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Report on “Our Stolen Future”

“Our Stolen Future” is a book by Theo Colborn, Dianne Dumanoski, and Pete Myers about the dangers of synthetic chemicals and the effects they have on reproduction in both humans and animals. Synthetic chemicals discussed in the book include DES (or diethylstilbestrol, a man-made estrogen which was prescribed to pregnant mothers), PCB’s (polychlorinated biphenyls, a pervasive industrial chemical) and dioxins (a pervasive chemicals created as an industrial byproduct). These synthetic chemicals get passed up the food chain between animals and are passed on to offspring from parents. Such chemicals are known as endocrine disrupters because they affect the body by increasing or blocking hormones such as estrogen, which can have negatively impacts on reproduction. To illustrate the way even natural estrogen can affect the body, the authors use an example of female mice and their “womb-mates”. To illustrate damaged reproductive cycles from synthetic chemicals the authors use examples from nature such as: the decline of the seal population, decline in reproductive rates and sexual deformities in alligators in Lake Apopka, Florida, extreme sexual deformities and contamination in beluga whales, and declining birth rates in polar bears in Norway. As this book was published in 1996, some of the information may be considered outdated. However, the authors have kept up a website (ourstolenfuture.org) dedicated to providing updated information to complement their book, and new scientific studies have been released supporting the dangers related to synthetic chemicals.

To understand how synthetic chemicals can affect hormones and damage reproduction, it is first helpful to understand how even natural changes in hormones can change behavior. The main example in "Our Stolen Future" of this is by Frederick vom Saal's experiments with mice. "In a series of experiments with mice, he showed that small shifts in hormones before birth can matter a great deal and have consequences that last a lifetime."[1] These hormonal shifts have to do with the position of female mice in their mother's womb before birth. Female mice that are sandwiched between two males in the womb are exposed to extra levels of testosterone due to the testicles of a male mouse secreted testosterone a week before birth.[2] Female mice exposed to this testosterone show increased aggression, less attractiveness to males, and are more likely to have male babies throughout their entire lives simply due to slightly more testosterone received before birth. These findings have much broader implications because if that small amount of testosterone is enough to cause differences among mice that have exactly the same genes, then synthetic chemicals that cause similar hormonal changes can mean great danger to humans and other animals alike.

In 1938, British scientist, Edward Charles Dodds, created a new chemical called diethylstilbestrol or DES.[3] DES was a synthetic chemical that was designed to mimic estrogen in the body. People in the medical community, such as researchers and gynecologists, declared DES to be a "wonder drug with a host of potential uses."[4] The drug was first prescribed to pregnant mothers who were thought to be at risk for miscarriages and premature births; however, "they began to recommend it for untroubled pregnancies as if it were a vitamin that could

[1] Colborn,Dumanoski, Meyers."Our Stolen Future". Penguin Books USA, New York:1996. pg 29.
[2] "Our Stolen Future" pg 31.
[3] Colborn.pg48.
[4] Colborn.pg48.

improve on nature."[5] In later years, DES has been shown to increase the breast cancer rate of the women who took it while pregnant by 30% over unexposed women.[6] The effects on the women who took DES pale in comparison to the effects the drug has had on the children whose mothers took DES while pregnant. DES daughters have higher risks of : Clear Cell Adenocarcinoma cancer of the cagina and cervix, breast cancer, infertility, ectopic pregnancy (when the fetus is developing outside of the uterus) and miscarriage.[7] DES daughters also are much more likely to have "severely misshapen"[8] uteri in which the uterus resembles a "T" rather than the normal triangle shape. In a sad twist of irony, DES has been shown to not even have been effective at preventing miscarriages. "By 1952, at least four separate studies had reported that women treated with DES for threatened miscarriages did no better than those treated with alternatives such as bed rest or sedatives."[9] DES failed to provide any kind of benefit to anyone who took the drug, instead causing irreparable to the women who took it, and their unborn children.

Even synthetic chemicals created for other purposes than mimicking estrogen like DES can have very similar effects to DES when introduced into the body. Such types of chemical are Polychlorinated biphenyls, otherwise known as PCBs, which are a family of 209 synthetic chemicals. [10] PCBs were used as a cooling compound for electric transformers, lubricants, hydraulic fluids, cutting oils, and liquid seals. PCBs were "nonflammable and extremely stable" and were thought to be nontoxic at the time.[11] Eventually PCBs were used in household goods to make wood and plastics nonflammable, to protect rubber, and were even used in paints,

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[5] Colborn.pg48.
[6] DES Action USA. www.desaction.org/desmothers. May 29,2008.
[7] DES Action USA.
[8] Colborn. pg 57.
[9] Colborn. pg54.
[10] Colborn pg89.
[11] Colborn pg89.

varnishes, inks, and pesticides.[12] In 1964, chemist Soren Jenson, "kept encountering mysterious chemical compounds as he tried to measure DDT levels in human blood…Jensen found it wherever he looked—in wildlife specimens collected three decades earlier, in the Swedish environment, in the surrounding seas, in hair samples from his wife and infant daughter."[13] In 1966, Jensen finally identified the synthetic contaminants as PCBs.[14] Other scientists also began looking for PCBs and it was discovered that they were everywhere: soil, air, water, the mud of lakes, and animals. PCBs are "'persistent' products in that they resist natural processes of decay that render them harmless." Because they were used in so many products before being banned in the 1976[15] they have become widespread throughout our environment, and their persistent nature allows them to survive very long periods of time. The effects of PCBs on humans include choracne, rashes, lowered immune response and possible liver damage.[16] It has been shown that children in Inuit villages with very high contamination rates of PCBs "do not produce the necessary antibodes when they are vaccinated for smallpox, measles, polio, and other diseases".[17] All long term effects that PCBs can have on humans and their offspring is still not known for sure, but what we do know is that it is virtually everywhere and virtually everyone is carrying this contamination with them.

Another pervasive persistent synthetic chemical similar to PCBs is dioxin. Dioxin, known to scientists as 2,3,7,8-TCDD is a contaminant created "during the manufacture of certain chlorine-containing chemicals such as pesticides and wood preservatives, as well as by bleaching

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[12] Colborn pg90.
[13] Colborn pg90.
[14] Colborn pg90.
[15] Colborn pg91.
[16] Aoki Y. "Polychlorinated biphenyls, polychlorinated dibenzo-p-dioxins, and polychlorinated dibenzofurans as endocrine disrupters--what we have learned from Yusho disease." www.pubmed.gov. May 2001.
[17] Colborn pg107.

paper with chlorine, incinerating trash containing plastics and paper, and burning fossil fuels."[18] Like PCBs it has been found throughout the environment, "in air, water, soil, sediment, and food".[19] Dioxin gained infamy in the years after the Vietnam War, when it was discovered that the Agent Orange sprayed throughout Vietnam had been contaminated with Dioxin. Vietnam War veterans reported a variety of medical problems including cancer and handicaps in their children.[20] Many are convinced that dioxin has something to with these medical problems. The actual effects of dioxin on humans are not fully known; however, it has been shown to affect the hormone levels of adult rats. When adult male rats were given dioxin it caused decreased levels of testosterone and a loss of weight to the testicles and accessory sex organs and a decreased sperm count. [21] The same effects have not been reproduced in humans; however, if dioxin contamination does eventually lead to a long-term decline in sperm count in humans this could cause serious reproduction problems for the human race, as humans "tend to produce barely the number of sperm required for successful fertilization".[22]

Persistent synthetic chemicals such as dioxins and PCBs have been able to travel throughout the world and contaminant nearly everything, even remote places such as Inuit villiages and the fat of polar bears above the artic circle.[23] Because of their persistent nature, once the chemicals have been released into the environment, they just don't go away. They spread through the air, through oceans, and attach themselves to the fat cells of animals and are passed up the food chain. The chemicals contaminating the water attach themselves to plant based sea life which are then eaten by the small animals at the bottom of the food chain and

[18] Colborn pg113.
[19] Colborn. pg 113.
[20] Colborn pg 114.
[21] Colborn pg 117.
[22] Colborn pg120.
[23] Colborn pg87.

passed up throughout the food chain with each step up on the chain getting a higher concentration than the one before, until it reaches the top where an animal at the top of the food chain such as a Polar Bear will have a concentration of PCB's 3 billion times that of the concentration of the water.[24] Humans, also at the top of the food chain, face this same problem. Because most of the things humans eat have been collecting high concentrations of synthetic chemicals, most humans end up with very high concentrations as well. These synthetic chemicals stay in our bodies and do not break down, and are then passed on to our children through breast milk. "In just six months of breast feeding, a baby in the United States and Europe gets the maximum recommended lifetime dose of dioxin…[and] five times the allowable daily level of PCBs set by international health standards for a 150-pound adult."[25] People who get their body tested for synthetic compounds will likely find at least 250 chemical contaminants regardless of where they live.[26]

All of the long-term affects of these compounds that are invading our environment and even our bodies are not yet known; however, we can look to the effects that these compounds are having on animals as clues on what might happen to humans. High concentrations of industrial chemicals such as PCB's and DDT have been found in the fat of Polar Bears who live high above the artic circle in Norway which researches believe to be the cause of significantly lower birth rates from female bears.[27] Researchers studying declining seal populations have determined that contamination of PCBs causes serious reproductive problems in female seals, including deformities of the uterus and fallopian tubes.[28] Alligators in Lake Apopka, Florida (which was contaminated by a chemical spill in 1980) have been to shown to have penises "only

[24] Colborn pg 104.
[25] Colborn pg 107.
[26] Colborn pg 106.
[27] Colborn pg 88.
[28] Colborn pg 89.

one-third to one-half normal size" as well as abnormal reproductive tracts, similar to the reproductive tracts of DES victims, and skewed hormone levels.[29] A much more shocking case of the horrible affects synthetic chemicals can have on animals is that of a beluga whale that was found dead on the South Bank of the Lawrence River in Quebec.[30] When an autopsy was performed on the whale, "they found two small testicles and normal-looking male plumbing…but to their astonishment, [the whale] had a uterus and ovaries as well—a complete female reproductive tract save for a vagina…They had discovered the rarest of biological curiosities: a true hermaphrodite".[31] Another whale was found to contain five hundred parts per million of PCBs in its body, ten times more than the level that is considered hazardous waste under Canadian law.[32] The fact that these chemicals are having this effect on animals does not necessarily mean that humans will see these same effects as well, but it is a definite possibility that reproductive damage such as these could occur to humans.

Synthetic compounds such as PCBs and dioxin are now pervasively spread through our environment and throughout our bodies. It is no question that this widespread contamination exists; however, the extent to which these compounds will damage our lives and the lives of our children is not yet known. As "Our Stolen Future" was published in 1995, there is now new studies and information available concerning this very topic. Much of the information in the book has been reinforced by later studies and information and it is still relevant today. For example, a later study has shown that Hyposadias, a birth defect of the penis, is on the rise.[33] It is not yet known whether this has to do with synthetic chemicals, but this fits in with the prediction that an increasing amount of reproduction problems can be caused by synthetic

[29] Colborn pg 151.
[30] Colborn pg144.
[31] Colborn pg145.
[32] Colborn pg 146.
[33] "Our Stolen Future: Human Impacts of Endocrine Disruption". www.ourstolenfuture.org.

chemical contamination. Another later study has shown that children exposed to higher PCB levels in the womb have a lower IQ and reading ability then children who were not exposed.[34] However, even today, 12 years after this book was published and 30 years after the banning of PCBs, we still do not the full effect these synthetic chemicals will have on humans, animals, and the entire planet as a whole.

[34]Janet Raloff. “Banned pollutant's legacy: lower IQs”. Science News Online. 14 September 1996