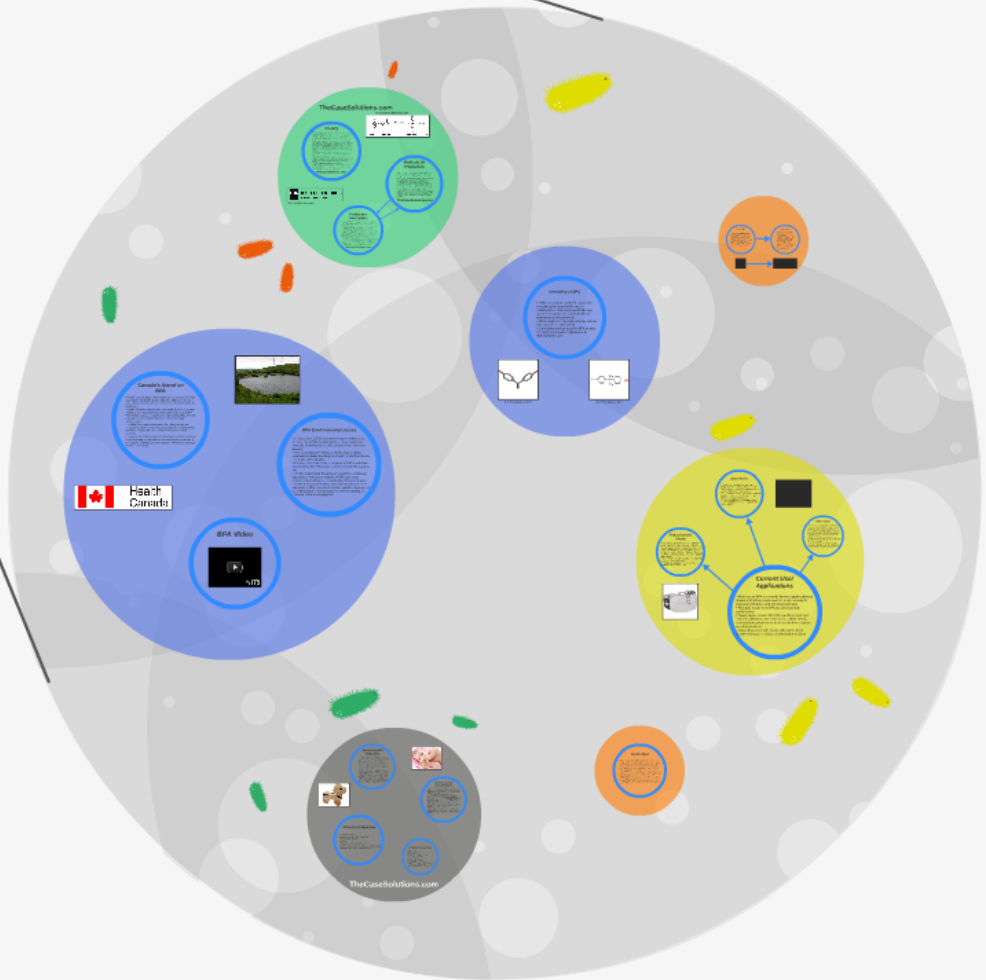
Oral Rehydration Therapy



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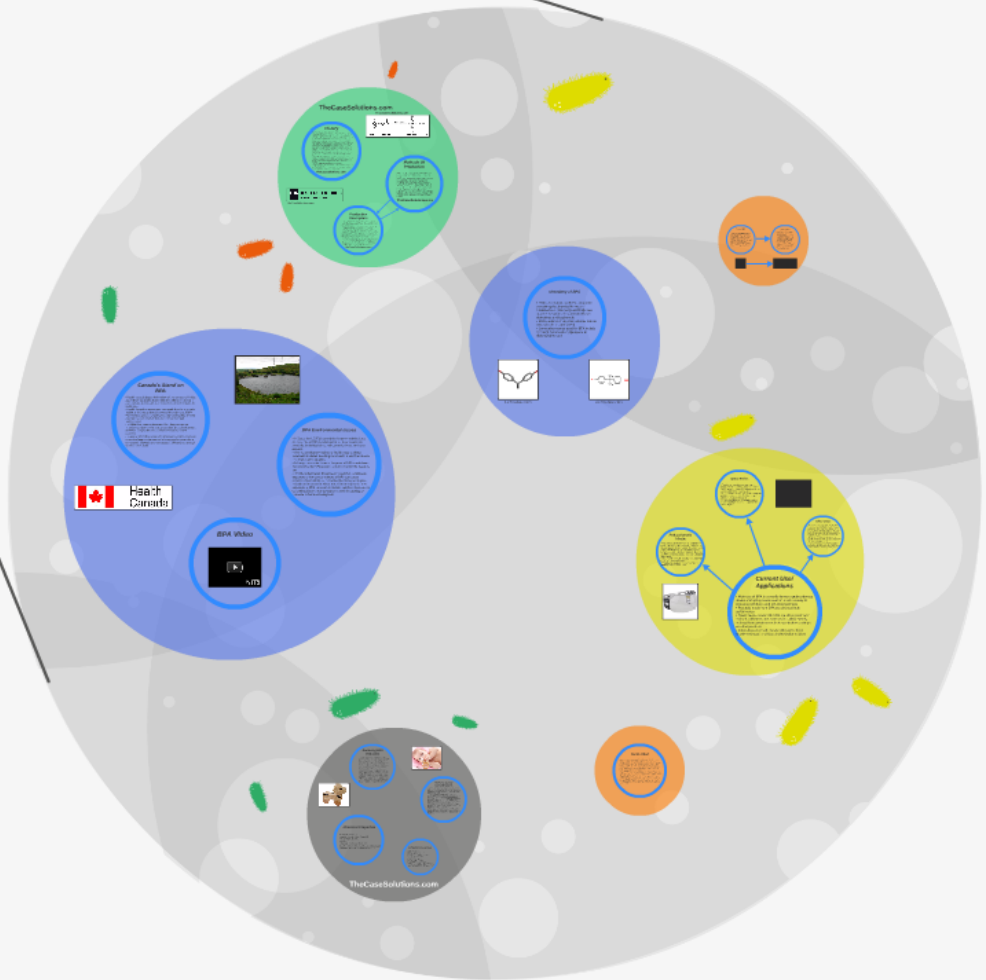

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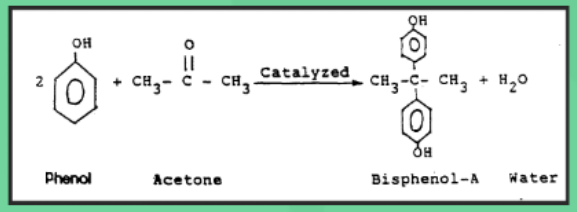

History

- First synthesized in 1891 by a Russian chemist by the name Aleksandr Dianin
- In 1940's a British chemist recognized that BPA can be used as an artificial hormone (estrogen)
- EPA's estrogen amorphies were not nearly as strong as other synthetic hormones synthesized 1930 and 1950. BPA was not being used or produced specifically
- In 1956, BPA was re-examined and rediscovered by the chemical world being used as an ingredient in polycarbonate and epoxy resins (plastic bottles and inside lining of cans)
- In the 1960's the use of BPA in water bottles, baby bottles, food containers and even can lining was approved by the FDA as it was their mass produced in these products worldwide
- Due to the increasing popularity of BPA a certain products a carcinogenesis and was done by the NCI and NTP in the late 1970's
- The resulting report stated that there was not enough convincing evidence to prove BPA had carcinogenicity effects although the NTP did reject reproductive toxicity
- In 2008, Dr. David Feldman noticed that BPA had migrated from his PC tool tube, into a test specimen and was mimicking estrogen. He was then one of the first to research the possible effects that low levels of PC and BPA have on human health
- In 2008, according to CHEC a report from the FDA stated that an estimated 11 nanograms of BPA are exposed to adults every day through the interaction with plastic products
- In 2007, the University of Missouri-Columbia finds that low-level exposure to BPA has an effect on the prostate and conducted a landmine one of the many studies focused on the health effects of BPA
- Between 1999 and 2003, Japanese industries undertook the use of BPA in their products due to consumer concern about toxic effects. The canning industry in Japan then replaced their BPA epoxy with BPA-free polyethylene terephthalate in many products. As a result, Japan scientists noticed that there was virtually no BPA in canned foods or drinks, and that BPA in Japanese blood levels dropped significantly
- **2008 Market attacks**
- European Commission and European Food Safety Authority declared that BPA-based products, such as PC plastics and epoxy resins, are safe for the public as long as they are used as instructed
- Health Canada released a statement declaring that BPA is toxic due to reproductive and developmental toxicity and environmental effects. Canada bans the sale, import and advertising of PC baby bottles containing BPA due to these effects
- NTP released a report, stating that there is concern for brain, behavior and prostate gland effects in infants and fetus's that have been exposed to BPA in certain PC baby bottles
- Between Health Canada's concern report and NTP's report many large manufacturing companies stop the production of PC baby bottles containing BPA. Walmart and Toys 'R' Us completely phase out all baby cups, bottles, etc. containing BPA
- SIGG Swiss water bottles are declared to contain BPA inner linings on their bottles although they previously claimed they did. The media continued to fan consumer's fear about potential BPA in plastic and now metal packaging
- National Resources Defense Council takes a stand against the matter and asks the FDA to remove the chemical from all food packaging
- In 2008, 6 US companies stop using BPA in their baby bottles
- The NTP to press $30 million in order to research the health effects BPA has on humans
- In 2010, the FDA finally releases a statement saying they see new expressing concern about BPA safety
- Health Canada releases a new safety on canned meats stating that exposure to BPA through food packaging will pose any health risks to the general population
- In 2011, the European Union bans the use of BPA in baby bottles while China proposes the ban of BPA in any food products relating to children
- FDA has, at first, ultimately banned the use of BPA in food or beverage packaging

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FDA U.S. FOOD & DRUG ADMINISTRATION

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Methods Of Production

- BPA is produced by acid catalyzed condensation reaction of two moles of phenol and one mole of acetone.
- BPA is usually produced in the presence of a strong acid catalyst such as hydrochloric acid, and sometimes with the promoter methyl mercaptan
- There are two ways that BPA can be produced: 1. The condensation of phenol and acetone using acid as a catalyst or 2. The condensation of phenol and acetone using ion exchange resin catalyst
- The condensation of phenol and acetone using ion exchange resin catalyst is the new and better version of producing BPA compared to using an acid as a catalyst

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Production Description

1. The recovered purified adduct is processed and fed at a temperature of 41 °C and pressure is kept around 25 torr in a BPA finishing system to remove phenol from product, and the resulting molten BPA of temperature 175 °C is solidified in the flaker followed by a pump to produce product prills which comes out at a temperature of 90 °C and is suitable for the BPA market
2. Acetone and excess phenol are reacted at a temperature of 75 °C and pressure is kept around 4.4bar by condensation in an ion exchange resin-catalyzed reactor system to produce BPA, water and various by-products.
3. The bottoms of the crude column having the temperature of 70 °C is sent to the crystallization feed pre concentrator after it is passed from a heat exchanger where inside temperature is 61 °C and it is cooled to 54 °C, which distills phenol and concentrates BPA to a level suitable for crystallization.
4. Acetone and lights are sent to second distillation column operating at 85 °C and then acetone is sent to the lights adsorber to produce a recycle in acetone stream and water is sent for the waste water treatment via recovery column.
5. A purge from the mother liquor is sent to the purge recovery system along with the recovered process water to recover phenol.
6. The crude distillation column having the temperature of 170 °C and pressure of 560 torr helps in removing water and unreacted acetone from the reactor effluent.
7. BPA is separated from by-products in a proprietary solvent crystallization and recovery system where it is cooled from 54 °C to 41 °C to produce the adduct of BPA and phenol.
8. Mother liquor from the purification system is distilled in the solvent recovery column to recover dissolved solvent which comes in this system through pump.
9. The solvent free mother liquor stream is recycled to the recovery system.

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• In 1930's a British chemist recognized that BPA can be used as an artificial hormone (estrogen)
• BPA's estrogen properties were not nearly as strong as other synthetic hormones so between 1930 and 1950, BPA was not being used or produced specifically
• In 1950, BPA was re-examined and returned to the chemical world being used as an ingredient in polycarbonate and epoxy resins (plastic bottles and inside lining of cans)
• In the 1960's the use of BPA in water bottles, baby bottles, food containers and inner can lining was approved by the FDA so it was then mass produced in these products worldwide
• Due to the increasing popularity of BPA in certain products a carcinogenesis test was done by the NCI and NTP in the late 1970's.
• The resulting report stated that there was not enough convincing evidence to prove BPA had carcinogenicity effects although the NTP did report reproductive toxicity
• In 1992, *Dr. David Feldman* noticed that BPA had migrated from his PC test tube, into a test specimen and was mimicking estrogen. He was then one of the first to introduce the possible effects that low levels of PC and BPA have on human health
• In 1996, according to EWG a report from the FDA stated that an estimated 11 micrograms of BPA are exposed to adults every day through the interaction with plastic products
• In 1997, the University of Missouri-Columbia finds that low-level exposure to BPA has an effect on the prostate and continued to become one of the many studies focused on the health effects of BPA
• Between 1998 and 2003, Japanese industries voluntarily rid the use of BPA in their products due to consumer concern about toxic effects. The canning industry in Japan then replaced their BPA epoxy with BPA-free polyethylene terephthalate in many products. As a result, Japan assessors noticed that there was virtually no BPA in canned foods or plastics, and that BPA in Japanese blood levels dropped significantly
• **2008-Market Shocks**

European Commission and European Food Safety Authority declared that BPA-based products, such as PC plastics and epoxy resins, are safe for the public as long as they are used as instructed
Health Canada releases a statement declaring that BPA is toxic due to reproductive and developmental toxicity and environmental effects. Canada bans the sale, import and advertising of PC baby bottles containing BPA due to these effects.
NTP releases a report stating that there is concern for brain, behavior and prostate gland effects in infants and fetus's that have been exposed to BPA in certain PC baby bottles
Between Health Canada's announcement and NTP's report many large manufacturing companies stop the production of PC baby bottles containing BPA. Walmart and Toys 'R' Us completely phase out all baby cups, bottles, etc. containing BPA
SIGG Swiss water bottles are declared to contain BPA inner linings on their bottles although they previously denied they did. The media continued to fuel consumer's fear about potential BPA in plastic and now metal packaging
Natural Resource Defense Counsel takes a stand against the matter and asks the FDA to remove the chemical from all food packaging
• In 2009, 6 US companies stop using BPA in their baby bottles
• The NIH is given $30 million in order to research the health effects BPA has on humans
• In 2010, the FDA finally releases a statement saying they are now expressing concern about BPA safety.
• Health Canada releases a new study on canned foods stating that exposure to BPA through food packaging will pose any health risks to the general population
• In 2011, the European Union bans the use of BPA in baby bottles while China proposes the ban of BPA in any food products relating to children
• FDA has still not ultimately banned the use of BPA in food or beverage packaging

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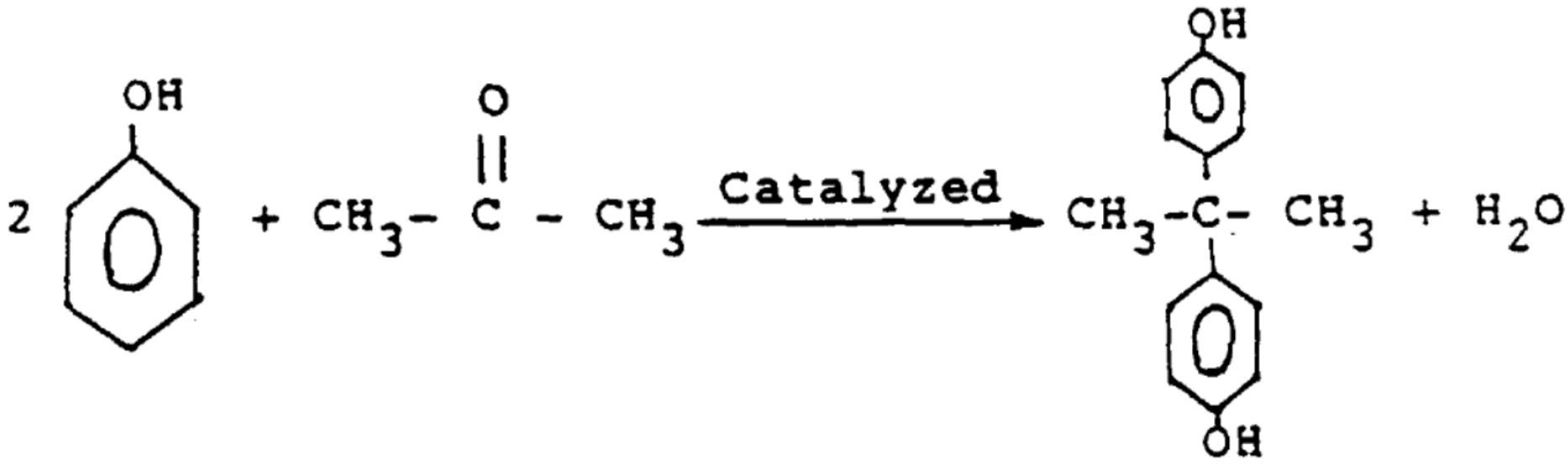

Reducing BPA Exposure

• Some ways of reducing exposure to BPA in either infants or adults are: don't buy plastic water bottles with the recycle code 1, 2, or 5; avoid drinking plastic water bottles that have been frozen or heated at high temperatures, store left over foods in glass opposed to plastic, cut down on canned foods or look for the canned food label that says "BPA free", avoid handling receipts printed on thermal paper, use glass baby bottles opposed to plastic ones
• Try cooking from scratch as it reduces the use of foods in cans or plastic bags that have the possibility of containing BPA
• Avoid heating up plastic containers in the microwave as it causes the BPA to release from the plastic into the nearby air
• When buying children's, toys think about purchasing wooden ones opposed to plastic ones as there won't be the chance of being exposed to BPA if it is wooden

Health & Safety Considerations

• Ever since BPA was created it has been deemed safe for public use. Although many studies have been done on the compound and several have turned up with health hazards, none have been solidified by the FDA
• BPA is an endocrine disrupter which means it can interfere with the body's hormones and endocrine system. Due to this it has been linked to several health hazards such as: Structural damage to the brain, impaired learning, hyperactivity, altered immune function, stimulation of prostate cancer cells, increase in fat formation, decrease in sperm production, early puberty and even infertility
• Many experiments to determine the risk factors of BPA have been on animals so there is the question of whether it has those same effects on humans
• One main area of worry for consumers is BPA effecting younger children and infants as many children products contain BPA and they fear it could alter the brain as it is still developing

Chemical Properties

Flash Point: 227 ◦C
Specific Gravity: 1.057 (water=1)
Vapor Pressure: N/A
pH: N/A
Chemical Formula: C15H16O2
Exerts hormone like properties at high dosages
Hydrogen bond donor/acceptor count: 2

Physical Properties

Synthetic compound
Boiling Point: 182 -C (359.6 -F)
Melting Point: 42 -C (107.6 -F)
Physical state: Solid (powder or flakes)
Odor: Distinct, aromatic, acrid
Taste: Burning
Color: Colorless to light pink
Molecular Weight: 94.11g/mol
Critical Temp: 694.2 -C (1281.6 -F)
Solubility: Methanol, 1g/15mL in water, benzene, alcohol, chloroform, glycerol, petroleum, fixed oils, aqueous alkali hydroxides, miscible in acetone.