

# Food, Environment and Human Diseases

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I have decided not to go into the technical details and will try to give you an overview. Today's topic is very broad and I'll like to start with environment and gradually enter into the other two aspects.

You must be aware of the devastating fire in the Amazon jungle where lakhs of hectares are getting destroyed. This Amazon is considered to be the lungs of the earth and hence this incident probably has more direct links with human activities rather than natural reasons. Human activities have caused a havoc around us and this huge change in the environment is so intense that scientists have coined a new term ANTHROPOCENE. 'Anthropos' means human and 'Anthropocene' is the term designated to mean the massive changes in our environment caused by human beings. In this discussion, I'll try to throw some light on these anthropogenic changes and the human diseases resulting out of these changes.

On the top of the geological time scale is Holocene where we are existing currently. From the history of evolution, it can be seen that we, the human beings, have come to this earth around 2 lakh years ago. Jurassic age where dinosaurs existed is nearly 5-6 crores of years ago. Other animals and human beings came into existence only after the dinosaurs had become extinct. This massive change in environment that is continuing for the past 100-200 years is now being termed as 'Anthropocene'.

*Nature*, the most famous scientific journal in the world, has acknowledged that

human epoch has arrived. Human activities are now controlling the entire environment like animals, plants, rocks, air, water—almost everything. I'm trying to give some idea about the types of diseases developing as a result of these changes. Based on the archaeological evidence, it can be said that human beings from eastern Africa had gradually spread all over the world about 1 lakh years ago. Now all the families in this world have different species. For example, cat family includes cat, lion, tiger, and under the dog family come wolf, hyena and dog. There are many more examples.

Homo family (Hominidae) also had at least 50 varieties like Homo Neanderthal, Homo denisovan etc. Now only Homo sapiens, that is, the human beings, exist and all others are extinct. There is evidence that we, the Homo sapiens are mainly responsible for the extinction of other Homo species. Homo sapiens is the only species found everywhere on this earth. Possibly there is no other life on earth which can survive under any condition. We, the human beings, with a population of nearly 900 crores have occupied almost all the physical space on earth; this is obviously not in agreement with Darwin's idea of natural selection.

## Impact

Without going into the technical issues, I'll now discuss the impact of Anthropocene. Statistics show that there have been exponential rise in the construction of large dams, water

consumption and use of fertilizers. These have caused a large impact.

Like the Amazon forest, I'll tell you another story of devastation. Aral sea of central Asia, considered to be the third largest lake in the world, used to get water from different rivers and remained water-filled all the time. This lake covering a few thousand square kilometres was used for trading, fish cultivation and as a means of transport. Due to various reasons, dams were constructed around it and the supply of water into the Aral sea gradually decreased. The satellite pictures of Aral sea taken from 1977 to 2013 show the gradual depletion of water. The 2013 picture shows that the lake has almost dried up at the cost of agriculture. The photograph taken in 2015 shows that the lake has now turned into a *desert* which is now used as a luxury drive by tourists. Large ships are seen lying idle as these are of no use now. This is a horrible destruction. There are several such examples which are collectively known as Anthropocene.

From the history of evolution, it can be found that there have been five cases of mass extinction. Each extinction continued for a few thousand years during which a large majority of plants and animals on earth became extinct. Then again, there had been generation of lives, development of biodiversity and again extinction occurred. The fifth or the last extinction took place 5-6 crores of years ago when the dinosaurs became extinct. No mass extinction history after that is known to us. The question is about the sixth mass extinction and from the available evidence, it appears that possibly we have already entered into this phase. The journal, *Science Advances* has published a research article on this topic.

In evolution, there is a certain rate of extinction. There is 10–100fold increase in

the rate of extinction of plants and animals; this figure matches with the sign and symptoms of mass extinction. It is estimated that about 25% of the mammals will be extinct in the next three generations (nearly 200 years). The way things are going on, there is possibility that human beings may also be included in the extinction list. This is, of course a prediction and there is no need to consider it as an absolute truth.

In order to get some idea as to how the extinction affects us, let us take up bees as example. Bees are responsible for pollination of 50% of the vegetables in the whole world. If these bees become extinct, there will be severe food crisis. Hence attempts are now being made for artificial pollination.

### Diseases

I'll next try to explain with examples how Anthropocene is related to diseases. One is smallpox which has now been eradicated using vaccination etc. But this smallpox has a history. People from western Europe moved to set up colonies in north and south America where they found the Red Indians. At present there is almost no Red Indians in north and south America; it is occupied by the Americans. One of the major reasons behind this is said to be smallpox; 90% of the Red Indians died out of this single disease.

Smallpox is a variant of cowpox and this smallpox has come from cow. For long, there has been an intimate relation of human beings with cow. So the infections found among cows are also found in humans. But since humans develop immunities most of them are thereby protected. There were cows in western Europe, but in America, there was no cow initially. Human beings, as said earlier, were present everywhere. The Spaniards brought the smallpox-infected cows by ship to America. Blankets rubbed

against the infected cows were thus distributed among the Red Indians and smallpox being a highly contagious disease, lakhs of them died in this process. This had been elaborately described by Jared Diamond in his book *Guns, Germs and Steel*. This is the reason behind the extinction of American Indians from America. We, the Indians, however were safe since we had cow from the beginning. So majority of us were protected from cowpox and this mishap could not take place in India but it did happen in Australia and America.

Seventy-five per cent of the infectious diseases known by various names like SARS, Flu, Dengue, Ebola etc. are transmitted from animals to humans. Cowpox is also one such disease. These diseases have inevitably been transmitted to humans in course of their passing through different ecological niche. Since we were not having these diseases initially, we don't have protection against them and hence get affected. Swine flu is one such disease.

Now, what is the depiction of Anthropocene and how does it reach us? Let me explain this with examples. We frequently complain about our country as being very dirty and the storehouse of a number of bad diseases like cholera, malaria, kala-azar etc. There was a time when villages after villages were desolated because of cholera epidemic. Interestingly, one simple way to know whether a particular disease was there in our country or not is to go through ancient medical books like *Charak Samhitā* and *Sushruta Samhitā*. These books have detailed description of all the diseases, their symptoms and clinical presentation. There are descriptions of the diagnosis of cancer (*karkat*), diabetes (*madhu meha*), goiter (*galaganda*) and various types of fever. But there is no mention of malaria in which there is high

fever accompanied by terrible shivering and also enlargement of liver and spleen. In medical books of ancient India, there is no mention of malaria. It is quite impossible that they have missed it. So, this is a definite proof that malaria was not there in ancient India.

In case of cholera, there is severe diarrhoea accompanied by vomiting and dehydration and an adult affected by cholera if untreated could die within 24 hours. If cholera were there in India in ancient days, it would have been definitely mentioned in *Charak Samhitā*. Like many others, I too had this question in my mind and from a book on medicine, I got the information that the hub of cholera is Kolkata from where it has spread to the whole world. Dr Sambhunath Dey was doing research on cholera in the Calcutta Medical College and it was he, who discovered the cholera exotoxin. He was nominated twice for the Nobel Prize for this discovery though was not awarded for unknown reasons.

We, the Indians, have a tendency to construct temples and worship the deity on the outbreak of any virulent disease. Cholera, as we know, is known as *olāothā* in Bengali. Dr Dey while visiting various such temples, found two types of deities, namely, *Olābibi* and *Olādevi*. The first one was dressed in salwar-kameez which is a conventional Muslim clothing. The second one was dressed up in saree like any Hindu lady. Dr Dey could trace the temple of *Olābibi* established in 1850 at Khidirpur.

The deity dressed up in salwar-kameez is a definite proof that the cholera came here only after the Muslims had entered India. Curiously enough, all these temples were found to be located near the port. This information led Dr Dey to conclude that cholera, whether endemic or epidemic, had come through the dock. In other words, this

disease must have come from outside via ship to the dock.

### **Kala-azar**

Next, we will try to find out the history of kala-azar. There is no known name for this disease in Sanskrit or Prākṛit. But the Britishers named this as 'Assam fever' since this was first found among the workers when deforestation of Dooars started for tea plantation. That means the disease was there in the sand flies of that area. Kala-azar was first reported in 1880. This wild destruction and interaction with the wild led us to be infected with the disease as we had no immunity against kala-azar since it was not present earlier. The DNA of kala-azar had been found in the mummies of Egypt. This shows that most probably the disease was there in the Mediterranean countries such as Italy, Greece, Egypt, Morocco etc. But there is no such history in our country. Hence there is sufficient reason to believe that kala-azar has not originated in India.

The same is the case with the history of malaria. There is no Prākṛit name for malaria; it is an Italian word, *mal air*, meaning bad or polluted air. It was not known at that time that the disease is caused by mosquito bite; instead it was thought that bad air caused it. Alexander the Great possibly died of malaria. Moreover, the death of five popes affected by malaria is documented. The entire group of Huns including their leader Attila, who had come to conquer the Roman empire, died of malaria in 7 days' fever. Thus there is substantial evidence that malaria originated in Europe and not in India.

### **Non-infectious diseases**

So far we were discussing the infectious diseases, but at this moment we are more concerned about the non-infectious

diseases. Other than the natural death, one major cause of death in India, is the non-infectious disease. The renowned medical journal, *The Lancet* has recently published change in the pattern of disease in India over the years. It shows that Indians in 1990 used to die primarily of infectious diseases. The main victims were the infants, the newborn babies and the pregnant women. Life expectancy was very low due to high maternal, infant and child mortality rate. Now those types of mortalities have decreased considerably leading to increased life expectancy. According to *The Lancet* journal, the study carried out in 2016 shows the dominance of non-infectious diseases. Sixty to seventy per cent deaths in India are due to heart attack or brain stroke. There are also cases of diabetes and lung problems, but the heart disease plays the vital role. The prevalence of heart disease is evident from the advertisements of private hospitals which claim that they arrange E.M.I. for heart attack treatments. It shows how obvious this disease is today and at the same time it is a *big business*.

In India, there has been a huge transition in all spheres of life during the period 1990-2016. This is a kind of anthropogenic impact. None of the diseases like heart disease, hypertension, diabetes, hyperlipidemia (too much of cholesterol in the blood), kidney problem etc. is infectious. These all are problems of our system. One major reason for this is that all these chronic diseases are food-borne. Food is the main link of our interaction with the environment. We will try to link the transition of the food with the transition of the disease pattern.

One main reason behind the transition of the food is the agricultural revolution. Mono-cropping is killing all the biodiversity. In a fertile land, there should be explosion in biodiversity. Instead, only a single crop is

grown in an area covering thousands of square kilometres. This agricultural revolution and mono-cropping have caused a havoc. Before discussing it, we may have a look at the food materials we are tempted to consume. We all know that leafy vegetables, fruits etc. are good for our health and cakes, chips, pizza etc. are not good for our health. We also know that consumption of oily and spicy food and excess of sugar are harmful to our system. However health conscious one may be, it is very difficult to resist oneself from consuming the fried and the sweet dishes even if there is option for taking fruits and vegetables. In Bengal, it is a common practice to treat our guests with two types of items, fried things and sweets. Even a child is pampered with either chocolate or chips. We have maximum craving for sugar and salt and, fried items, you know, are usually salted.

### Why this craving?

In order to find out the reason behind this craving for salt and sugar, we are to go back to evolution. We have learnt that human beings got scattered from Africa to the rest of the world. The journey was entirely by land and not by sea. Being restricted to land, there was deficiency of salt and hence our kidneys have enormous capacity to conserve salt.

Again, human beings have started cultivation since last 10,000 years. Before that, there was no cultivation for nearly 2,90,000 years; the only natural sweetener was honey. Hence the body, the mind, the brain etc. evolved in such a way that the human being always wanted sugar. Indiscriminate intake of cane sugar has started just about 100 years ago. We need sugar as it gives us energy, but whenever we consume free sugar, we feel like having it more. For example, after eating one

rasogolla, we like to have more. The specific neurons in the hypothalamus of the brain stimulate us to do so.

One can easily correlate hypertension to excess intake of salt and diabetes to excess sugar intake. As per the WHO recommendation, daily intake should be one to two gram, but normally we consume eight to ten times more than is required by the body. Our system has no clue as to how to negotiate with this excess salt and eventually it manifests in all kinds of diseases.

In order to explain the anthropogenic activity, I'll give a few examples—the first one being potato. It is well known that the Portuguese had brought potato to India from America (mostly from middle and south America). Though potato was not our indigenous product, several thousand varieties of potatoes were available. At present, we are getting mainly two varieties in the market. Thus there is loss of biodiversity and, at the same time, loss of nutrient diversity. Another example of anthropogenic activity is the mustard plant. This mother plant has been modified to cauliflower, cabbage, kohlrabi, broccoli etc. Thus we have changed the entire plant and this change is not through any natural selection, rather this is cultural selection.

Some apparently disconnected products like potato, green chilli, tomato, pineapple, guava, papaya etc. are not indigenous. These had been brought to India by the Portuguese only a few hundred years ago. In the history of Bengal, there is mention of a large number of sweets but rasogolla is not mentioned. In Lord Sri Krishna's childhood stories also we do not find the name rasogolla or any other sweet made from *chhena* (curdled milk). Even now, *chhena*-made sweets are not quite common in north India. So *chhena* was not there in our

culture. The main reason behind this was that milk was considered to be sacred and our culture did not allow milk to be curdled. Portuguese people have a favourite item called ‘cottage cheese’ which is a modified form of *chhena*. This has been introduced in Bengal by the Portuguese. After that there were several trials with this substance and rasogolla is one of the outcomes of it. Rasogolla has been discovered in Kolkata which is nearly 300 years old and the Bengalis are here in Bengal for the last 10-15 thousand years. The change in food habit has led to increased sugar consumption.

Another example of anthropogenic change is banana. The wild banana used to contain many seeds through which banana plants could propagate. But now, the bananas are all seedless and hence the plants cannot grow naturally. In order to grow the plants, the roots are to be implanted. In other words, we have *destroyed the natural mode of propagation of banana*. The sustenance or life of banana plant is now absolutely dependent on human activity. If we do not implant the roots, banana plant will soon get extinct. The grapes now-a-days are all seedless. Seedless watermelons have also started coming in the market. It seems that we have started disliking the seeds in fruits; but the seeds are invaluable to the plants for their propagation. This way we have changed animal and plant lives; or in other words, we have changed the whole world.

We have changed carrot also. The wild variety showed a yellowish colour after peeling and was quite narrow and hard. The crunchy, sweet-tasting, orange coloured carrot has been invented only 100-200 years ago. Similarly, the wild corn looked very much like a small bean full of tiny seeds inside. With gradual changes, it has taken the present form. Red Indians used corn for

5000-10000 years in America. This wild variety of corn was at the centre of the Mayan culture. The corn that we find today is only a few hundred years old. These days, the present type of corn is the main source of sugar in America. In the Western world cane cultivation is not possible as it requires tropical climate. So they have changed the corn in such a way that these are extremely sweet and are very juicy. Corn syrups are prepared from these corns. These all are examples of anthropogenic changes.

Rice is the most favourite and staple food for the Bengalis. Rice is obtained from paddy plant which is primarily a grass. Since there are several varieties of grass, paddy is also expected to be of various types. As per available report, there were 60,000 varieties of rice in the Indian subcontinent and there were 6000 varieties in Assam, Bangladesh and West Bengal. Now only 60 varieties are available and in West Bengal, 50% of the available species is the *swarna dhan*.

Previously, we used to consume lots of rice—twice or thrice a day—but diabetes was not so common. There has been prevalence of diabetes in last 20-30 years. One main reason is the introduction of milled rice that started capturing the market in large quantities since the 80’s. At that time there were several cases of night blindness and it reached such a height that vitamin A supplements were distributed among school children and villagers as a part of the government project. Let us try to correlate these two. On removing carefully the husk of a paddy seed, one can see a loosely attached brown coating (it is not the brown rice sold now-a-days in the market). At the connecting end of the seed, there is an opening containing the embryo which contains a very important and very good quality oil (polyunsaturated fatty acid). This is rice bran oil sold in the market. So in

milled rice, we are removing the good fat as well as the brown coating which contains vitamin B-complex and also good quality soluble fibres that help us to reduce cholesterol. The leftover white part is essentially starch, a polymer of glucose. In our body, this starch breaks into glucose and hence after eating milled rice, a thick glucose solution is formed in the stomach.

The history of evolution tells us that we have never seen so much of sugar. Now because of milled rice, we are consuming pure glucose but our system is not adapted to handle so much sugar load. This is probably the reason that diabetes is now quite common among the thin people also in India. Overseas diabetic people are normally obese. From this observation we can assume that in case of Indians, the pancreas

has not evolved in a way that can handle so much of insulin in terms of beta-cells or insulin; it was not required either.

The rice, obtained by the traditional method using 'dhenki', contains various other things apart from sugar. This rice is very tough because of the presence of fibre etc. and hence one cannot consume it in large quantity. But the milled rice can be consumed in large quantities if one so desires. Even after eating so much of sugar in the form of rice, we take more sugar as dessert. It is very difficult to resist this temptation as we are biologically tuned to crave for sugar.

In conclusion, I think that existence of the human beings will be a big question if the present rate of extinction continues for so many reasons stated above. ■

\* This article is based on the lecture Dr Partha Chakrabarti, Principal Scientist, CSIR, IICB, delivered at the Ramakrishna Mission Institute of Culture on 27 August, 2019. The lecture was organized by the Vivekananda Science Circle of the Institute.

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