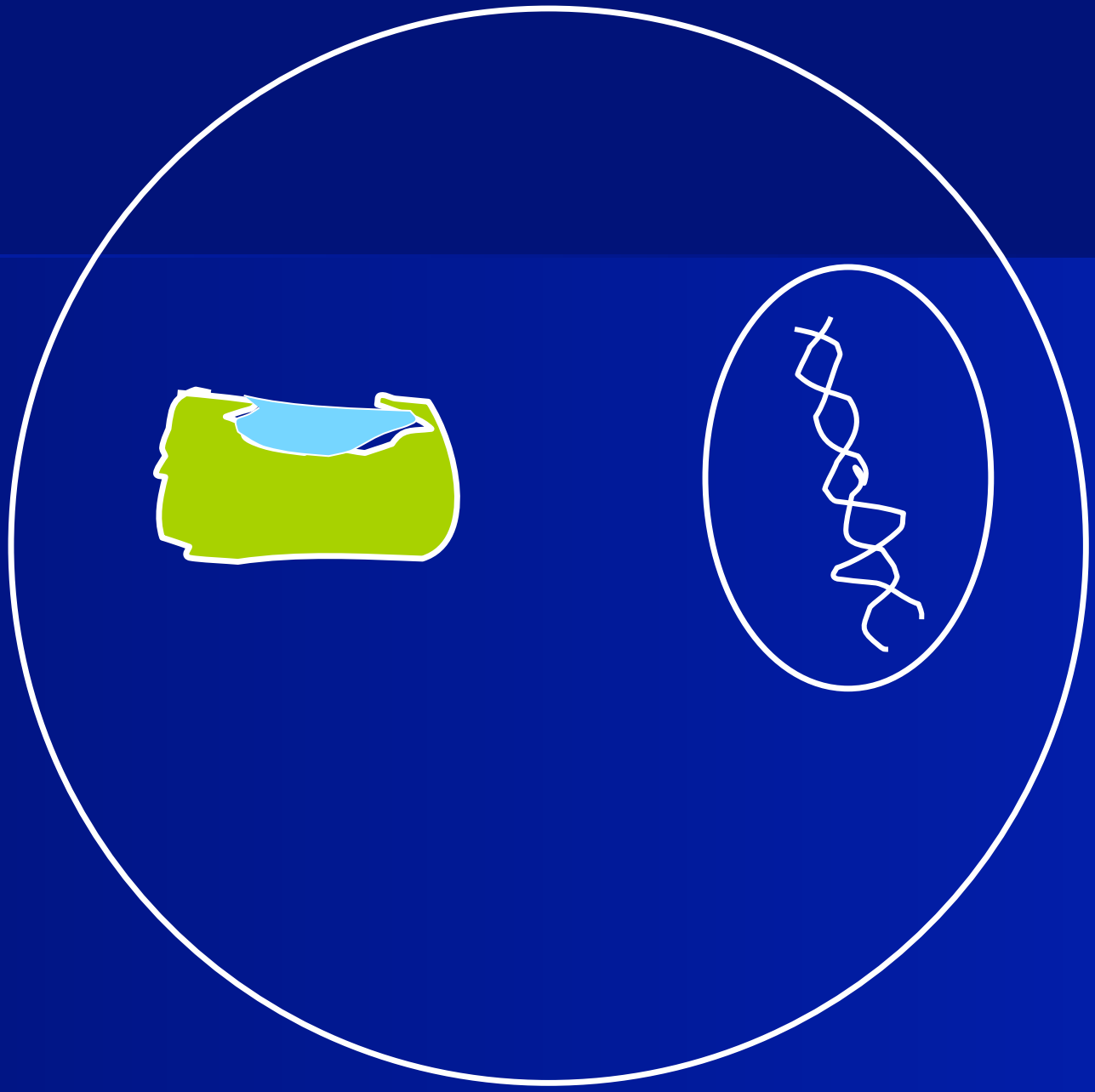
- PBBs (poly brominated biphenyls)
- PBDFs (poly brominated dibenzo furans)
- PBDDs (poly brominated dibenzo dioxins)
- PBCDDs and PBCDFs (mixed brominated and chlorinated dibenzo dioxins and furans)
- PBDPE (poly brominated diphenyl ethers)
- Poly brominated and chlorinated napthelenes
- Nitrogen and sulfur analogues!

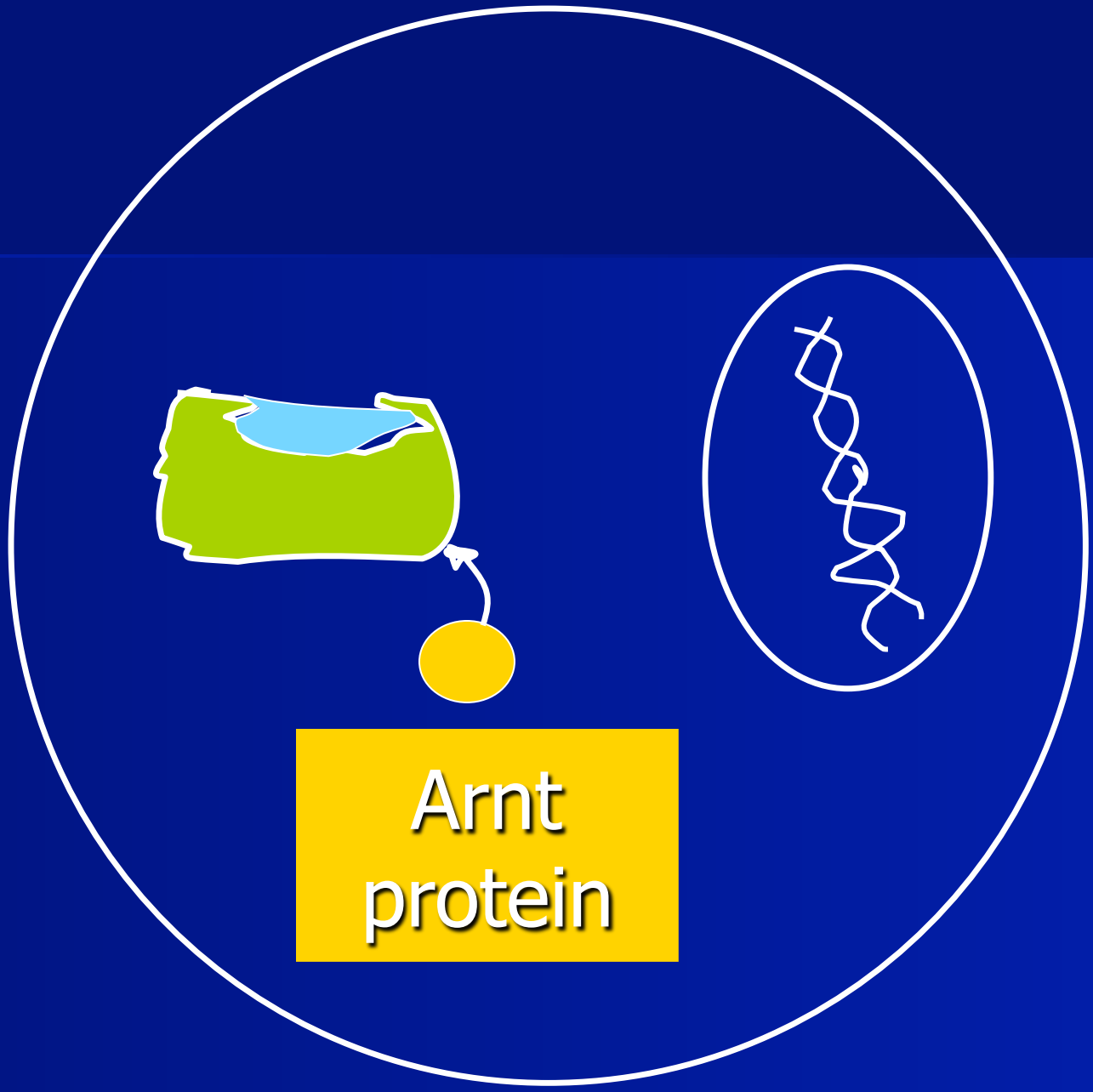
The biology

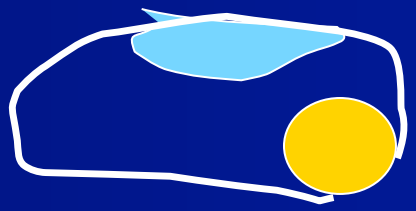
Dioxin
Or
Dioxin-like
Compound
(DLC)

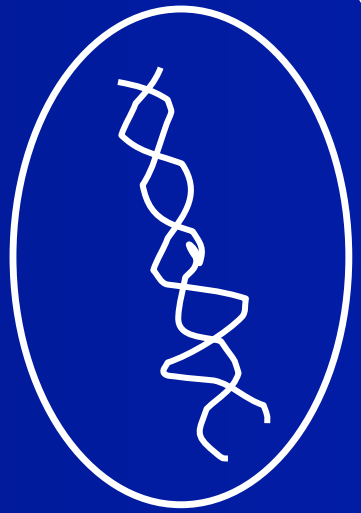



Ah receptor

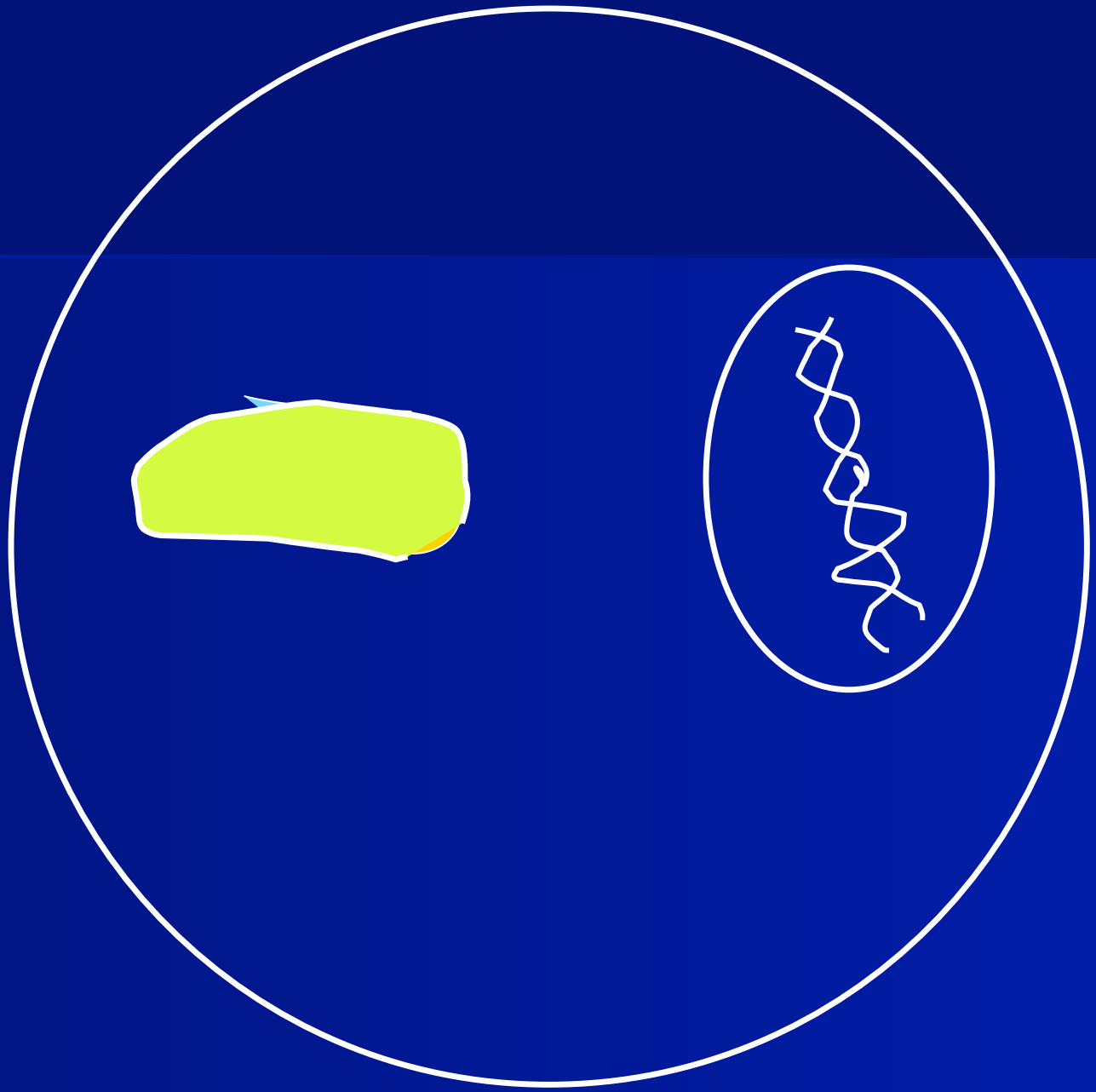


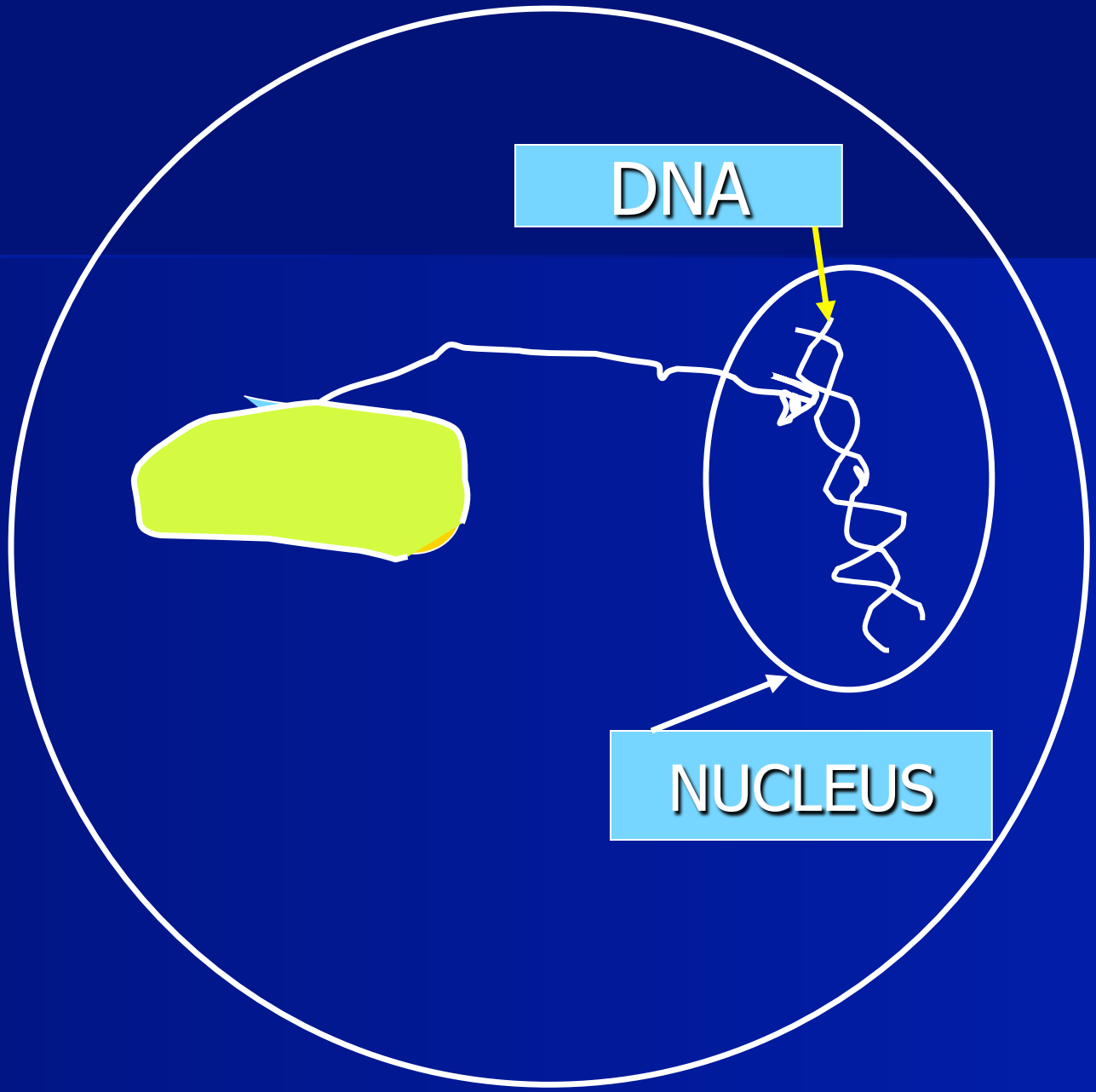

Arnt
protein



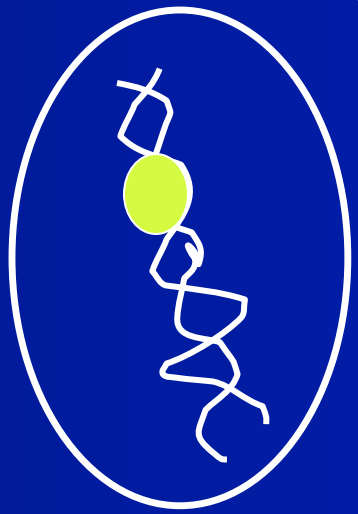


Complex
With
Changed shape

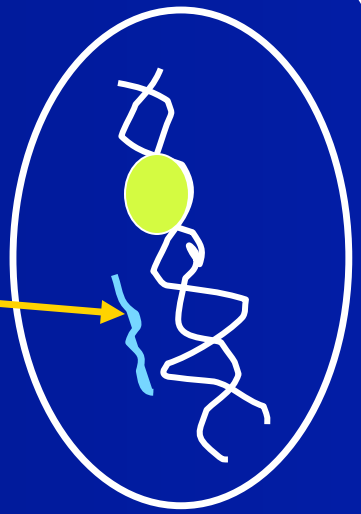



DNA
NUCLEUS

Dioxins
do not cause
mutations
But
switch on genes

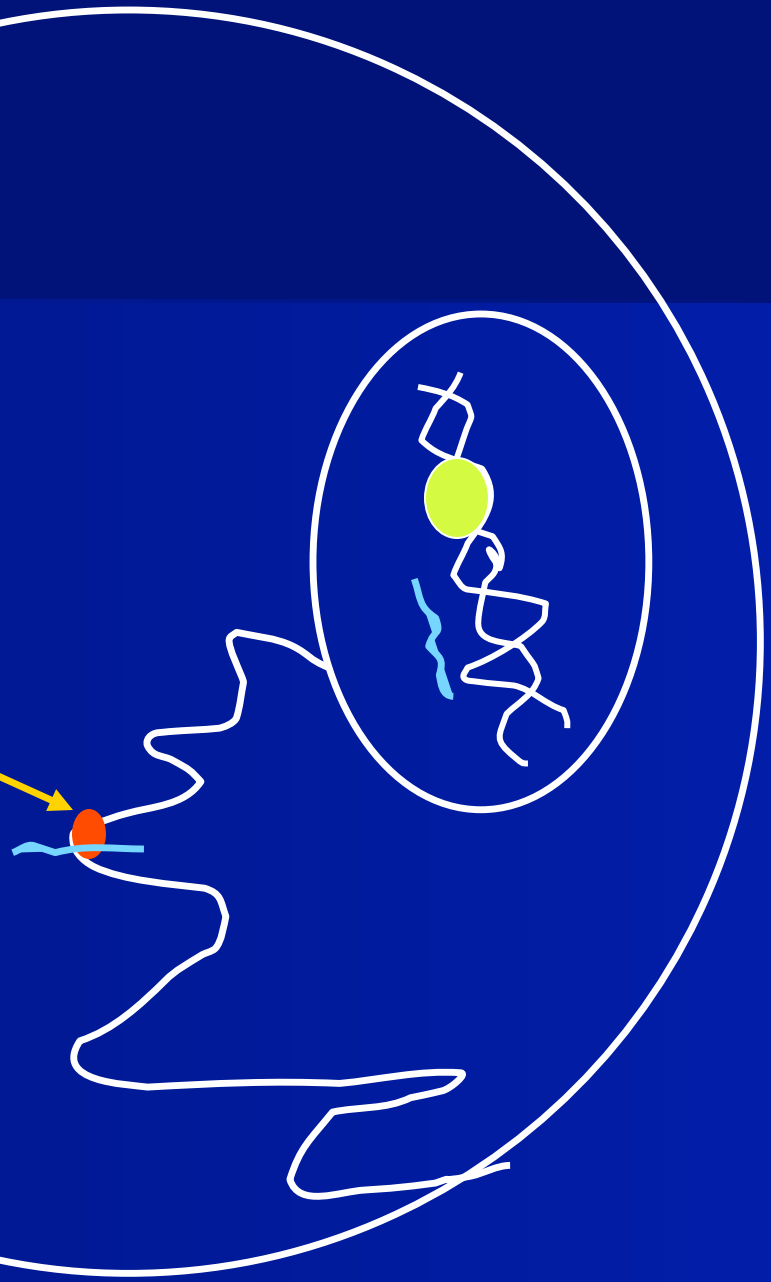


Switching on a gene means producing a specific messenger RNA which codes for a specific protein

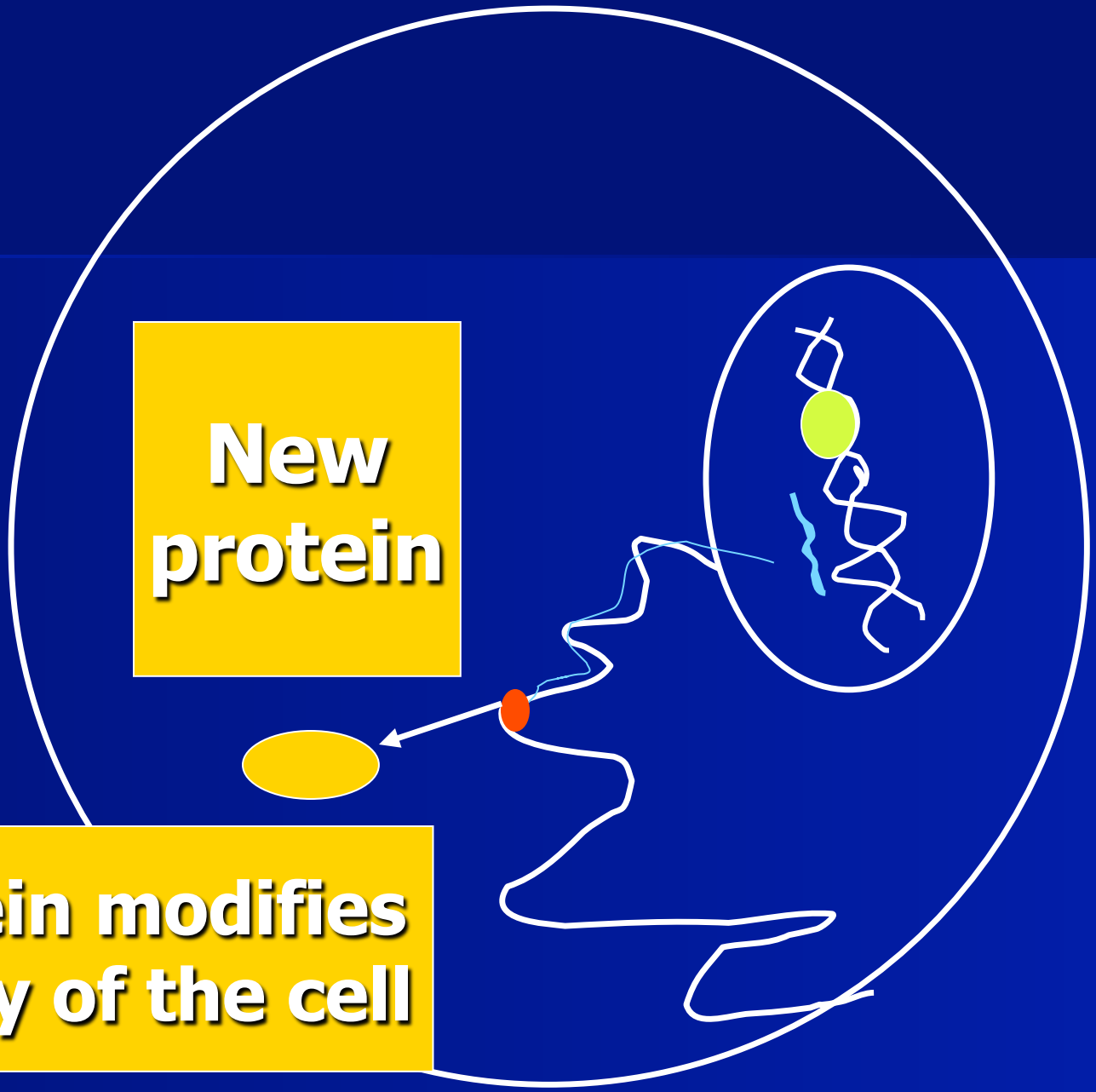


messenger RNA travels to the **ribosome** (= protein factory)

In the ribosome the messenger RNA directs the production of a specific protein




New protein

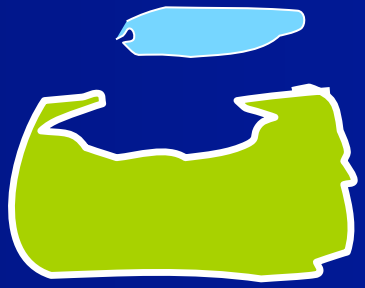


New protein modifies the activity of the cell


Ah receptor

Two remarkable things about the Ah Receptor

1) After 30 years of research scientists do not know what it is in the cell for. They have not identified its normal ligand or function.



?

2) The Ah receptor appears in evolution at the same time as the backbone appears in fish. Every species above invertebrates has the Ah receptor.

Effects of dioxins on thyroid function of new born babies

- H.J. Pluim et al., The Lancet, May 23, 1992. (Volume 339, 1303)
- Examined 38 new born babies, divided them into 2 groups:
- Low-exposed (mothers had average 18.6 ppt dioxins in milk fat, range 8.7 - 28)
- High-exposed (mothers had average 37.5 ppt dioxins in milk fat, range 29 - 63)

Effect of Dioxins on Neonatal Thyroid Function after Low-exposure and High-exposure at various ages

		Low-exposure (mean)	High-exposure (mean)	P*
At birth	T4	122.5	134.3	0.071
	T4/TBG	0.240	0.232	0.45
	TSH	10.4	11.9	0.58
1 week	T4	154.5	178.7	0.006*
	T4/TBG	0.291	0.332	0.006*
	TSH	2.93	2.56	0.51
11weeks	T4	111.1	122.2	0.033*
	T4/TBG	0.220	0.247	0.040*
	TSH	1.81	2.50	0.044*