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Review Article

### TOXINS AND ITS IMPACT THROUGH OUR DAILY DRINKS - AN OVERVIEW

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#### ABSTRACT

Water is the essence of earth and basic necessity of all the living beings. In present times drinks include various forms like energy drinks, milk, milk shakes, fruit juices, soft drinks, bottled water etc. Due to the impact of globalization and industrialization many changes occurred and our world is becoming more exposed to toxic factors. So our daily drinks are also becoming part of it and reported to contain dangerous chemicals, heavy metals, pesticide residues, pathogenic microorganisms and even rocket fuel. Exposure to these toxic elements through our daily drinks is an imperative public health problem worldwide. Alarming increase in ailments like stroke, cardiac problems, cancer etc. can also be attributed with this.

**Keywords:** Drinks, toxin, health, micro organism, chemicals, pesticide residues.

#### INTRODUCTION

Eating and drinking are the two basic necessities for human survival. Without eating, a person can survive for few months but without drinking he may die within few days. Drinks are simply liquid substances which are used for human consumption. When the human body get dehydrated it experiences the feeling of thirst and to quench this we are using drinks. But nowadays in addition to basic need it forms a part of culture of human society. Today we cannot restrict only water in the group of drinks because drinks or beverages are changing its form to soft drinks, milk, milk shakes, carbonated water etc. Even then all these forms have some form of water in them; water itself is not often classified as a beverage. As an add-on to these changes some or other forms of toxins also get into our daily drinks. Industrialization, globalization, agricultural revolution, etc also contributed to it. To concur with the fast running world, over use of pesticides, poor handling of edibles, use of outside foods, etc. are now popularizing. Exposure to all these is becoming a major health problem worldwide. Alarming increase in heart attack, stroke, cancer, etc can also be attributed to these toxicants. There should be a strict awareness among the public about what are all the possible toxins that get into the body unknowingly through their daily drinks. The aim of this article is to do an overall view of some toxins enters into the body through our common and favorite drinks.

#### TOXINS IN OUR DAILY DRINKS

##### Milk

Milk is considered as a complete food which contains proteins, fats, carbohydrates and most of the vitamins and minerals in it. There are more than 6 billion consumers of milk and milk products throughout the world.<sup>1</sup> But now this nutritious drink is termed as White Poison since the presence of a number of pesticide residues, infectious microbes, adulterants, excessive hormones are reported from this. The pus, blood, antibiotics, carcinogens in milk and chronic fatigue, asthma, anemia, auto immune disorders caused by milk consumption do no body good.<sup>2</sup>

##### Some infectious microbes in milk

*Bacillus cereus*-These bacteria produce a toxin that can cause diarrhea and vomiting. *Bacillus cereus* spores are heat-resistant and may survive pasteurization.

*Brucella*- *Brucella* is a bacterial microbe that is found in unpasteurized dairy products. *Brucella* infection, or *Brucellosis*, has also been called "Undulant Fever".

*Mycobacterium tuberculosis*

*Salmonella*- *Salmonella* contamination of raw milk has been the source of several outbreaks in recent years. Symptoms include diarrhea and high fever.

*Staphylococcus aureus*- It produces toxin which causes explosive vomiting.

*Yersinia enterocolitica*

**Pesticide residues in milk**

USDA Pesticide Data Programme suggest the presence of four pesticide residues in milk.<sup>3</sup>

| What Pesticide?  | How often? | Toxicity   |
|------------------|------------|--|
| DDE              | 0.6%       | Known Carcinogen, Suspected Hormone Disruptor    |
| Iprodione        | 0.4%       | Known Carcinogen, Suspected Hormone Disruptor    |
| Dicofol          | 0.1%       | Possible Carcinogen, Suspected Hormone Disruptor |
| Permethrin trans | 0.1%       |  |

**Commonly used adulterants in milk**

| Adulterant                | Harmful effects                            |
|---------------------------|--|
| Unhygienic water & Starch | Stomach disorder                           |
| Urea                      | Stomach disorder, Giddiness and joint pain |
| Detergent                 | Diarrhea                                   |

**Bovine Growth Hormone in milk**

The recombinant Bovine Growth Hormone (RBGH), a genetically engineered hormone is reported to inject in the cows to force the cows to produce more milk than they normally would. Increasing levels of this hormone boosts milk production, causing a number of problems with the milk, among them, raising levels of pus, antibiotics residues and a cancer-accelerating hormone called IGF-1. Whenever cows are forced to produce more milk, they become more susceptible to udder infections called mastitis which end up in the presence of pus in cow's milk. More over this mastitis is treated with antibiotics which result in the presence if antibiotic residues in milk. IGF-1 are a naturally-occurring hormone found in the milk of both cows and humans. It affects cell growth and is responsible for the quick growth of infants in both species. But when cow's milk is consumed by human non-infants, it behaves as a cancer-accelerator.

**Tea and Coffee**

Drinking tea and coffee has become an integral part of today's life. But today these drinks are also bathed with one or other kind of toxins. Some recent studies suggest the presence of heavy metal contamination in most of the tested tea samples. Heavy metals like mercury, lead, aluminum, arsenic, cadmium etc are present significantly in tea samples. This metals which will get deposited in our body while drinking tea causes significant health issues. Tea leaves which are damaged or of inferior quality are being treated with various coloring agents to improve appearance and price. Commonly used coloring agents are Bismark Brown, Prussian Blue, Indigo, Plumbago etc which may cause some harmful effects in human body. Tea leaves are often sprayed with pesticides like Propargite which is a known carcinogen. Most tea leaves are not getting washed before it is packed since effect will be direct. Paper tea bags are often treated with Epichlorohydrin which is a potential carcinogen. It is also not uncommon to add charcoal, burnt umber, brown sugar, chicory, seed husk, acal seeds etc. in coffees to improve its flavor and colour. More over it is reported that coffee is one of the most

chemically treated crops in the world. When we are ingesting these pesticide residues, it may contribute to many health problems including cancer and miscarriages in pregnant women. Even decaffeination process also involves treatment of coffee with lots of chemicals, which are known to be carcinogenic<sup>4</sup>.

**Carbonated drinks**

Carbonated drinks and soft drinks in its diverse names, colour, flavor, taste etc will surely stimulate our taste buds. The soft drink industry is one of the largest in the world, with revenue from sales of carbonated soft drinks totaling billions of dollars annually<sup>5</sup>.(www.thermoscientific.com)But these are considered as greatest carriers of environmental toxins. Most of these types of drinks require additives and preservatives which consist of chemical substances that are harmful to our bodies. Artificial sweeteners are added with soft drinks like Aspartame which shows carcinogenic effect. Another chemical substance often associated with is Benzene which proved cancer causing in humans. Phosphoric acid present in all carbonated drinks is found associated with kidney decline and cell damage in mitochondrial level. Ph of those drinks are very acidic (3.2) which readily dissolves enamel. Another dangerous effect is in concern with canned juices, since these are usually coated with Bisphenol A (BPA), which causes a wide of health issues like hypertension, obesity, cancer, heart disease etc. Some drinks coming in aluminum cans causes accumulation of aluminum over a period of time, which may cause memory problems like Alzheimer's. Carbon dioxide which is used to make carbonated drinks is the same unwanted gas eject out of our body through lungs. Caffeine in carbonated drinks may get easily absorbed which causes birth defects, insomnia, irregular heartbeats, high blood pressure, breast lumps etc. Traces of heavy metals like Arsenic, Cadmium, Copper, Tin etc are also reported from many soft drinks and canned juices. Even though it is very difficult to completely avoid soft drinks from our diet, we have to limit our consumption to prevent unnecessary exposure to several harmful toxins.

**Some common Pesticide Residues in Soft drinks**

| Pesticides                | Harmful effect                         |
|---------------------------|--|
| Lindane                   | Birth defects, cancer                  |
| DDT and metabolites       | Effects on reproduction, breast cancer |
| Chlorpyrifos              | Immunological changes                  |
| Malathion and metabolites | Muscle weakness, paralysis             |

**Some common Additives in soft drinks**

| Additive        | Toxic effect  |
|-----------------|---|
| Aspartame       | Migraines, Seizures, Vision loss, Parkinson's Disease, Multiple Sclerosis |
| Acesulfame -K   | Carcinogenic  |
| Food colorings. | Causes thyroid tumors in experimental animals                             |
| Caffeine        | Birth defects, breast lumps   |
| Benzene         | Carcinogenic  |

**Water**

Drinking is the basic necessity of all living beings. In fact, drinking plain water is essential for health and it is said to remove all the impurities from our body. But now days there arise a main question, "How safe is our drinking water?" With about more than 4% of water resource in the world, India would have been a water adequate nation, but in 2011 India turned into a water stressed nation according to experts.<sup>6</sup> Many types of pathogenic microorganisms, pesticides, heavy metals and even rocket fuel are also been reported to present in our daily drinks. Many steps have been taken and implemented for supply of safe drinking water; even then toxins are still present

with all its impact. Chlorination is a process adopted for purification of water but due to one or other reason chlorine level in our drinking water is alarmingly increasing from safe limits. This may cause several health issues in due time. Fluoride group of compounds added in water to prevent tooth decay, but due to mishandling fluorine levels in water is also crossing the limits. These in overdose may block iodine receptors of thyroid causing hypothyroidism. Dental and skeletal fluorosis may also occur in high levels of F1 in drinking water. Plastic water bottles are often made from petroleum distillates and some chemicals that leech into the water in the bottle, and can cause serious health issues.

**Common micro organism and its effect in drinking water**

| Micro organism      | Harmful effects  |
|---------------------|--|
| Salmonella Enterica | Fever, vomiting, weak immune system                      |
| Chaetomiumsp        | Phaeohyphomycosis  |
| E. Coli             | Vomiting, Abdominal pain, diarrhea                       |
| Cryptosporidium     | Diarrhea   |
| Giardia lamblia     | Vomiting, Abdominal pain, diarrhea, nausea, weight loss. |

**USDA Pesticide Data Program mesuggests the presence of 59 pesticide residues in drinking water.<sup>7</sup>**

Some of them are enlisted below.

| Pesticide     | Toxicity  |
|---------------|---|
| Atrazine      | Known carcinogen, Suspected Hormone disruptor     |
| Metalachlor   | Probable carcinogen, Suspected Hormone disruptor  |
| Simazine      | Reproductive toxin, Suspected Hormone disruptor   |
| Diuron        | Known carcinogen, developmental toxin             |
| Propiconazole | Reproductive toxin                                |
| Acetochlor    | Developmental toxin, suspected hormone disruptor. |
| Carbaryl      | Neuro toxic, Reproductive toxin                   |

Exposure to toxic elementals like Lead, Mercury, Arsenic etc through various sources of drinking water like ground, surface, tap water etc is not uncommon now, due to increased urbanization and industrialization. This may physiological effects on kidney, digestive system, circulatory system, nervous system etc. The jet - propulsion additive Perchlorate

is one of the contaminant recently found in drinking water. Perchlorate is also used in fireworks and explosives. In most cases water contamination by perchlorate is mainly due to improper disposal at rocket testing sites, military areas, chemical plants etc.

**Some common heavy metals and its effects in drinking water are tabulated below**

| Heavy metals | Harmful effect  |
|--------------|---|
| Lead         | Behavioral problems, High blood pressure, anemia, kidney damage, learning difficulties. |
| Mercury      | Blindness, digestive problems, lack of co ordination, mental retardation.               |
| Arsenic      | Nausea, diarrhea, vomiting, known human carcinogen, peripheral nervous system problems  |
| Cadmium      | Causes damage to liver, placenta, kidney, bones, brain etc.                             |

**Some simple methods to detect adulterants in our drinks**

| Food | Adulterant | Method of detection  |
|------|------------|--|
| Milk | Starch     | Take a small portion of the product in a test tube add water and boil. Cool to room temperature. Add 1-2 drops Iodine solution. Blue colour indicates the presence of starch |
|      | Urea       | Take a tea spoon of milk in a test tube, add half teaspoon if soya bean powder. Mix up the content   |

|        |                                      |  |
|--------|--------------------------------------|--|
|        |                                      | thoroughly by shaking the test tube. After 5 minutes dip a red litmus paper in it. Colour changes from red to blue indicates presence of urea  |
|        | Detergent                            | Take 5-10 ml of sample with equal amount of water. Lather indicates the presence of detergent.   |
| Tea    | Tea Colored leaves, Used teas        | Place tea on filter paper and add water with a dropper over the heap of leaves. Adulterated colored tea will leave streaks of colour on the filter paper   |
|        | Artificial dye                       | Deposit tea leaves on a moistened blotting paper. Artificial dyed tea leaves will impart colour to the moistened blotting paper immediately.   |
| Coffee | Powdered date seeds, Tamarind powder | Sprinkle a little coffee powder on a piece of blotting paper and spread a few drops of Potassium Hydroxide solution over this paper. If a brown colour emerges around the particles of coffee, adulteration is established               |
|        | Chicory                              | Sprinkle a little coffee powder on the surface of water in a glass tumbler. Particles of genuine coffee powder will float, but chicory particles will begin to sink within seconds. They will also leave a stain of colour in the water. |

### DISCUSSION

Our mainstream drinks like milk, tea, coffee, soft drinks, and even plain drinking water either bottled or tap water are now not far away from dangerous toxins. Introduction of adulterants, adding additives above prescribed level, unscientific processing, packing or bottling, over use of pesticides, improper handling methods etc may turn our favorite drinks as dangerous poisons. Local, National, International regulations and implementation of best practices have been taken to provide safe food and water supply to all the consumers. Even then potential risk of disruption of food by adulterants, additives, pathogens, pesticides etc cannot be wholly eliminated. This shows that those food frauds are always one step ahead of all the rules and regulations. In 2011, Food Safety and Standard Authority of India (FSSAI) did a survey study over 33 states of India, found that milk is adulterated with contaminated water, detergent, fat and even urea.<sup>8</sup> Recent reports suggest the presence of numerous chemicals and pathogens in drinking water. Source of these contamination are immense which include human animal fecal wastes, improper disposal of chemicals, use of fertilizers and pesticides in agriculture etc. Health risk through the intake of these chemically contaminated drinks include skin lesions, vascular and cardiac problems, cancer of bladder, lungs, skin etc, damage to the nervous system, suppression of immune system, birth defects and so on. The most identical way to protect our water is through consistent and constant monitoring of drinking water supply. Proper treatment and

handling of bottled water is also indispensable. Moreover food laws and regulations should have been made more amiable.

### CONCLUSION

Water is the essence of survival of life on earth. In order to ensure the continuity of life on earth it is responsible to make our water safe to consume in all its forms. An individual needs to consume at least 2 liters of water daily for survival. More over 75% of human body constitutes of water. So the impact of toxins through our drinking water is unimagable. There are a many number of places in the supply chain can contaminate our daily drinks like a sick cow, an over use of pesticide, improper handling, broken seals etc. But access to safe water is a human fundamental need and a basic right. Exposure to any form of toxins through our daily drinks may embarrass physical and social health of individual. So it is our collective responsibility to make and provide safe water supply.

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