Department of Toxic Substance Control (DTSC)
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(4 Sep 2021 ©)
Submitted via online portal at https://calsafer.dtsc.ca.gov/

Proposed Regulation: **6PPD in Motor Vehicle Tires**

Dr. Williams:

With hundreds of millions of dollars spent on research, four decades of time lost in the search for answers,[1] treaties violated, cultural practices in deep decline,[2] endangered species on life support,[2,3] and a growing number of environmental and human tragedies, again the truth has been buried deeply in the archives of chemical giants. In this instance, Monsanto (1986) hid its knowledge that 6PPD is highly toxic to steelhead, blue gill, daphnia, fathead minnows and toxic to rats[4]

In 2004, bioaccumulation factors were also found for Oryzias latipes, (Japanese rice fish)[5, 6] and for 6PPD degradation products (N-Phenyl-p-benzoquinone monoimine, 1,3-Dimethylbutylamine) in carp (Cyprinus carpio).[5]

Hiding behind CBI (confidential business information),[6-8] bullying institutions established to protect the environment,[9-14] strategically aiding rollbacks, systematic undermining by the previous administration,[15] and unsavory lobbying efforts, chemical company empire building has been allowed to continue unabated for decades. This egregious behavior begs the question, "Whose useful life do we want to extend? Our children, our salmon, or our tires?"[16]

Monsanto, in it's confidential info MSDS (Material Safety Data Sheet) for Santoflex 13 (1986) noted that in rat studies "hematology values were significantly different for high-dose males and/or females during the study."[4] The studies themselves were much more descriptive.[17] Limited 6PPD rabbit studies (n=2) with fur clipped and intact skin led to a finding of "sensitization" and "skin irritant."[18, 19]

In addition to skin sensitivity, early research revealed further implications for human health:

> "The appearance of systemic toxicity after oral and dermal exposure shows the principal bioavailability of 6PPD via these routes…Biomonitoring of workers in the rubber industry detected 6PPD in urine thereby demonstrating that the substance can be resorbed from the respiratory tract and possibly after dermal contact."[20]

Tian et al (2020)[1, 21] discovered that even diluting road runoff down to 5%, 6PPD was lethal to coho salmon within 24 hours. Additional research by Canadian colleagues determined that the mechanism that caused the high mortality in coho was a disruption in the blood brain barrier that allowed blood

plasma redistribution, triggering a precipitous rise in hematocrit via hemoconcentration. The ability of red blood cells to transport oxygen was not diminished, but neurologic impairment ensued.[22]

With a dilution down to 5% in roadway run off having such a profound effect, what impact might 6PPD have on the developing human brains of children exposed to used tired crumb often for several hours a day, multiple days per week? Should we rely on biased, special interest,[23, 24] or other research with dubious methodology?[25]

> "The supposed "study"[26] that Washington State did which many allude to, did not try to parse out whether more exposed athletes vs less exposed or those with no exposure had higher rates [of cancer]…They simply looked a the whole population and at all players and compared the overall cancer rates of both, without distinguishing if they had ever been on [synthetic turf] or not much less how often and without accounting for the time it takes to develop cancer. This inappropriate methodology buried any difference there might be between those exposed vs not exposed and between players with different exposures over sufficient time to develop cancer."[27]

Should studies related to dermal exposure only be conducted on an intact integumentary system? Turf burns are a frequent occurrence in synthetic turf. So is embedding of crumb rubber in those wounds.[28] Should studies of oral and optic exposure take place in a test tube over a couple of weeks time?[29, 30]

Published in 1987 in by the International Agency for Research on Cancer (IARC), the following findings from studies of workers in the rubber industry were reported:

> "A large number of studies have been conducted on the rubber industries in Canada, China, Finland, Norway, Sweden, Switzerland, the UK and the USA [ref: 1-19]. Workers employed in the industry before 1950 have a high risk of bladder cancer, probably associated with exposure to aromatic amines. Leukaemias have been associated with exposure to solvents and with employment in back processing, tyre curing, synthetic rubber production and vulcanization. Excess mortality from lymphomas has been noted among workers exposed to solvents in such departments as footwear and in tyre plants [ref: 20]. Other cancers, including those of the lung, renal tract, stomach, pancreas, oesophagus, liver, skin, colon, larynx and brain, have been reported as occurring in excess in various product areas and departments, but no consistent excess of any of these cancers is seen across the various studies."[31]

In 2003, research on tire crumb exposure in a factory in Taiwan found

> "…mutagens/carcinogens, such as styrene, benzothiazole, phthalate ester and naphthalene were identified. Total particulate levels ranged from 0.43 to 6.54 mg/m(3), while respirable particulates were in the range 0.23-1.25 mg/m(3). Ames testing revealed indirect mutagenicity on strain TA98, indicating possible

> effects of frame-shift type mutagens. Chemical analysis of airborne particulates confirmed the presence of amines, aniline, quinoline, amides and benzothiazole, which are potentially convertible to frame-shift type mutagenic nitrosoamines."[32]

Norwegian researcher, Dr. Victoria Bohne (2006) discovered that another antiozanant invented for rubber by Mosanto in the 1950s, Ethoxyquin had devastating effects on farmed salmon. Originally registered with the US EPA as a pesticide in 1965,[33] it's unauthorized use in fish meal pellets has had devastating effects on aquaculture worldwide. [33, 34] Her research findings on rubber antiozanant effects in Atlantic wild and farmed salmon are eerily reminiscent of findings related to the rubber antiozanant 6PPD quinone and coho salmon.

> "We have recently shown that substantial amount of dietary EQ [Ethoxyquin] is incorporated in salmon muscle with extensive partitioning in other tissues with equal concentration in blood, kidney, heart, brain, gut, muscle, spleen, and gills after 12 weeks of feeding (Bohne et al., 2006a). High concentration of parent EQ was found in adipose tissue and liver, de-ethylated EQ (DEQ) was found in liver, and EQ-dimer (EQDM) was found in adipose tissue of salmon fed graded levels of EQ."[33]

With six major discoveries, including possible carcinogenic effects of Ethoxyquin, her research at NIFA (National Institute of Food and Agriculture) was defunded by the National Ministry of Fisheries under spurious circumstances.[34, 35] Dr. Bohne's original thesis, received and accepted in 2006, was finally published in 2019.[36]

With low manufacturing costs and effectiveness as an antioxidant Ethoxyquin, also known as SantoFlex, SantoQuin and Quinol, was being used as a preservative in animal feeds by the 1970s, including as a food pellet in aquaculture for farmed salmon and other fish. The European Union and Norway removed authorization in 2017. Sales were suspended In 2020 and all use on 20 June 2020. It is banned in Australia.[37]

Due to acute oral, dermal and inhalation toxicity in humans (as well as eye irritation), it's use in the US is limited to prevention of browning in pears, color change of select spices, and in poultry feeds and dog food.[37, 38] Human exposure can still occur via consumption of farmed fish, poultry, eggs and fish oils.[39] The potential for carcinogenic effects is of particular concern.

The Halifax Project (2012-2015),[40, 41] with 170 collaborating international cancer scientists, determined that exposure to low dose chemicals in the environment can have a synergistic effect with the potential to cause cancer. No one is exposed to a single chemical in isolation on crumb tire playing fields and playgrounds. They are exposed to a toxic brew of chemicals and everything the 40k to 80k tires came into contact with during their useful life.

In 2019, the Consumer Product Safety Commission (CPSC) reported results of a phone survey of 1896 households across the US to determine type of crumb rubber surfaces, frequency, duration and exposure routes experienced by children. The study reveals children living in the West have higher rates of dermal and oral exposure to loose playground materials.[42] That same year, S Korean researchers found that children who play on used tire crumb pour in place playgrounds have a 10x greater risk of developing cancer than those who play on natural soil.[43]

CONCERNS RAISED

Concerns have been voiced for well over a decade about the hundreds of toxic and carcinogenic chemicals in used tires dumped on sports fields and playgrounds:

2007 Environment and Human Health, Inc.[44]

> "It is clear that the recycled rubber crumbs are not inert, nor is a high-temperature or severe solvent extraction needed to release metals, volatile organic compounds, or semi-volatile organic compounds. The release of airborne chemicals and dust is well- established by the current information. The Connecticut Agricultural Experiment Station research conclusively demonstrates that release can occur under ambient conditions experienced in the summer in Connecticut."
>
> "Those published health assessments that indicate de minimis risk should not be applied to the synthetic turf paradigm and may not be appropriate for playgrounds with open layers of recycled tire crumbs."

2008 United States Environmental Protection Agency (US EPA) acknowledges that it recommends used tire crumb for playgrounds. Region 8 of EPA

> "…also supports uses of recycled tires when they do not present disproportionate hazards to children, such as asphalt-rubber road surfaces."[45]

2012 Children and Synthetic Turf. Leading Health Experts on SBR (styrene butadiene rubber) Artificial Surfaces.[46]

> "Children's' brains and nervous systems particularly are developing rapidly and there are unique windows when they are more susceptible to toxins."
> Dr. Joel Forman, pediatrician, Mt.Sinai School of Medicine
>
> "We know children are more vulnerable to these chemicals. They are more Heavily exposed pound for pound. They are biologically more vulnerable. They don't have the ability to break these chemicals down and get rid of them."
> Dr. Phillip Landrigan, pediatrician, epidemiologist."
>
> "We have to think about exposures that might cause disease that [have] long latency…The whole thing is a recipe for disaster."

2015 Vested in reducing used tire stockpiles,[47] the US EPA's judgement was clouded, according to US EPA Toxicologist Suzanne Wuerthele:[48]

> "The EPA made a mistake in promoting this. That's my personal view. This was a serious no-brainer. You take something with all kinds of hazardous materials and make it something kids play on? It seems like a dumb idea."

2016

> "The Rubber Manufacturers Association (RMA)…from 2007-2013…estimated that 274.15 million pounds of ground rubber per year were used as playground mulch. According to an online rubber mulch calculator, covering a 100 square foot playg-ground 4" deep requires 1,092 pounds of material, or 10.92 pounds per square feet. The average tread of a tire is 215 millimeters or 8.5 inches. A square foot of mulch Result in a 16.94"-long tread. Laying all of the ground rubber used for playground mulch along the tire-wide tread, four inches deep, leads to a track that is 49,976 miles long. Earth's circumference at the equator is 24,901 miles.
> James Vallette, Healthy Building Network[49]

2017

> "I think if a comprehensive study isn't mounted within the next five years, I think it's going to be almost impossible to find a group of unexposed kids in the next five years."[50]
> Dr. Stuart Shalat, Environmental Epidemiologist

2017

Acting Chairman Ann Marie Buerkle, Consumer Product Safety Commission (CPSC), released a statement calling for turf infill to be tested to the same standards as for toys.[51] In Dec. 2017, the CPSC issued a warning to consumers, athletes, coaches and others stating:

> "Our approach to playing surfaces should be very simple – no one should be exposed to harmful chemicals. Period."

2019

Diana Zuckerman, PhD,[53] President of the National Center for Health Research warned that false claims of safety of synthetic turf and playground surfaces based on poorly done and special interest based research is used to mislead the public, local and state governments.[54]

2019

> "…when Oliver died suddenly at a Miami children's hospital, just 36 hours after doctors first diagnosed the disease, his parents Simon and Vilma started looking for answers. What they found was disturbing… Yet what really elevated the disquiet of Oliver's parents was increasing concern over the role that carcinogenic environmental toxicants, including industrial waste and pollutants, were believed

to be playing in the rise of childhood cancer."

"Look at the turf and the black spongy stuff that's in it. It's mostly diced up, used vehicle tires, it's petrochemical stuff. There are strict regulations for the disposition of full vehicle tires, but nothing when it comes to dicing them up and using them as a spongy surface for athletes to play on."[55-57]
Simon Strong, father, co-founder, Oliver Forever Strong Foundation and TheReasonsWhy.us

2020
Now, the alarm is being raised raised about the extent of used tire crumb in children's playing surfaces by the researchers who discovered the smoking gun:

"Tire rubber disposal also represents a major global materials problem and potential potent source of 6PPD-quinone and other tire-derived transformation products. In particular, scrap tires re-purposed as crumb rubber in artificial turf fields suggest both human and ecological exposures to these chemicals. Accordingly, the human health effects of such exposures merit evaluation"[21]

"A MAJOR GLOBAL MATERIALS PROBLEM"

21 Apr 1996

"What at first seemed like a brilliant way to get rid of mountains of old tires has given new meaning to the old saying about what paves the road to hell"…Two highways repaired with chunks of rubber are smoking and oozing a toxic, oily goo that is threatening nearby marshes on the Columbia River.

Digging out the mess will cost from $1 million to $3 million, officials estimate. The first sign of trouble came in December when asphalt pavement laid over the fill began to crack, split and give off wisps of noxious smoke, with tempera- tires up to 160 degrees….Some of that buried rubber had started burning, apparently through natural processes, similar to what heats up a compost pile. And as the rubber heats up, it releases a goo that oozes to the surface and flows onto the mud flats below,dangerously close to a saltwater marsh and freshwater wetlands.

"It smells like creosote, with a burned-plastic undertone…The underground combustion is generating toxins such as benzene, a known carcinogen, said Coast Guard Lt. Rob Myles."[58]

7 May 2018 Norway

Research showed that students in Norway walked off a soccer field with an average of 1.9ML of tire crumb after an average of 29 minutes of play.

> "The Football Association of Norway annually arranges 355,000 matches, amounting to about 44 ml per game (2x11 players), in total 14740 liters. 14 740 liters of crumb rubber weigh approx. 6.5 tonnes. The scientists have further assumed that there are about ten times as many training matches played as official matches, thus concluding that players transport ca. 65 tonnes (>71.65 tons) of crumb rubber away from Norwegian soccer fields each year."

The tire crumb "walked off" the fields is the equivalent of 10,000 used car tires. (**Norway has 1600 synthetic turf fields; 1100 regulation size; Balance smaller)[59, 60]

6 Apr 2019 USA

> "The rubberized asphalt surfaces put down on Valley freeways in the past 10 to 15 years are now reaching the end of their life span, according to officials from the Arizona Department of Transportation. That has resulted in a growing number of Potholes, cracks and deep gouges along Valley freeways…Portland cement has a life span of 40 years or more."[61]

19 Apr 2019 British Columbia, Canada
VIDEO: Oak Bay High soccer turf closed indefinitely as plastic sheds into Bowker Creek.[62]

23 Jul 2020 Norway

> "…many urban areas are located on the coast, making the marine environment an additional likely sink for CRG [crumb rubber granulate] as it is transported through the environment. For example, Norway has a number of artificial turfs using CRG as turf infill located near the coast or fjords, and also storage and production facilities for CRG adjacent to ports and the open sea…"[63]

10 Aug 2020 Hong Kong

> "Huge quantities of small crumbs of black rubber or tyre-like material have washed up on shoresof Discovery Bay on Lantau Island on July 28. Dana Winograd, the director of operations of Plastic Free Seas, believes that the material appears to be crumbs used for the infill for astroturf, the artificial ground for sports playing."

> "The rubber crumb is often made from recycled car tyres and scientific studies have shown serious adverse impacts to marine life in water that is polluted by the rubber and associated chemicals,"[64]

14 Aug 2020 Norway
A toxic cocktail in seawater – chemicals from car tire rubber[65]

> "The rubber crumbs do readily leache this cocktail of organic additives and metals

into seawater. This included high concentrations of benzothiazole and zinc, as well as detectable levels of PAHs and phenolic compounds."

"…a lot of this rubber enters coastal marine environments in Norway, both from tire wear on roads, the effluent from washing machines cleaning the clothing of the players and in snow removed from artificial turfs. Today we know that rubber from car tires are one of the largest contributors to microplastic pollution in the oceans. We therefore wanted to investigate if CRG [Crumb Rubber Granules] can contaminate seawater and it is toxic to marine organisms".

28 Aug 2020

"In black waves, drifts and bands, crumbs of rubber are polluting miles of the Puyallup River after a spill at a dam project last month. Rubber debris already is likely more than 40 miles downriver in Puget Sound. The pollution is the result of unpermitted use of thousands of yards of artificial turf by the dam's owners while reconstructing parts of the dam."[66]

24 Nov 2020

"…so many tire particles are landing in the Arctic that they pose a climate change risk. By turning the snowy tundra a less reflective white, the polluted Arctic ice may absorb more light and melt even faster."

Mixing old tires into new roads is an ideal, full-circle solution that California, burdened with diverting tens of millions of junked tires from landfills annually, has embraced. In 2005, the California State Legislature mandated recycling waste tires in state pavement and aimed to rubberize 35 percent of new pavement projects beginning in 2013. It was hoped that would also lessen air pollution: tire wear contributes to airborne particulate matter—up to 30 percent in high-traffic areas—and the dust can inflame human lungs. But Sutton, of the SFEI, worries that paving streets with ground-up car tires may be unloading their heavy metals and chemicals into sensitive aquatic ecosystems."

"To be honest, the concerns we're now having about tires are brand new concerns. I'm not sure those have been part of the strategy as CalRecycle was trying to come up with new uses for tires," Sutton says. "We want to fix the issue. But reuse needs to be wise, or we're just going to create a new problem."[67]

21 Feb 2021 Norway

Rubber From Car Tyres - Even Recycled - Poses A Toxic Threat to Our Oceans[68]

28 Mar 2021 Scotland

Plastic Fragments Found in Two-Thirds of Scottish Waters as Pollution Threat Laid Bare

"We must stop this pollution at source. Microplastic gets into the environment from lots of different sources including from sports pitches and from spills of plastic pellets, known as nurdles, used to make products, as well as from bigger plastic items breaking down."[69]

15 Apr 2021, New South Wales, Australia.

"New research by the Australian Microplastic Assessment Project (AUSMAP) with Northern Beaches Council, funded by NSW's Environment Protection Authority, has found 80% of the waste entering stormwater drains adjacent to sports fields with synthetic surfaces was black crumb (recycled tyres used for the base of these fields) and microplastics from artificial turf – compared to 5% in areas without these playing fields."[70]

15 Jul 2021 USA

US Congress, Natural Resources Committee, Subcommittee on Oversight and Investigation.

"Are Toxic Chemicals From Tires And Playground Surfaces Killing Endangered Salmon?"[71]

20 Jul 2021 USA

Safe Healthy Playing Fields, Playing With Pollution[72]

20 Jul 2021 European Union

"COMMISSION REGULATION (EU) 2021/1199 of 20 July 2021 - amending Annex XVII to Regulation(EC) No 1907/2006 of the European Parliament and of the Council as regards polycyclic-aromatic hydrocarbons (PAHs) in granules or mulches used as infill material in synthetic turf pitches or in loose form on playgrounds or in sport applications[73]

5 Aug 2021 Phoenix, AZ

"Crews with the contractor group Broadway Curve Constructors kicked off the project on July 23 with the removal of 1 inch of rubberized asphalt along approximately 5 miles…of westbound I-10. During the first closure of westbound I-10, five milling machines got to work grinding off the top layer of rubberized asphalt, creating 13,500 tons of material and filling 575 truckloads. Much of that material will be recycled."[74]

LOST TIME AND OPPORTUNITY:

1986

Monsanto hides toxicity of 6PPD behind CBI[4]

1996 California Integrated Waste Management Board

"The findings of the literature search did not reveal the potential for significant environmental impacts resulting from waste tire land application (i.e., use as road bed material), ocean disposal, or reuse in oceans as artificial reefs. Information on the environmental impacts of retreading or remolding tires was also not found…"[75]

1997

Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks[76]

"By the authority vested in me as President by the Constitution and the laws of the United States of America, it is hereby ordered as follows:

Section 1. Policy. 1-101. A growing body of scientific knowledge demonstrates that children may suffer disproportionately from environmental health risks and safety risks. These risks arise because: children's neurological, immunological, digestive, and other bodily systems are still developing; children eat more food, drink more fluids, and breathe more air in proportion to their body weight than adults; children's size and weight may diminish their protection from standard safety features; and children's behavior patterns may make them more susceptible to accidents because they are less able to protect themselves. Therefore, to the extent permitted by law and appropriate, and consistent with the agency's mission, each Federal agency:

(a) shall make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children; and

(b) shall ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks."

President William J. Clinton

2002

6PPD Listed as Chemical for Priority Action by the Oslo and Paris Convention (OSPAR),Consisting of 14 countries.[15]

2004 France

"RECOMMENDATION

The chemical is a candidate for further work

Human Health:

RATIONALE FOR THE RECOMMENDATION AND NATURE OF FURTHER WORK RECOMMENDED

The chemical possesses properties indicating a hazard for human health (skin sensitization, anemia). It is therefore recommended that countries perform an exposure assessment, and, if then indicated, a risk assessment addressing exposure to workers and to humans via the environment.

Environment:

The chemical possesses properties indicating a hazard for the environment. Releases of 6PPD into the environment may occur during manufacturing in the rubber industry

from the use of 6PPD as an antiozonant, as well as from the utilization of rubber products. Therefore, an exposure assessment and, if then indicated an environmental risk assessment is recommended. This should also include further investigations on identities and properties of degradation products.[20]

2005 6PPD, IPPD in Tires Denmark

"The aromatic amines are present in much higher concentrations. This finding is not very surprising because these substances are added to the tyres in high concentrations to prevent degradation of the rubber. The dominant chemical substance is in general 6PPD, but IPPD is also present in considerable amounts. The highest concentration of 6PPD has been measured in a new passenger car tyre (sample no. 13). The lowest amounts of aromatic amines has been measured in an impact absorbing playground surfacing."[77]

2007 Netherlands

Environmental risk limits for twelve substances, prioritized on the basis of indicative risk limits.

"The environmental risk limits derived by RIVM (National Institute for Public Health and the Environment) for twelve chemical substances, as reported here, are better underpinned than the existing indicative environmental risk limits. Risk limits derived here form the basis for setting environmental quality objectives by the Interdepartmental Steering Committee on Substances. These quality objectives are used by the Dutch government to implement national policy on substances and the European Water Framework Directive.

The twelve chemical substances concerned are pentabromo diphenyl ether, para-tert octylphenol, benzo[b]fluoranthene, isodrin, 2-methyl-4,6-dinitrophenol (4,6-dinitro-ortho-cresol, DNOC), aniline, epichlorohydrin, 1,2-dibromoethane, ethinylestradiol, methyl bromide, 4- [dimethylbutylamino]diphenylamine (6PPD) and 3,3'-dichlorobenzidine. "[78]

2008 6PPD in Tire Infill Denmark-

"It was concluded that with modern analytical measuring equipment, it is possible to detect even the smallest traces of organic substances. The substances are washed from the surface by rainwater after a relatively short period of time."

"It was also established that the substances leached from rubber granule infills and rubber pads are the same substances which are drained from roads as a result of rubber wear particles from the car tyres, and which are discharged from municipal treatment plants."[79]

2008 US EPA,

internal communications question the “low risk” of used tire crumb exposure to children. Internal documents obtained by FOIA request by PEER.org[44, 80]

2013 US EPA

Retracts Synthetic Turf Safety Assurances

New Agency Posting Stresses Uncertainty amid Wide Range of Chemical Exposures

> “Washington, DC — The U.S. Environmental Protection Agency (EPA) has stepped back from prior safety assurances about artificial turf in response to an administrative complaint filed by Public Employees for Environmental Responsibility (PEER). The agency has posted new cautions concerning unexplored chemical exposure to more than 30 compounds found in synthetic shredded tire turf, including arsenic, lead, cobalt, mercury and trichloroethylene.”[81]

2019 Data Quality Complaint submitted to US EPA (6PPD was found in FRAP)

> “Part 1 of the Federal Research Action Plan (FRAP) is based on inaccurate, incomplete, and unreliable information regarding the potential risks to human health and the environment of exposure to recycled tire crumbs used in artificial turf, and issues conclusions that are not supported by the study. Part 1 of the FRAP violates the EPA Guidelines for Objectivity. It used an inaccurate lead testing methodology, failed to consider the actual and combined effects of the various chemical components of tire crumbs, tested for VOCs and SVOCs at inadequate temperatures, failed to consider the constituents of the carpet, and did not study the inhalation of fine particulate matter.
>
> The FRAP cautions against relying upon only the FRAP because of its limitations. The FRAP states that it cannot be used as a risk assessment. Despite this, the FRAP concludes, "While there are many chemicals associated with recycled tire crumb rubber, our laboratory experiments suggest that the amount of chemicals available for exposure through release into the air and simulated biological fluids is relatively low." This conclusion is not supported by the evidence and is outside the scope of its assessment.
>
> Because the evidence in this report does not support its conclusion, PEER and the Ecology Center ask EPA to retract its conclusion and conduct further studies on the safety of artificial turf to ensure the objectivity, utility, and integrity of the information EPA disseminates to the public. We also ask EPA to rescind and correct online and print information regarding the safety of artificial turf in Part 1 of the FRAP on the basis that it contains inaccurate, incomplete, and unreliable information. Finally, we strongly urge the EPA to correct its methodology prior to releasing information to the public.”[82]

2021 European Union

> “Danger! According to the classification provided by companies to ECHA in REACH registrations this substance may damage fertility or the unborn child, is very toxic to

aquatic life, is very toxic to aquatic life with long lasting effects, is harmful if swallowed and may cause an allergic skin reaction."[83]

2021 Atlanta, GA[84] SDS for 6PPDq

"6PPD- quinone, human and aquatic toxicity:
HAZARDS IDENTIFICATION
2.1 Classification of the substance or mixture
Serious eye damage/eye irritation Category 2
Skin sensitization Category 1
Specific target organ toxicity - Single exposure [Category 3] Narcotic effects
Specific target organ toxicity - Repeated exposure [Category 2] Blood system
Acute aquatic hazard Category 1
Long-term aquatic hazard Category 1"

More danger:

Rubber antiozanants in reusable food containers. We can pack our food in reusable food containers with any number of rubber antiozanants…EXCEPT 6PPD:

"…antiozonants (excluding 6PPD) are permitted for use in rubber articles intended for repeat food-contact use in the US (FDA regulations chapter 21 Part 177.2600). The biggest disadvantage of 6PPD is its partial decomposition during the vulcanization leading to the formation of toxic primary aromatic amines (PAA), such as aniline and secondary aromatic amines (SAA). A number of new PPDs have been developed and patented, that due to their chemical structures, are far less soluble in aqueous solutions but a lot more soluble within the rubber matrix. They therefore show significantly less migration of PAA and SAA. These new antiozonants were investigated and compared to 6PPD using commercial rubber materials with a certain content of antiozonant with regard to their migration of PAA and SAA into three different food simulants. The lowest concentration of PAA and SAA in all food simulants was measured in the RU 997 stabilized elastomer. Due to this fact RU 997 was permitted as a new antiozonant for commodities based on rubber according to the Recommendation XXI 'Articles based on natural and synthetic rubber' of the Federal Institute for Risk Assessment (BfR). RU 997 therefore represents an alternative for 6PPD with less migration of aromatic amines."[85, 86]

Yet, it's ok to allow our children to play, roll around in, fall asleep in 6PPD containing used tire crumb playing fields and playground surfaces? Should signage not be posted at each and every such surface warning parents of the toxic and carcinogenic chemicals? We have a right to know what is in nail polish and beauty products and even to repair cell phones. Should we not have a right to information and the ability to protect our children as well as the environment?

The 80k mile tires for the 10-15 year rubberized road[60]…in the vehicle with 6PPD in gasoline[87, 88]… Which direction are we headed?

Production of 6PPD was reportedly 5000-10,000 tonnes per year between 1990 and 1993.[17] By 1995, the number of producers had grown to 20 with an annual production of 117,000 tons. In 2001, production of 6PPD was 130,000 tonnes with an additional 10,000 tonnes of IPPD (N-Isopropyl-N'-phenyl-1,4-phenylenediamine).[18] By 2016, antiozanant production reached 300,000 tons of TMQ (1,2-dihydro-2,2,4-trimethylquinoline), 6PPD and IPPD.[89] Today, there are approximately 176 producers of 6PPD globally.[90]

The primary source of 6PPD is considered to be from tire abrasion. The sale of electric vehicles (EV) increased globally by 140% between Q1 2020 and Q1 2021 (China 500k; Europe 450k; US with fewer EVs, but doubled sales).[91] EVs are ~1000 pounds heavier than internal combustion vehicles. What they decrease in exhaust production of airborne pollutants, they increase in the amount of tire crumb deposited on roadways by a comparable amount.[92] With the current estimate of of 500g of 6PPD in passenger cars and 10kg in heavy trucks,[93] the increase in tire crumb deposition by heavier vehicles necessitates rapid intervention regarding 6PPD and other toxic and carcinogenic chemicals in tires.

> "Even if this harmful chemical was removed from tire production today, we will be dealing with the legacy of its use for the next 15 to 20 years," Nisqually Tribe biologist David Troutt.[94]

As we continue to build in the path of rising sea levels,[95] continue to use materials that have contributed to climate change and loss of biodiversity, and subject humans and the environment to harmful chemicals and products, it is even clearer that unless change is enacted now, there will be far fewer drivers in need of tires in the future.

> "*6PPD is more toxic than Mercury, 27 times more toxic than Cyanide, 425 times more toxic than Arsenic and more toxic than DDT…we do know that all those same ingredients in the chemical reaction that kills salmon are in those playground and playing surfaces…What we need is research on the risks from 6PPD quinone and on the possible substitutes. We need to treat this with urgency befitting a danger to our children.*" [71]
> The Honorable Katie Porter, Chair. Natural Resources Committee, Subcommittee on Oversight and Investigations. 15 July 2021.

Moving forward:

7 Apr 2021[96]
Phelps, N. Is the tire chemical 6PPDq killing Minnesota's fish?
Proposal request for funding for 2022 submitted by University of Minnesota to the Environment and Natural Resources Trust Fund.

15 Jun 2021[97]
HR 1144- The Puget SOS Act

- establishes Puget Sound Recovery National Program Office in Environmental Protection Agency (EPA) to coordinate efforts restore and protect to Puget Sound.

- codifies the Puget Sound Federal Leadership Task Force
- authorizes $50 million for five years to carry out the provisions above.

15 Jul 2021[98]
Letter from Senator Jeffrey Merkley (OR) to Secretary Pete Buttigieg, US Departmemt of Transportation. Urges the Secretary to review the microplastic pollution created by tire wear, the impact of 6PPD quinone to endangered species and the tire crumb in playing fields and playgrounds.
Requests US Transportation Department:

- Work collaboratively with U.S. Environmental Protection Agency (EPA) and U.S. Fish and Wildlife Services to assess risk to aquatic species from existing and future roadways;
- Explore substitutions for 6PPD in tires; minimize tire shedding
- develop simple, inexpensive biofiltration systems to incorporated along roadways; prevent lethal impacts on aquatic species

29 Jul 2021[99]
A press release from Office of Rep. Marilyn Strickland.
Strickland Amendment to Protect Coho Salmon Included in Appropriations Package. Passed House. Read twice in Senate.

19 Aug 2021[100]
The House Committee on Natural Resources, Subcommittee on Water, Oceans and Wildlife. Letter to National Oceanic and Atmospheric Administration and US Fish and Wildlife Service regarding urgent need for research and action

ADDITIONAL ACTION ITEMS:.

a) Remove underperforming tires from circulation
   Labeling system that rates based on tire crumb release
b) Prohibit use of tires underwater
   Reefs, aquaculture seeding
c) Prohibit OHV use - Oceano Dunes (in process); Algodones Dunes (CA Aquifer)
d) Ban crumb rubber use in Synthetic turf fields and playgrounds
   Trace, track; Regulate as hazardous waste; prohibit use of taxpayer dollars
e) EPR (Extended Producer Responsibility) for tire, synthetic turf and, crumb rubber manufacturers
f) Prohibit use of tire crumb in building products: concrete, asphalt, permeable pavers, roofing materials; recreational uses (athletic surfaces, walkways, trails, playgrounds, playing fields, water parks)

Petroleum containing asphalt, with and without crumb rubber, must be reconsidered. Is a 10-15 year life expectancy, with the human and environmental health hazards it brings, worth the price tag?

As with other plastics, turning a blind eye to crumb rubber use has contributed to climate change, loss of biodiversity, human heath, and cultural systems. The financial losses associated with its use are astronomical. Moving forward, consideration of all associated long term costs must be given priority over companies rights to CBI, empire building and stockholder dividends. Too much has been sacrificed and we cannot afford additional loss of time…

Respectfully,
Dianne Woelke MSN

Mitigation considerations

Bioswales:
Straw wattles with polyethylene jute mesh- potential for contribution of microplastic pollution
https://www.iwtcargoguard.com/bioswale-green-infrastructure/

Gabion baskets- zinc coated wire- potential for contribution to zinc toxicity to aquatic organisms
https://www.iwtcargoguard.com/products/gabions-basket-and-reno-mattress/

Geotextiles- synthetic fibers- potential for microplastics and associated leachate pollution and bacteria adsorption. https://www.iwtcargoguard.com/products/geotextiles/

6 PPD Alternatives
https://ijtech.eng.ui.ac.id/article/view/4083

https://core.ac.uk/reader/288352208

https://core.ac.uk/reader/327692886

https://www.ukimediaevents.com/publication/5ecff2ad/92

Broken and weathered chunks of asphalt from storm-ravaged State Road 399 mix with sugar white sands throughout Gulf Islands National Seashore on Monday, Dec. 17, 2018. *Tony Giberson/tgiberson@pnj.com*

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