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Save the Environmental Ethics of Ganga River by Stopping Toxic Elements

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Abstract: Ganga River is known as sacred river in India. It is one of the major sacred river of India. It is my concern that our holy rivers are getting polluted. One of these river is Ganga at Haridwar(Uttarakhand) is getting polluted due to heavy metals. It is believed that Bhagirathi River is the source of Ganga River. It originates from Gaumukh, which is located at the base of Gangotri Glaciers in Uttarakhand. Gaumukh is about 18 km. from Gangotri and regarded as the birth place of Ganga on earth. How the holy river became so polluted today is a symbol of reverence of devotees is my concern. This research paper is only an effort that how to make Ganga pollution free, so the Ganga water be worth drinking.

Keywords: Ganga River, Water Pollution, Toxic Elements, Health Risk

I. INTRODUCTION

In present-day, river pollution is a serious and emerging problem in the majority of developing countries[1]. Due to rapid industrialization, there has been an increase in the amount of effluent being disposed to natural water bodies. Industrial effluents and sewage entering the water bodies are one of the prime sources of environmental toxicity, which endangers aquatic biota and deteriorates water quality[2,3]. The principal sources of pollution of the Ganga river can be characterised as follows: (i) Domestic and industrial wastes. (ii) Solid garbage thrown directly into the river. (iii) Non-point sources of pollution from agricultural run-off containing residues of harmful pesticides and fertilisers. (iv) Animal carcasses and half-burned and unburned human corpses thrown into the river. (v) Defecation on the banks by the low-income people and (vi) Mass bathing and ritualistic practices [4]. The following elements are also polluting the Ganga river: Chromium(Cr-24), Manganese(Mn-25), Iron(Fe-26), Nickel(Ni-28), Copper(Cu-29), Zinc(Zn-30), Arsenic(As-33), Cadmium(Cd-48), Mercury(Hg-80), Lead(Pb-82) etc. Out of them Cr, Mn, Fe, Ni, Cu, Zn, Cd and Hg, belong to d-Block elements of the periodic table and As and Pb belong to p-Block elements of the periodic table. These elements are either transition metals or metals or metalloids.

These heavy metals are not readily degradable in nature and accumulate in the animal as well as human bodies to a very high toxic amount leading to undesirable effects beyond a certain limit. Heavy metals in riverine environment represent an abiding threat to human health. Exposure to heavy metals has been linked to developmental retardation, kidney damage, various cancers and even in instances of very high exposure[1]. It is my concern that why the water of such holy Ganga is not drinkable.

II. METHODS AND MATERIALS

Water samples were collected from varios ghats of Haridwar (i)Maharaj agrasen ghat, (ii) Hari ki paudi ghat, (iii)Ganga aarti sthal ghat, (iv)Krishna ghat. There are several methods to determine the water quality. The quality of water here is determined by making measurement or by taking samples of Ganga water and testing them. There are some basic water test like P^H, conductivity, TDS, Total hardness, odour, sediment and turbidity are also used.

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Name of parameter	Instrument used for determination	Method used	Method reference
pH	pH meter	-	APHA (1998)
Conductivity	Conductivity meter	-	Trivedi and Goel (1986)
TDS	TDS meter	Evaporation	Trivedi and Goel (1986)
Total hardness	Burette	Titration	Trivedi and Goel (1986)
Calcium	Burette	Titration	Trivedi and Goel (1986)
Magnesium	Burette	Difference	Trivedi and Goel (1986)
Sodium	Flame photometer	Calibration	APHA (1998)
Potassium	Flame photometer	Calibration	APHA (1998)
Chloride	Burette	Titration	APHA (1998)
Nitrate	Spectrophotometer	Phenol disul fonic acid	APHA (1998)
Fluoride	Spectrophotometer	SPADNS	APHA (1998)
Heavy Metals	Polargraph and atomic absorption spectrophotometer	Standard addition	Khandekar and Mishra (1984)

Fig.1: The methods of analysis of different parameters for water quality [5].

Parameters	USEPA	WHO	ISI	ICMR	CPCB
pH (mg/l)	6.5-8.5	6.5-8.5	6.5-8.5	6.5-9.2	6.5-8.5
Turbidity NTU	-	-	10	25	10
Conductivity (mg/l)	-	-	-	-	2000
Alkalinity (mg/l)	-	-	-	-	600
Total hardness (mg/l)	-	500	300	600	600
Iron *mg/l)	-	0.1	0.3	1.0	1.0
Chlorides (mg/l)	250	200	250	1000	1000
Nitrate (mg/l)	-	-	45	100	100
Sulfate (mg/l)	-	-	150	400	400
Residual (mg/l) free Chlorine	-	-	0.2	-	-
Calcium (mg/l)	-	75	75	200	200
Magnesium (mg/l)	-	50	30	-	100
Copper (mg/l)	1.3	1.0	0.05	1.5	1.5
Fluoride (mg/l)	4.0	1.5	0.6-1.2	1.5	1.5
Mercury (mg/l)	0.002	0.001	0.001	0.001	No relaxation
Cadmium (mg/l)	0.005	0.005	0.01	0.01	No relaxation
Selenium (mg/l)	0.05	0.01	-	-	No relaxation
Arsenic (mg/l)	0.05	0.05	0.05	0.05	No relaxation
Lead (mg/l)	-	0.05	0.10	0.05	No relaxation
Zinc (mg/l)	-	5.0	5.0	0.10	15.0
Chromium (mg/l)	0.1	-	0.05	-	No relaxation
E. coli (MPN/100 ml)	-	-	-	-	No relaxation

Fig.2: The acceptable/permissible limits of drinking water quality [5].

III. RESULTS AND DISCUSSION

Chromium is an essential elements for human but the excess of chromium can cause the Cancer. The Department of Health and Human Services(DHHS), the International Agency for Research on Cancer(IARC) and EPA have determined that chromium(VI) compounds are known human carcinogens. In workers, inhalation of chromium (VI) has been shown to cause lung cancer. Chromium (VI) also causes lung cancer in animals. An increase in stomach tumor was observed in humans and animals exposed to chromium (VI) in drinking water [6]. Iron plays a vital role in immune system function, treating anemia, boosting hemoglobin but the excess of iron is very harmful. Iron is an essential mineral, however like many other nutrients; it is harmful in high amount. Iron toxicity is either sudden or gradual. Many serious may be caused by accidental overdoses, taking high-dose supplements for a long time, or chronic iron

overload disorders. Poisoning can occur when people, usually children, on iron supplements[7]. Water stored in a Copper vessel, preferably overnight or at least for 4 hours, acquires a certain quality from the copper. Copper is essential for good health. However, exposure to higher does can be harmful. Long term exposure to copper dust can irritate your nose, mouth, and eyes and cause headaches, dizziness, nausea and diarrhea. If you drink water that contains higher than normal levels of copper, you may experience nausea, vomiting, stomach cramps or diarrhea [8].Zinc is an essential element needed by your body but if you take more than the recommended daily amount of supplements containing zinc, you may have higher levels of zinc exposure. Zinc can enter the body through the digestive tract when you eat food or drink water containing it. The most likely route of exposure near NPL waste sites is through drinking water containing a high amount of Zinc [9]. Arsenic is highly toxic in its inorganic form. Contaminated water used for drinking, food preparation and irrigation of food crops poses the greatest threat to public health from arsenic. Long term exposure to arsenic from drinking water and food can cause cancer and skin lesions. It has also been associated with cardiovascular disease and diabetes. In utero and early childhood exposure has been linked to negative impacts on cognitive development and increase deaths in young adults [10]. Cadmium and its compounds are highly toxic and exposure to this metal is known to cause cancer and targets the body's cardiovascular, renal, gastrointestinal, neurological, reproductive and respiratory systems. Chronic Cadmium exposure has been reported to be associated with chronic kidney disease and cancer. The leafy vegetables such as spinach and lettuce may have considerably higher Cd level. The toxic elements including Cd were higher in leafy vegetables than in root vegetables [11]. High levels of Mercury exposure can harm the brain, heart, kidneys, lungs and immune system of people of all ages. However, the U.S. Environmental Protection Agency (EPA) has determined that methylmercury is a possible human carcinogen. Mercury, a liquid metal also known as quicksilver, combines with carbon to make organic mercury compounds. Methylmercury is the most common one. Methylmercury is made primarily by microscopic organism in water and soil[12]. Lead is heavy metal and a strong poison. It can accumulate in the body if it enters the mouth or is inhaled. It can also enter through splits in the skin or through mucous membranes. It can damage all the body system, including the heart, bones, kidneys, teeth, intestines, reproductive organs, nervous system and immune system. Young children, especially before the age of 6 years, are particularly sensitive to lead poisoning, it can irreversibly damage mental and physically development[13]. Unwanted activities such as location of toilets within submergence area of the river beach during rainy season, disposal of untreated liquid waste, disposal of garbage etc., affect the quality of river water[14].There is a one side to how dangerous these elements for life and the another side is religious beliefs. Therefore purification of Ganga River is more necessary.

IV. CONCLUSION

I came to this conclusion after the whole study, is that, First of all, Prevent poisonous elements from entering in the Ganga River. It has been found in the study that the quantity of these elements in the Ganga water samples is more than accepted quantity. The sources of these elements must first be ascertained, where these elements are coming from, get information about and stop them. The sources of these toxic elements should first be prevented from going into to the Ganga river like; Metal industries, process industries, smoking, sewage sludge, combustion of fossil fuels, industrial wastes, refining of iron ores, volcanic emission, windblown dust, leather processing industries, forest fires, mining operation, metallurgic operation, fungicides, pesticides, nuclear fission plant, batteries plant, pulp and paper industries, hydroelectric industries, automobile emission, paint industries etc. Either these activities are away from Ganga River or do not allow the dirt coming out of them into the Ganga River and some such measures should be taken that their wastes do not get into the Ganga River. If these precautions are taken then no more cleaning will be required later, means Precaution is better than cure. If this Water Pollution is not corrected, then the lives of the people of the places where Ganga water is used in drinking are in Health Risk.

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