

Today's quote

“ If we knew what it was we were doing, it would not be called research, would it?”

— Albert Einstein

The Eastern Today

Voice of the Periphery

Demonetisation and its discontents

Demonetisation seems to have made friends of foes, and foes of friends in the political firmament. If Bihar Chief Minister Nitish Kumar differed from his allies while heaping praise on Prime Minister Narendra Modi for embarking on demonetisation, Shiv Sena chief Uddhav Thackeray was critical of his party's senior partner in government for "bringing tears in the eyes of the people" who had voted it to power. In West Bengal, Mamata Banerjee and her Trinamool Congress showed a readiness to join hands with arch-rival Left Front to fight the demonetisation drive. While the withdrawal of high-denomination notes can hardly be expected to trigger a political realignment anywhere, political parties seem to be rising above mundane political calculations while reacting to the demonetisation. A cynical view might be that Mr. Kumar is keeping his political options open by building bridges with the BJP, and keeping his politically junior but numerically stronger ally, the Rashtriya Janata Dal, in check. Arguably, he could be trying to recover his assiduously cultivated anti-corruption image, which took a beating following his electoral pact with Lalu Prasad of the RJD. But a simpler explanation cannot be ruled out: that Mr. Kumar saw some merit in the demonetisation drive, even as he recognised the difficulties in implementation. Similarly, the Sena cannot afford to break with the BJP at this juncture. Quite likely, Mr. Thackeray was prompted not by the possibilities of political realignment (of which there is practically none), but by the realities on the ground, in distancing himself and his party from the demonetisation decision. In West Bengal, an alliance between the Trinamool and the Left Front is inconceivable, but that did not stop Ms. Banerjee from reaching out to the CPI(M) in her fight.

If political parties have thus reacted unpredictably, it could just be on account of the mixed results seen on the ground. None can afford to be seen as directly opposing measures to clean up black money and weed out counterfeiters. However, stories of cashless banks and shuttered ATMs seem to have given some life to opposition parties looking for an issue to pin the government down on. Reports of the BJP having made huge cash deposits in banks in West Bengal, and land deals in Bihar days before the demonetisation, have provided some ammunition to opposition parties that were initially reluctant to criticise the move for fear of being labelled supporters of black money hoarders and counterfeiters. Demonetisation might not have changed political equations, but it has shaken up the political scene. What they cannot oppose in principle, parties have opposed in practice.

Cuba after Fidel

Poultry is one of the fastest growing segments of the agricultural sector in India today. While the production of agricultural crops has been rising at a rate of 1.5 to 2 percent per annum, that of eggs and broilers has been rising at a rate of 8 to 10 percent per annum. As a result, India is now the world's fifth largest egg producer and the eighteenth largest producer of broilers.

Broiler is a tender meat of young chicken of male or female that grows from a hatch weight of 40 grams to a weight over approximately around 1.5 kg to 2 kg in about six weeks' time period only. Broilers today has emerged as the one of the fastest growing poultry segment with the increased acceptance of broiler chicken meat in cities, towns, and villages, the demand and consumption of broiler chicken is increasing day by day in a fast pace. In India, during the last few years, poultry farming has taken a giant leap from a backyard venture into a fast growing commercial sector.

Broilers breeds reared for meat purpose in India are:

- Commercial Broiler breeds
- Dual purpose Broiler breeds

Commercial Broiler breeds in India are Caribro, Babcock, Krishibro, Colour broiler, Hy-Bro, Vencobb. Dual purpose Broiler breeds are Kuroiler Dual, Rhode Island, Red Vanaraja, and Grama Priya.

Antibiotics have been used in animal feed for about 50 years ever since the discovery not only as an anti-microbial agent, but also as a growth-promoting agent and improvement in performance. Tetracyclines, penicillin, streptomycin and bacitracin soon began to be common additives in feed for livestock and poultry. Currently, the following antibiotics are used in livestock and poultry feed: chlortetracycline, procaine penicillin, oxytetracycline, tylosin, bacitracin, neomycin sulfate, streptomycin, erythromycin, lincomycin, o l e a n d o m y c i n , virginamycin, and bambamycins. In addition

to these antibiotics, which are of microbial origin, there are other chemically synthesized antimicrobial agents that are also sometimes used in animal feeds. These include three major classes of compounds: arsenical, nitro-furan, and sulfa compounds. Arsenical compounds include arsanilic acid, 3-nitro-4-hydroxy phenylarsonic acid, and sodium arsanilate; nitro-furan compounds include furazolidone and nitro-furazone, sulfamethazine, sulfathiazole, and sulfadoxaline.

Other chemicals are also used as antiprotozoal agents to prevent coccidiosis and histomoniasis in chickens. Antibiotics are used regularly in animal feed at a rate of 2 to 50 grams per ton for improved performance in the treatment of various reasons including a more efficient conversion of feed to animal products, an increased growth rate and a lower morbidity/mortality rate in general. The levels of antibiotics are often increased to 50-200 grams/ton or more when specific diseases are being targeted as when the spread of a particular disease is rampant. The levels are also increased in times of stress. This increased amount is often decreased when the threat of a disease is gone.

The benefits of antibiotics in animal feed include increasing efficiency and growth rate, treating clinically sick animals and preventing or reducing the incidence of infectious disease. By far the major use of antibiotics among these, however, is increased efficiency, i.e. a more efficient conversion of feed to animal products, and an improved growth rate. In chicken feed, for example, tetracycline and penicillin show substantial improvement in egg production, feed efficiency and hatchability, but no significant effect on mortality. Chlorotetracycline, oxytetracycline and penicillin also show an improved growth rate, but little effect on mortality. Antibiotics in animal feed, in general, are used regularly for increased

efficiency and growth rate than to combat specific diseases.

After animals have been fed antibiotics over a period of time, they retain the strains of bacteria which are resistant to antibiotics. These bacteria proliferate in the animal. Through interaction, the resistant bacteria are transmitted to the other animals, thus forming a colonization

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of antibiotic resistant bacteria. The bacteria flourish in the intestinal flora of the animal, as well as, in the muscle. As a result, the feces of the animal often contain the resistant bacteria. Transfer of the bacteria from animal to human is possible through many practices. The primary exposure of humans to resistant bacteria occurs in farms and slaughterhouses. Humans clean the feces which contain the bacteria, of the animals on farms. During the cleaning process, humans may get bacteria on their body and hands. If the body or hands are not properly cleaned, the bacteria could be ingested by the person. Likewise, in slaughterhouses, during slaughter, the intestine is severed. Resistant bacteria are exposed to slaughterhouse workers, which could get the bacteria on their bodies and hands. Transmission occurs when the bacteria is ingested. Along with the previous sources of contamination, humans can get infected by eating meat from animals with resistant bacteria. Even though cooking reduces the survival of the bacteria, some may still survive and infect the human. For example, in 1983, 18 people in four mid-western states in America developed multi-drug resistant Salmonella food poisoning after eating beef from cows fed antibiotics (1). After initial transmission and infection to humans, the transmission to other humans has a couple paths. Transmission can take place through the many mediums (aerosol, physical contact, and bodily fluids) of human contact in the community. An infected individual may also be admitted to a hospital for treatment. Treatment may not work in drug resistant bacteria, therefore, identifying a drug resistant infection. Bacteria are transmitted to other patients via the hospital environment or health care workers hands.

After transmission, the bacteria will colonize in several of the patients. Colonization in other patients with other resistant bacteria can produce bacteria with multi-drug resistance. Once the patients recover, they are discharged into the community. These patients could potentially infect several community members. Multiple infections could potentially produce a supergerm which is resistant to many drugs due to resistance sharing between bacteria.

In most cases, the drug resistance genes of bacteria are carried on plasmids (specifically, the R or resistance plasmid), which replicate separately from the cell's circular DNA. These plasmids can be passed from cell to cell, allowing for a drug resistance to be passed to a large group of bacteria and to different types of bacteria. These resistance genes are also carried on transposons, which allow for these genes to move from one strand of genetic material to another. Because of this, a cell can receive multiple plasmids with resistance genes and then integrate all of the resistances onto one plasmid. Some R plasmids have as many as 8 drug resistances on them.

The development of a drug resistance is not orchestrated specifically to counteract a drug. Rather, drug resistances arise because of spontaneous genetic mutations within a gene sequence. By chance, these mutations happen to produce some change in the cell that allows for drug resistance. This mutated bacteria then has a selective advantage over other non-resistant bacteria. The addition of antibiotics to the environment (the host organism) then selects for the resistant bacteria by killing off all of the non-resistant bacteria. This allows for the resistant cells to grow and divide, creating a large

population of resistant bacteria. The larger population then increases the likelihood that plasmid transfer will occur to other, non-resistant bacteria of various strains. This attained resistance has little effects on the host organism until plasmid/resistance transfer to a particularly virulent bacteria occurs. Then, the host is susceptible to infection from this organism without the benefit of treatment with the antibiotic that the bacteria is now resistant to.

There are several general methods through which a cell can become resistance to an antibiotic. These mechanisms are:

1. Decreased cell permeability to the drug - the cell can change its membrane structure so that the drug cannot enter the cell and perform its function

2. Alter the drug binding/recognition site - by changing the structure of the membrane surface, the site which previously allowed the drug to bind to the cell can no longer do so

3. Chemical modification of the antibiotic - by cleaving a portion of the molecule or adding a substituent group, the properties of the active molecule in the antibiotic can be altered such that it is rendered harmless to the cell

4. Active transport - the transport of drug molecules out of the cell. In many cases, this is done via a drug/proton antiport system. With this mechanism, H⁺ ions are pumped into the cell as drug molecules are pumped out.

5. Enzyme or pathway alteration - the cell can change the pathway or enzyme used to carry out a cell process occurs. By doing this, the cell can bypass the enzyme that is affected and cause the drugs effects to have no bearing on the functioning of the cell.

There are three main ways in which genetic material (in these cases, drug resistance genes) can be exchanged between bacteria. They are as follows:

1. Conjugation - a direct, cell-to-cell, contact transmission method. The plasmid containing cell generates a small tubule that con-

nects the two cells (the sex pilus). This tube then allows for the passage of DNA strands between the two cells

2. Transformation - the absorption of "naked", free-floating DNA by a cell. Upon the death of a bacterial cell the cell components degrade, leaving the DNA and cell materials to disperse in the environment. If a cell with antibiotic resistance dies and breaks down, the resistance gene may be released into the environment and absorbed by another bacterial cell.

3. Transduction - the transportation of genetic material by a bacteriophage. When a bacteriophage infects and replicates in a cell, some new phages may be filled with cellular genetic material, rather than viral genetic material. In some cases, this cellular material is a resistance gene. When the phage containing the resistance gene infects another cell, the infected cell then gains the bacterial resistance.

To stop using antibiotics in poultry will cause economic fallout also. The economic impact is difficult to measure, partly because extensive searching could not turn up exact figures for employees and profits specifically in feed additives. However, it is safe to say that in the U.S. alone, stopping the practice of adding antibiotics would result in a loss of millions of dollars in profits and thousands of lost jobs. This is true in case of India or any other countries. It is also worth noting that sales of antibiotics are a very profitable sector for companies that engage in their productions.

Thus in India poultry farms have been using antibiotics unabatedly and its affects are now felt among the meat consuming population of the country. Another important aspect of this problem is the lack of any regulatory authority to put a curb on selling certain antibiotics meant for the poultry. Till then the scenario of use of antibiotics in poultry seems to be a matter of concern in our country. (Under the aegis of CSE Media Fellowships)