

**Plastic Waste Management**  
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**Lecture – 24**  
**Plastic Pollution : Health and Environmental Impact**

So welcome back. This is the 4th module or so 4th video for week 5. We will continue our discussion on Health Impact Environmental Impact associated with plastic pollution ah. So, far we looked into the marine debris. How the plastic goes in there and also the impact on marine life and we looked at some of the issues with the land population as well. In the last video if you remember we had we were discussing about the impact on animals like cows and bull, you saw one last video on a bull where several kgs of plastic were recovered from his body.

So, those are the issues. So, once we have this plastic being into the body either directly or indirectly what is the health impact and what is the overall environmental impact. So, we will continue the discussion in this video and in the next video which could be the last two videos for this particular week.

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**Effects on Humans**

- Many adverse effects on human health due to the presence of additives used in manufacturing of plastics
- For example plasticizers used as additive to provide flexibility in PVC.
- The three most commonly cited plastic additives are :

BISPHENOL-A

PHTHALATES

FLAME  
RETARDANTS

So, getting forward the what how it is going to effect on humans. See we are always a I all I think I say that many times that we are one of the selfish species on this planet. Every time when we think about any environmental impact, first of all we think about

what will happen to us. And that is why even the terminology used as human health and environment. That is what you will see in most of the textbooks in terms of any chemicals.

So, let us look at what will be the potential effect on humans, whether because since we are on the top of food chain many of these things will come to us, directly mostly indirectly through fish, through milk and through other species as well. And so effect on humans it does there are lot of additives used in manufacturing of plastics. And plasticizer for example; which provided flexibility to PVC.

The three most commonly cited plastic additives are bisphenol-A, which is BPA many times you see that plastic containers labeled as BPA free. So, they do not have BPA; BPA we will talk about that I will also show you a small video on like a health impact related to BPA that has been reported. Then pthalates here p is silent pthalates and flame retardants. So, these are the three major category bisphenol-A is used pthalates are used and flame retardants are used and all of these 3 categories has been documented to have adverse human health impact which is already there in the literature.

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Additives and their Ill-effects	
<b>BISPHENOL A</b>	<ul style="list-style-type: none"><li>• Act as endocrine disruptor in humans</li><li>• Causes thyroid cancer, osteoporosis, hypo &amp; hypertension</li></ul>
<b>PTHALATE OR PLASTICIZER</b>	<ul style="list-style-type: none"><li>• Reproductive, malformation, developmental disorders</li><li>• Causes pulmonary system effects including asthma allergies</li></ul>
<b>FLAME RETARDANTS</b>	<ul style="list-style-type: none"><li>• Impact on immune system, fatal and child development</li><li>• Cancer, neurologic dysfunction</li></ul>

The slide includes logos for Swamyam (Free Online Education) and a small video inset of a man in a red vest speaking.

So, which. So, bit what are their impact? It so, these are the additives and they are what are the ill effects? So, bisphenol A acts as endocrine disruptors in humans. So, it impacts our endocrine system. So, it acts as a endocrine disruptors. Can cause thyroid, cancer, osteoporosis hypo and hyper tension. So, it causes both hypo as well as the hypertension.

So, that is what bisphenol a we are really worried about BPA and this that is why many plastics these days are trying to be away from BPA. So, they do not use BPA anymore bisphenol a the BPA is a short form for bisphenol A.

Phthalates or plasticizers they impact the reproductive system, malformation, development disorders, causes pulmonary system effects including asthma allergies so that is what phthalates are known for. Flame retardants it impacts on immune system, it can be fatal and on child development, it can cause cancer or neurologic dysfunction as well. So, these three are the broad categories of a additives used in plastics and they these are their ill effects.

So, we are always worried about things leaching from plastic and getting into our food especially if you are using as a food container or when the plastic goes into the surface water or the ocean things leaching from plastics. So, BPA leaching from plastic getting into the water or say if you are using even these days the we use lot of water bottles which for drinking water throughout the day and if we have water there for 5, 6 hours touching that plastic surface, BPA is leaching or these chemicals are leaching from the plastic to my water and then it its a problem.

It is a it can lead to over several years of consumption of water with little bit of these chemicals can create an adverse health impact. And it is even for a small babies we are using plastic bottles these days. That is what for feeding bottles and they there you see a more like a we you will many of those bottles claimed to be BPA free. Whether they are BPA free or not we do not we of course, it needs to be tested out to find out whether they are BPA free. So, that is those are the issues that we have to deal with.

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**Bisphenol A**

**Uses**

- Contains BPA: Water bottles, Measuring cups, Baby bottles, Dishwasher tablets, Dishwasher trays, Dishwasher racks, Dishwasher filters, Dishwasher detergent, Dishwasher salt, Dishwasher rinse aid, Dishwasher spray, Dishwasher cleaner, Dishwasher brush, Dishwasher pad, Dishwasher sponge, Dishwasher brush, Dishwasher pad, Dishwasher sponge, Dishwasher brush, Dishwasher pad, Dishwasher sponge.

**Ill-effects**

- ONCOLOGICAL DISEASES
- LIVER DISEASE
- AUTISM
- OBESITY
- DIABETES
- IRRITATION OF MUCOUS MEMBRANES OF THE UPPER RESPIRATORY TRACT
- IRRITATION OF THE MUCOUS MEMBRANES OF THE EYES
- DERMATITIS

Source: <http://www.water-bottle.co.nz/bpa-were-detected-in-92-5-of-the-urine-samples/>

Source: <https://us.fotolia.com/id/196912750>

swayam

So, where the BPA is used? If you look at the bisphenol a used in your its container so, these are the ones which has creates have BPA presents in different types of containers. You have canisters, measuring cups, beverage bottles, mixing pictures, cake keepers, I steamers and polycarbonate see beverage bottles where with the straw or another bottle. So, these are all these can potentially contain a BPA unless it is BPA free.

And we already talked about it's effect can leads to liver disease, autism, irritation of mucous membrane, dermatitis which is a skin disorder. Irritation of mucous membrane, upper respiratory tract, obesity, diabetes and oncological disease which can lead to cancer and other stuff. So, that is the typical structure for bisphenol like 2 benzene rings with OH groups at the end and then C H 3, C H 2 and C H 3 groups in the middle. So, that is how its structure is this is how it looks like. So, this is a what the bisphenol a where they are found and what is its potential impacts are in terms of ill effect.

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The slide is titled "Phthalates or Plasticizer". It is divided into two main sections: "Uses" and "Ill-effects".

- Uses:** This section contains a collage of images showing various items where phthalates are commonly found, including kitchen items like a rubber duck, a bottle of hand sanitizer, and a spray bottle, as well as toys like colorful blocks and a yellow duck, and personal care items like a hairbrush and a perfume bottle.
- Ill-effects:** This section features a diagram of a pregnant woman. A red arrow points upwards from the text "Level of phthalate" to the text "Risk of miscarriage", indicating a positive correlation. The word "Risk!" is written in large, bold letters below the diagram.

At the bottom of the slide, there are two source URLs: <https://www.globalindoorhealthnetwork.com/phthalates> and <https://medicalpress.com/news/2015-09-exposure-phthalates-linked-pregnancy-loss.html>. The slide also features the Swayam logo and the text "FREE ONLINE EDUCATION swayam" and "शिक्षण ही है विकास".

Phthalates it is used in different kind of materials, toys, cosmetics, bottles, are different containers, they use phthalates and the risk is we talked about it earlier the reproductive system and other issues associated with that, as the level of phthalates goes up the risk of miscarriage is more. So, you do not want too much exposure of phthalates.

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The slide is titled "Flaming Retardants". It is divided into two main sections: "Uses" and "Ill-effects".

- Uses:** This section shows a room with various items labeled as containing flame retardants: "KITCHEN APPLIANCES", "COUCHES", "ELECTRONICS", "EASY CHAIRS", "CARPET PADDING", and "FOAM BABY ITEMS". A central banner reads "FLAME RETARDANTS CAN BE FOUND IN...".
- Ill-effects:** This section contains three numbered points:
  1. Flame retardants cross the placenta; babies are born with flame retardants in their bodies.
  2. Flame retardants accumulate in breast milk, exposing nursing infants.
  3. More time on the floor and hand-to-mouth behavior means young children have higher ingestion of flame retardant contaminated house dust.

At the bottom of the slide, there are two source URLs: <https://www.epa.gov/knowledge/2016/08/flame-retardants-why-they-re-out> and <http://www.environmentalhealth.org/news/2016/08/01/flame-retardants>. The slide also features the Swayam logo and the text "FREE ONLINE EDUCATION swayam" and "शिक्षण ही है विकास".

Flame retardants is essentially used to retard the flame as the name suggest. So, anything which any equipment or anything which gets heated up, which can we are worried about things catching fire, we have flame retardants there. So, we will have electronics carpet

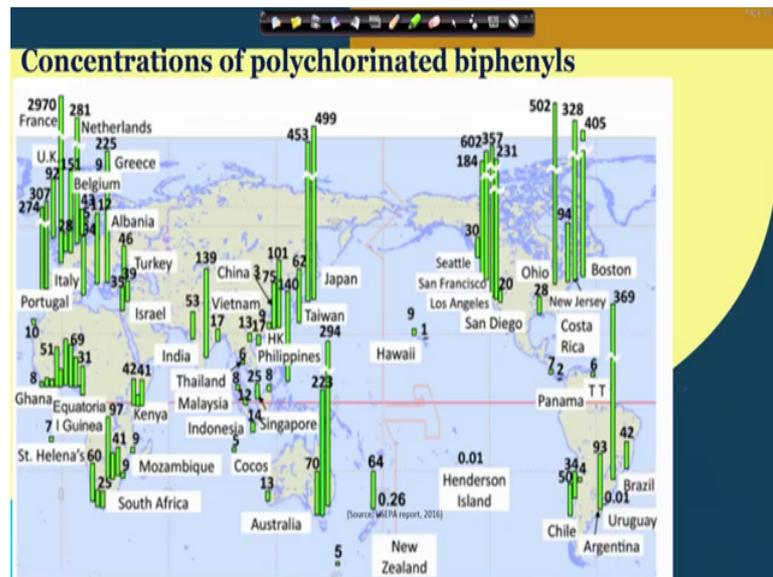
padding, form baby items, chairs, kitchen appliances so, anything where we want that if there is any fire it gets any it should get retarded. It should not propagate we use flame retardants.

So, flame retardants the way it has a ill effect is it crosses the placenta and so even from it can go from mother to the baby. Babies are born with flame retardants in their bodies. So and the flame retardants also accumulate in breast milk, exposing nursing infants. So, small babies can get it through the breastfeed as well. They may get it through the placenta, but also through the breastfeed.

More time on the floor when they are going around on the floors in the carpet padding, we use lot of many many especially in the developed countries the concept of using carpets are there, things many people are moving from carpets to kind of wooden floor now. But still carpets are used if you go to Delhi airport the entire airport has been carpeted especially t 3.

So, it is more time on the floor if you have more time on the carpeted floor and then you have this hand to mouth activity where the kid is touching things on the carpet then putting his hand in the mouth, means young children have higher ingestion of flame retardants contaminated house dust, because this from the carpet padding and other sources you will have flame retardants in the dust, and when the kid has the tendency of touching things and then putting in into the mouth it becomes an issue in terms of impact on their body. So, they get exposed to these flame retardants.

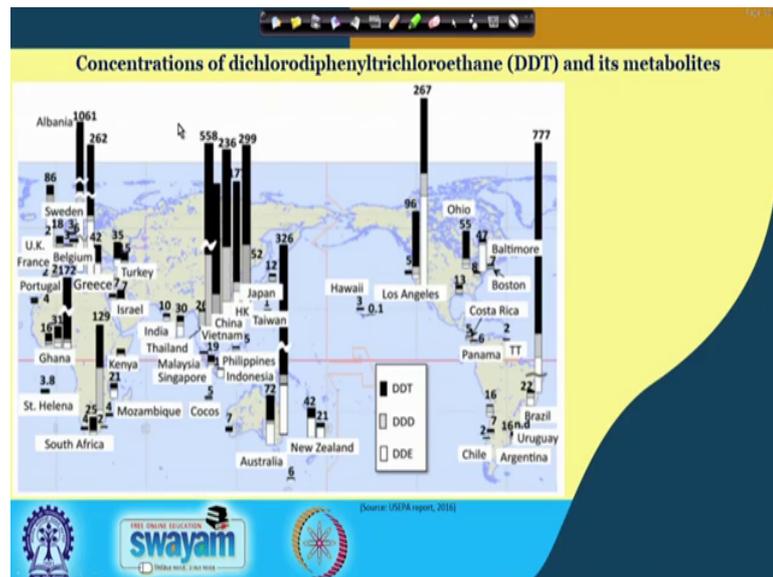
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Now, if you look at some of these pc contaminants concentration in different parts of the world. So, this is as per the USEPA report of 2016, concentration of bisphenol A, poly polychlorinated biphenyl which is, if you look at their concentration. And we do see a pretty high concentration ranging from close to 3000, I think these are in micrograms per liter, it goes all the way in some places it is pretty low and but we see a wide variety of ranges of concentrations showing up in terms of polychlorinated biphenyls at different parts of the world.

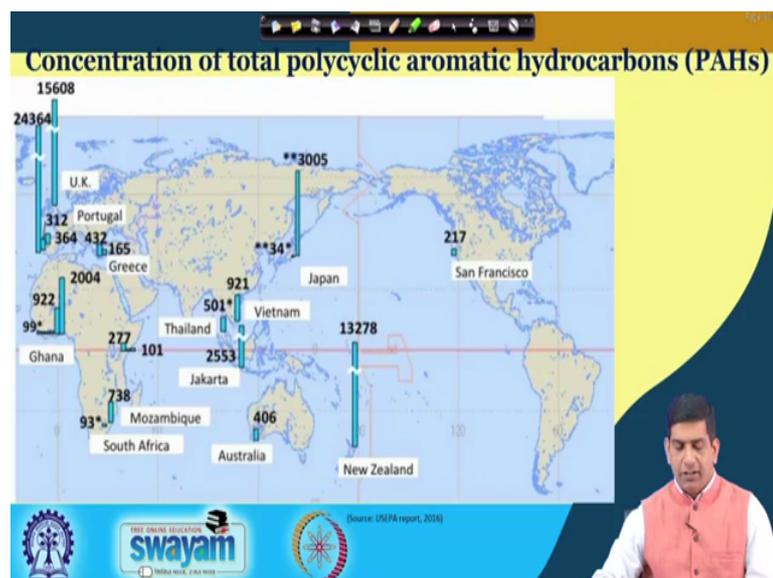
So, the reason for putting this graph up there is just to show you that it is not only a localized problem. It is a global problem and some places it is more some places it is less based on how much plastics are being used or how much this is the other sources of polychlorinated biphenyls as well. So, as you can see it is pretty much everywhere around the world where you see these things showing up.

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And similarly if you compare that with a DDT and its metabolite you see that DDT also kind of shows up throughout the world. So, polychlorinated biphenyl has kind of similar exposure as compared to DDT. DDT which we have been talking about for quite some time, for almost 4 decades now. And so if this polychlorinated biphenyls could be the next DDT, where we need to really worried about in terms of its control as well as remediation over time, in globally at throughout the world.

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Then polycyclic aromatic hydrocarbon that is another one which does so up here you see that in some places you see the concentration to be much higher. So, all these are from that USEPA report which is there in your reading material. So, here as you can see that there are piece PAH. Some places the data is not have not presented that does not mean it does not have it.

It is actually the data was not available. So, data is not available for those particular areas. So, similarly for India we do not have the data, in terms of what is the total PAH is there into the environment going from different industrial and others activities happening in the country.

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Toxic compound	Use	Effect(s)	Plastic type(s)
bisphenol A	plasticizer, can liner	mimics estrogen	PVC, PC
phthalates	plasticizer, artificial fragrances	interferes with testosterone, sperm motility	PS, PVC
persistant organic pollutants (POPs)	pesticides, flame retardants, etc.	possible neurological and reproductive damage	all plastics
dioxins	produced in manufacture of PVC, during waste incineration	carcinogen, interferes with testosterone	all plastics
nonylphenol	anti-static, anti-fog, surfactant (in detergents)	mimics estrogen	PVC
polyaromatic hydrocarbon (PAHs)	produced when fossil fuels are burned	developmental and reproductive toxicity	all plastics
polychlorinated biphenyls (PCBs)	electronics manufacture	interferes with thyroid hormone	all plastics
styrene monomer	breakdown product	carcinogen, can form DNA adducts	polystyrene

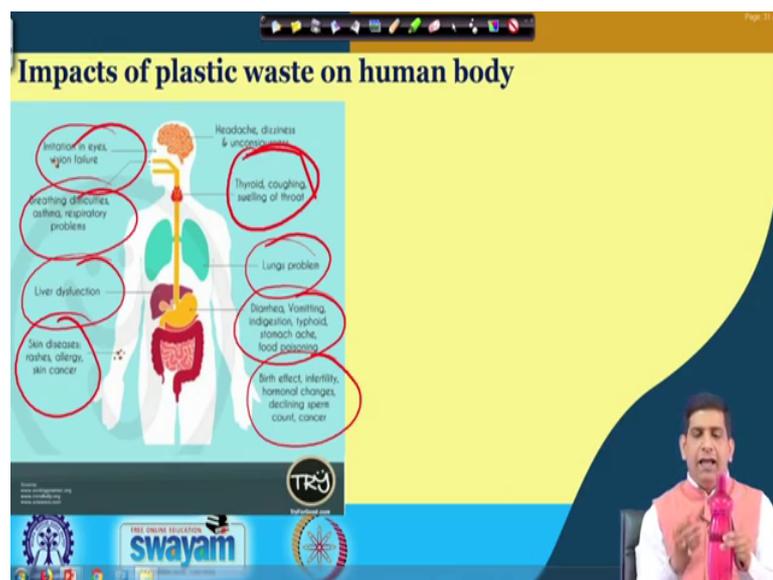
So, if you look at in terms of where they use what is the effect and where in which type of plastic it is used. So, bisphenol A it is plasticizer it is used as a liner for certain cans and other stuff it mimics estrogen, so endocrine disruption compound, and used in PVC and PC that is where you see them used.

Phthalets are plasticizer, also artificial fragrance it interferes with testosterone, a sperm mobility so that is why the reproduction issues, it is used in polystyrene and PVC. Persistent organic pollutants which is also known as POPs it is POPs is used in pesticides, flame retardants, etcetera and has a possible neurological and reproductive damage and it is used in all plastics. So, POPs are there in all plastic.

Dioxins which is produced in manufacture of PVC during waste incineration. Carcinogen interferes with testosterone it used in all plastics. Then nonylphenol which anti static, anti fog surfactants used in detergents, it mimics estrogen, they also used in PVC pipes, PVC polycyclic aromatic hydrocarbon. Whenever you burn fossil fuel it is form. It is development and neurological reproductive toxicity it has been found again in all plastic.

PCBs which is polychlorinated biphenyls which is electronics manufacturers interferes with thyroid hormone again, it is in all plastic. Styrene monomer which is a breakdown product carcinogen forms DNA, effects DNA used in polystyrene. So, these are different type of toxic compounds and where in different types of plastics it is used and it is impact in terms of on health.

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So, if you look at impact of plastic waste on human body, it can creates headache based on different chemicals that we just looked into which is there in different types of plastic, it can create headaches, dizziness, unconsciousness, thyroid, it can impact thyroid, swelling so thyroid lungs problem, diarrhea, vomiting birth effect infertility hormone changes, skin disease, liver dysfunction, breathing difficulties, irritation in eyes and vision failure.

So, as you can see it has a variety of impact for different body system. But thing is that, it is again it will happen when we have mismanagement of plastic waste. It is not that if I

am using a plastic bottle, see if I have this plastic bottle sitting in front of me from day to morning to evening I am not getting exposed to any of these chemicals as of now.

But once say if the water inside this bottle, if this bisphenol A or phthalates or different compounds which is present in this plastic bottle if it is present, because some of these bottles are supposed to be like BPA free and all that. But if it is present and if it leeches into this water and when I consume this water I am getting exposed to it. And if I am consumed to this water this kind of water every day for a longer period of a say few years, few decades down the line then only you get these kind of sickness, it is not that you consume water today and tomorrow you will have this sickness.

So, it is and this is one source there are other sources of this similar contaminants showing up into the environment which you can be exposed to as well. So, the major problem comes is of course, we have to make sure that things does not leach here, so that is the design problem. If we it can be designed properly so things does not leach. But at the same time once this bottle is used up, one says if bottle gets a leak or something happens to this bottle I throw it becomes a plastic waste, at that time we need to make sure that this plastic waste is handle properly so, that these chemicals which could be presented as a plasticizers and other things in here does not get into the environment.

So, does not get into the if it gets into the surface water things may leach, if it gets into the ocean things may leach out, so we need to prevent that leaching by having a proper plastic waste management framework for every city town and state of course, in the country. So, if you can do that and that becomes part of again municipal solid waste.

So, this municipal solid waste management rules and plastic waste management rules has to be looked into in tandem where we can try to manage this plastic waste properly. If we can do the management properly, if you can recycle things properly then we can minimize the risk from these different chemicals present in these different types of plastics which is out there which is used for different applications in our day to day life.

So, that is looking at different plastic waste into the ocean. So, they will look at this particular video, which is this one was done by I think usgs if I am correct and it also involves some of the researchers from different universities in US, where they majorly focus on bisphenol A in terms of it is adverse impact and how much bisphenol A is making into the water body which is one of the major source is coming from the plastic

pollution. So, let us look at this video and then we will discuss the issues around it and it is mostly focused on from an angle of human health and which you will see.

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Its like something out of science fiction. Unsettling transformations or sweeping across the planet. And clue by clue, investigators are assembling a new picture of earth. They suspect we have entered a time of faster global change than any human being has ever witnessed. But we can rise to the challenge. Alter the course, it is up to all of us to confront. These strange days on planet earth.

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Each of us now produce more than 1500 pounds of trash a year and the fraction that is plastic is going nowhere by the earth. If enough of us change what we do in simple ways, we can reduce the threat plastic poses to the ocean. Still, when it comes to plastic out of sight should not mean out of mind. Fred vom Saal of university of Missouri and Don Tilley from the US geological survey, live in work in the nations Heartland.

Alarmed by rising numbers of wild animals found with bisard developmental and reproductive problems. They have joined a national effort to find the cause. The prime suspects include pesticides, the residue of birth control, pills and other drugs and treated wastewater and the compound found in many familiar plastics bisphenol A.

The problem with chemicals such as bisphenol A is it breaks out of the plastic and leeches into water. Study show that from water this chemical can get into animals. And there it can act like a dose of the female sex hormone estrogen. Too much estrogen can disrupt the endocrine system and that is been linked to a wide range of health impacts, including gender bending. One critical unanswered question is at what level of exposure these effects occur? With bisphenol A we are talking about extremely small quantities of this chemical getting into the environment.

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Samples drawn from this stream at only 30 parts per trillion. Vom Saal is worried because study show tiny amounts of bisphenol A can derail early cell development in mice. And if mice are vulnerable might people be as well. Recently Vom Saal tested

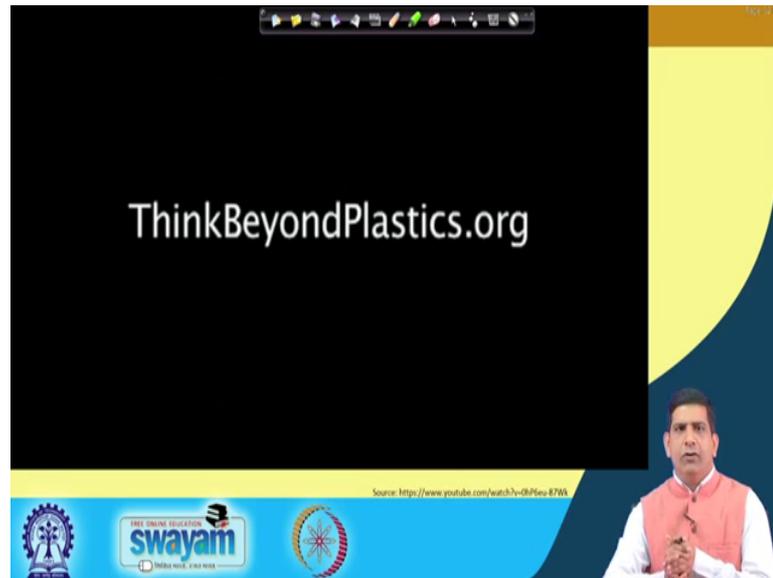
clear plastic baby bottles to see if they release bisphenol A. He devised the simplest of experiments, let distilled water sit in brand new bottles for 24 hours and then tested.

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Everyone released bisphenol A. Curious he then decided to see what happens when the same baby bottles are run through an ordinary dishwasher which heats them to a 240 degrees. Some of these bottles by the time we had washed them 10 times, we are leaching 10 times more bisphenol A than they had before they had been washed. The plastics industry vigorously disputes any danger to children from the chemical. They cite the continued blessing of the US food and drug administration. But the Japanese are cutting back in their use of bisphenol A and recent independent studies have motivated the FDA to take a fresh look.

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So, as you saw this is this was done by national geographic and with this particular website thing beyond plastic dot org. So, as you listen to those researchers they collected the water sample from certain streams and they were looking at the BPA concentration in that water. And later on in the video they were looking at the plastic bottles which we were used to feed babies and so they found all of them actually having a leaching of BPA and when they washed it using that washing machine at higher like warmer temperature, warm water they found that as they were more and more washing was actually leading to more and more leachability.

So, after 10 wash if I remember correctly it says kind of says that 10 times more leaching happened. So, this BPA leaching from this plastic bottles is of concern because it is showing a negative impact on mice. So, it is extrapolated that it will be have a negative impact on human bodies as well. So, that was just one example and similar studies have been done with different chemicals which kind of you will you may (Refer Time: 22:39) encountered in different courses that you have taken especially if you have taken any course related towards toxic toxicology and other stuff.

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**Transfer of Contaminants from Plastics to Organisms**

- Most marine organisms obtain contaminants from plastics by ingesting plastic debris (mostly micro plastics) thinking of them as plankton species. Adsorbed contaminants can leach into digestive fluids and can be transferred to other tissues. As plankton species form the foundation of every food web, any threat to them can have serious effects.
- Toxicants may bio accumulate in the tissues to produce high tissue toxicant concentrations. Toxicant concentrations may also increase through transfer within a food web (bio magnification).
- The transfer of contaminants within food webs is prevalent everywhere in the marine food web and may even affect non-marine species such as polar bears and humans.

So, these are these do has a problem in terms of human health problem and also it is problem for other aquatic species that things do leach which we are talking about. So, there is an issue of plastic design of plastic products where, to make sure that things does not really leach the harmful chemicals should not leach from plastic to the body, to the food or to the drinks. So, that it becomes a problem especially from the food point of view, and they have been some report also that when you use a plastic container from microwave there also you see the leaching gets enhanced because again for the warmer, warmer temperatures.

So, we need to kind of do some work in that area to make sure that those plastic where containers are safe. And if we use them if we can phase out them gradually that may be a maybe a welcome step, but at the same time we need to make sure that whatever is the replacement we are going to use is better from a human health point of view better from environmental point of view. So, kind of having a long some sort of LCA study Life Cycle Analysis study of the alternatives will help and to assess which one is better; which one is a better option.

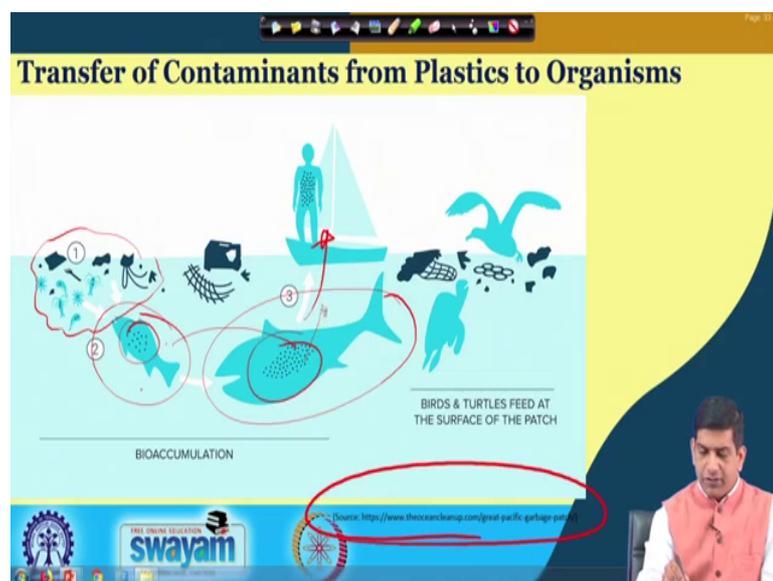
So, when we talk about contaminants getting from plastic into different media and then from the different media the plastic will this contaminants will go into the organisms as well. So, here what when we talk about things going into the different organisms most marine organisms obtain contaminants from plastic by ingesting plastic debris which is

mostly micro plastic. So, this micro plastics they ingest that micro plastics they think that they are plankton species and that is what creates the confusion. Adsorbed contaminant can leach into digestive fluids, things can and can be transferred to another tissues.

So, as planting species from the foundation for the every food web any threat to them can have serious effect. So, if there it is getting impacted the planting species are getting impacted. So, that will have a kind of food chain impact where things will go into the higher level of the food chain. Toxicants may bio accumulate. Bio accumulate means it will kind of build up in the tissues usually for the lipophilic chemicals, lipophilic means something which has affinity for lipids, for fats in the body. So, it is a lipophilic and then it adsorbs to that particular site in our body if it is lipophobic; that means, phobia of lipids. So, it will not absorb.

So, since many of these contaminants are lipophilic, they try to bio accumulate produce high tissue toxicants concentration, and other concentration also increase within the food change by bio magnification. Because things go from a smaller species to higher species and then the concentration bio a it is gets increased. So, there is a bio magnification there. So, contaminants within the food web is prevalent everywhere and even after non marine species such as polar bear and humans. So, this contaminant does keep on going up in different species and then humans being kind of being on the top of the species chain end up getting exposed to it as well.

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So, it is a just same thing which we just talked about if you put it in a pictorial way which was done in this particular report which is referenced at the bottom over here, where you can again these many of these reports will be there, but this is kind of one of the report which must be you will you will get a copy of that as part of reading material, for this week or the week for this I think probably this for this week only.

So, as you can see the plastic pieces or plastic and other pieces smaller those plastic micro plastics have been consumed by this small organisms which is being eaten up by the fish and from the smaller fish getting eaten by the bigger fish and the bigger fish goes to kind of becomes a food for us, and we see those plastic getting there. So, as you can see there were a small micro plastic which gets accumulated over here and then the concentration increased over here because it eats many of those fish.

And then from here the concentration kind of increases in a humans body as well because things are bio accumulating. And so that is one for the fish route and then birds and turtles feeds at the surface of the patch and they also consumes many of these micro plastics which again with micro plastics they are also getting different contaminants different chemicals which are present on those micro plastic into their body as well.

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So, in terms of in California and Indonesia who they found that recent some study was done where they found 1 quarter of the fish sample from fish markets in California and

Indonesia contain plastic pieces in fiber their guts. So, the plastic pieces and fibers are already showing up in the into the in this fish is around 25 percent of the fish had that. So, then of course, that will lead to human exposure.

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Ah there was also some study done we will study finds that 93 percent of bottled water has micro plastics. So, 93 percent of the bottle water had micro plastics, which you see that it is showing up in 93 percent of the micro plastic in the water bottle. And nestle pure life which is there in many countries had has been tested. In in India Bisleri was tested as well Bisleri was tested and found to be my have micro plastic. And then Germany and other country like PepsiCo, Aquafina, Aqua, Minalba, Wahana, Dasani which is again Coca Cola brand, Evian, San Pellegrino which is again nestle kind of manufacturer as you can see many of these bottle was found to have plastic with 325 average number of plastic particles for every liter of water sold.

So, they were 259 bottles from 11 brands across 9 countries. So, plastic discover included polypropylene, nylon and polystyrene terephthalate. So, this was the study done and so, we are seeing micro plastics coming into this water bottles, because the water bottles are the water treatment plants are not designed to treat for these micro plastics. So, they do end up in these water.

So, although we may consume many times you consume these plastic bottle water thinking that they will be safe they are better, but many many times. They are actually

not there the country like us is still in general if you say that plastic bottle may be slightly better, than the tap water in some places maybe the same or even the worst, but if you look at the developed countries most of the water supply system there is much much better than the plastic water bottle what you get the water plastic water bottle.

Say if you are in Europe or even most part of US you do not really need plastic you do not really need water bottle that the regular supply that you get is actually highly regulated most of the times better quality then what you get in the plastic bottles. In developing countries like India still since we do not our water treatment system is still not that good in entire country. So, there are issues.

So, many many places people do prefer to go for these plastic bottles, but plastic bottles are not also plastic water bottles, but they are also not that great, they also have issues and so in houses we use Aquaguard and those different water filter Aquaguard or Kent or different brands are out there.

So, but that is again that that is gives a better water hopefully, but at the same time it there is and most of these filtered system has lots of wastage, minimum that we have is like 1 is to 1, where if you have 2 liters of water, 1 liter is what you get one liter is the waste. So, let us I stopped here with these discussion and then we will continue the discussion of plastic impact on human health in our last video for this particular week. Again any questions put it on discussion forum, we will be more than happy to like respond to your queries any suggestions any newer information please share it on the discussion forum and it will be helpful for all the students.

So, thank you enjoy it like a I hope you are enjoying this course, keep doing that and I look forward to seeing you in the next video thanks.

Student: (Refer Time: 32:09) water bottle comes sir please say, please say sir thank you for once again.

So thank you. So, this is a bring set to the last this is the 4th video this has been to the end of the 4th video of week 5. So, we will continue the same discussion in the next video where we finish the impact on human health and environment from plastic pollution.

Thank you.