



# CHEMISTRY IN IRELAND

## European City of Science 2012

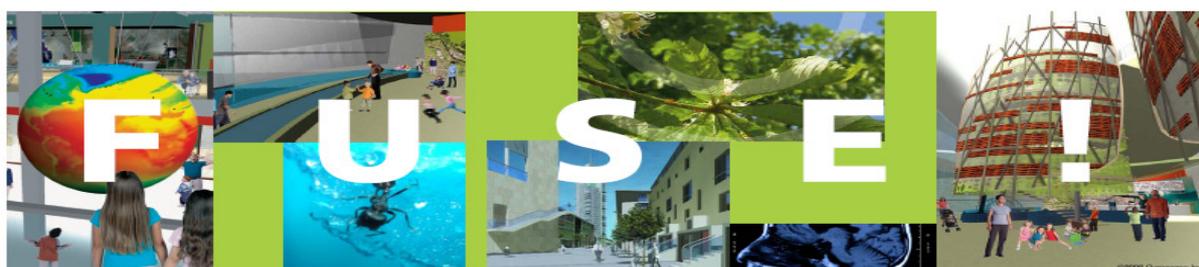
Dublin has recently been chosen as **European City of Science for 2012**. The Euroscience Open Forum (ESOF) takes place every two years and Dublin was chosen over many other countries including their main rival, Vienna, to host the event. The decision was made in Stuttgart in Germany on the 13th of November. There will be various events happening in Dublin throughout the whole year,



with a special **'International Festival of Science'** to take place that June. There will be science talks, demonstrations and exhibitions taking place. Thousands of selected people have been invited to this festival which is anticipated to show the world the best of Irish Science and research. There will also be an 'Olympics of Research' event taking place for 50000 citizens in July. The current minister for Science and Technology, Jimmy Devins, said the decision to make Dublin the City of Science was "recognition of the great strides that Ireland has made in the area of science and technology and innovation". Previous European cities to host the event have been Stockholm in 2004, Munich in 2006, Barcelona in 2008 and will be Turin in 2010.

A new interactive science museum is also being built with a vision of bringing art, science and everyday life together.

## EXPLORATION STATION



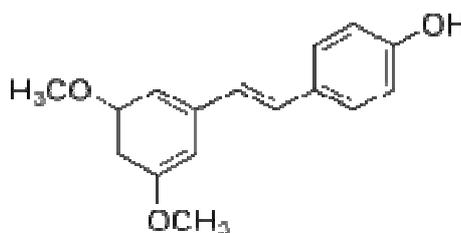
## CONCEPTUAL FRAMEWORK

# Food for Thought



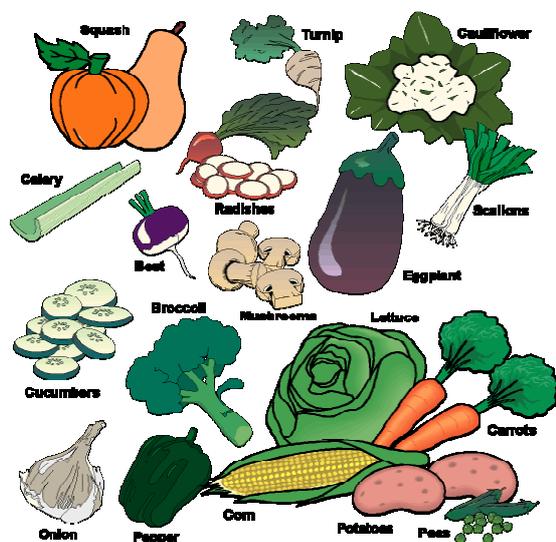
We've always known the key to good health is a balanced diet and that certain foods are good for different parts of our bodies for example calcium in dairy products helps build & strengthen bones & vitamin C in fruits & vegetables builds our immune system and protects us. However new studies carried out by nutrition scientists and nutritionists in universities across the world have discovered you can eat your way to a better health and they have created a list of foods with proven protective & medicinal qualities, which could prevent many common and potentially fatal illnesses.

These 'wonder foods' include porridge as eating oats improves blood flow and helps the removal of cholesterol from the body. This means that eating porridge & other oat-rich foods can help protect your heart and prevent coronary heart disease. Research by nutritionist Fiona Hunter has also found that beetroot can lower high blood pressure as it contains nitrates which widen blood vessels this then increases blood flow and reduces pressure. In fact drinking 500ml of beetroot juice will significantly reduce blood pressure, within an hour of drinking it blood pressure falls.



The chemical structure of the antioxidant pterostilbene which is found in blueberries

Blueberries were found to contain an antioxidant that can help fight colon cancer. The US Department of Agriculture found not only did this antioxidant (pterostilbene) reduce the rate of cancer but appeared to reduce the growth rate of cancerous cells. Some other health improving foods include oily fish, sardines, beans, blackcurrants, brazil nuts - in fact eating food in season gives much better nutrition.



Scientists & nutritionists also know how important vitamins & minerals are in maintaining a healthy body. However many Irish people are lacking vital vitamins & minerals e.g. iron and calcium as their diets are based more around the macronutrients protein, carbohydrate & fat. In order to combat these deficiencies many new improved foods are coming on the market for consumers to buy e.g. Avonmore Supermilk, fortified breakfast cereals & many more. These foods are known as 'functional foods' as they have health benefits beyond the basic nutritional value for example probiotic yogurt helps the growth of good bacteria in the intestine. So there is Chemistry in all aspects of our lives.



## Contaminated drinking water can cause blood-disorder in infants



*Spreading fertilizer*

Nitrates ( $\text{NO}_3^-$ ) are an essential source of nitrogen for plants. When nitrogen fertilizers are used to enrich soils, nitrates may be carried by rain, irrigation and other surface waters through the soil into ground water. Human and animal wastes can also add to nitrate contamination of ground water. Agricultural practices have been linked to raised levels of ni-

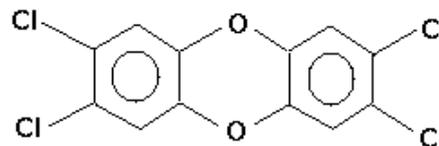
trates in drinking water. Elevated nitrate levels may suggest the presence of other contaminants such as disease-causing organisms, pesticides, or other inorganic and organic compounds that could cause health problems.

The Environmental Protection Agency has set the Maximum Contaminant Level (MCL) of nitrate at 10 mg/L or 10 parts per million for the safety of drinking water. Nitrate levels at or above this level have been known to cause a potentially fatal blood disorder in infants under six months old called **methemoglobinemia** or “**blue-baby syndrome**” in which there is a reduction in the amount of oxygen in the blood. In serious cases, infants will start to show obvious symptoms of cyanosis: the skin, lips or nail may develop a grey or bluish colour and the infant could have trouble breathing. The EPA most recent report on Irish water quality published in November 2008 said run-off from waste treatment plants and farms was the main cause of pollution in rivers, lakes and coastal seas. It found nitrate concentrations were significantly above natural levels in rivers & streams in several areas, particularly in the south and south-east.



## Incinerators — What are the Health risks?

Incineration is a method of waste treatment that involves the burning of organic materials. It does not solve the problem of waste, it only reduces the amount of waste to 30-50% of the original waste. Incineration plants do however, generate heat and electricity that can be used at the incineration plants. The remaining waste must be brought to landfill sites and the safe transport and disposal of this is very problematic especially for the people living near incinerators. This method of waste disposal is called thermal treatment and converts the waste into ash,  $\text{CO}_2$ , heat and particular matter. Particular matter is a complex mixture of organic and inorganic particles that are left behind, suspended in the air, and it is these particles that make incineration so dangerous for us — for example, in babies PM affects the rate of lung growth and development, and heightens the chance of developing asthma and severe bronchitis. The exact composition of these emissions vary depending on what is being burned. PM has also been shown to increase the number of deaths from cardiovascular and respiratory disease and lung cancer. The 'fly' ash produced during incineration contains some of the most toxic concentrations of substances like metals and dioxins. Reports have found that these toxins can cause damage to our immune system and can accumulate in fatty organs and tissues. In unborn babies these toxins gather in the nervous system and the brain. The 'bottom' ash is also extremely dangerous when not disposed of correctly. Incinerators are also guilty of odour and visual pollution too! Thankfully, the amount of the toxic emissions being produced has been lessened by advances in design and government regulations, and the bottom ash residue has been shown to be non-hazardous when disposed of correctly. Even though it has its advantages, reusing, recycling and other methods of waste disposal would be easier, far safer and more efficient to use. Dioxins are one of the most toxic chemicals known to man and EPA reports that there are no safe level of exposure. The most toxic dioxin is 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) and are by-product of waste incineration as well as backyard burn barrels. Dioxins are known carcinogens.



2, 3, 7, 8 - p - TCDD

**Reduce Reuse Recycle**  
let's get it sorted

# Irish pigs were fed bread in plastic bags

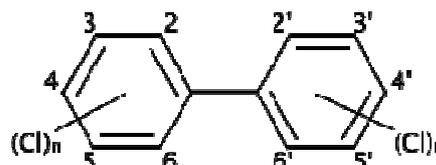
Elevated levels of PCBs in pork products, ranging from 80 to 200 times the EU's upper safe limit of 8 parts per billion was recently discovered in Ireland.

Laboratory results of animal feed and pork fat samples obtained confirmed the presence of dioxins, it said, with toxins at 80-200 times the safe limits.

While the contamination was limited to just 9 pig farms, the Irish government requested the immediate withdrawal and disposal of all pork-containing products produced in Ireland and purchased since September 1st 2008.

Studies have shown PCBs are associated with specific kinds of cancers in humans, such as cancer of the liver and biliary tract.

Ireland had almost 1.5 million pigs and exported 368 million euros worth of pig meat in 2007, half of it to Britain so this crisis will have huge economic consequences in these recessionary times. Bacon and sausages can be found on most Irish breakfast tables while ham is a traditional food around Christmas. This might be the end to the breakfast roll in the short term at least!



**Polychlorinated biphenyls (PCBs)** are a class of organic compounds with 1 to 10 chlorine atoms attached to biphenyl.

PCBs are classified as **persistent organic pollutants** which **bio-accumulate** in animals with a long half-life.

## Kids Corner - CHEMISTRY WORDSEARCH

W	Z	S	E	L	M	B	P	H	A	O	N
C	H	E	M	I	C	A	L	S	X	M	M
A	T	L	W	O	E	S	P	T	R	I	C
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S	L	Y	N	O	P	U	Y	I	S	E	F
M	E	X	P	E	R	I	M	E	N	T	G

Try and find these science related words in the word-search!!!

Microscope	Electricity	Goggles
Test tube	Chemicals	Experiment
Beaker	Solution	Mixture



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