NEWS IN BRIEF

MUZAFFARPUR MYSTERY

In medicine, mysteries lurk, waiting to be solved. Why were hundreds of children dying every year of unexplained encephalopathy every year in Muzafarpur? The question has haunted physicians for two decades. Now the bits of evidence collected over years have been pieced together to solve the puzzle. A large case-control study published in the *Lancet Global Health* in January 2017 examined various possible etiologies to explain the recurrent epidemics, and confirmed that the real culprit is the litchi fruit.

The epidemics happen every year between April and July, affect hundreds of children with 40-60% mortality. Children who had been perfectly normal till the previous day would usually present in early morning with encephalopathy and seizures. Hypoglycemia had been observed in many. Previous studies had ruled out Japnanese B encephalitis. It was noticed that the cases occurred in areas where litchi cultivation was rampant, and occurred mainly in the litchi season. In 2014, Dr Jacob John from Vellore and Mukul Das from CSIR hypothesized that hypoglycin A and methylene cyclopropyl glycine (MCPG) contained in litchi induces hypoglycemia and also interferes with beta oxidation of fats in the mitochondria resulting in encephalopathy and seizures in malnourished and predisposed children.

In the present study, blood, urine and CSF samples of children with unexplained acute encephalopathy in the epidemic season were collected. Litchis from the particular area were also collected. Biological samples were tested for various infectious etiologies and litchis were tested for pesticides and MCPG. Urine organic acids and plasma acyl carnitines were also tested to look for interference with beta-oxidation of fats. There was no evidence of infectious etiology to explain the epidemics. However, they found abnormal urine organic acids in the form of elevated ethylmalonic, glutaric and adipic acids, which suggest a block in fatty acid oxidation. Unripe litchis were found to have higher concentrations of hypoglycin A and MCPG.

The final understanding is that during the litchi season, children gorge on the fruit and go to bed without an adequate meal. Both gluconeogenesis and fatty acid oxidation is affected by the hypoglycin and MCPG. In children who are already malnourished, neither the glycogen stores nor the fats can be metabolized leading to acute encephalopathy. Children in Muzaffarpur are now being advised to take an evening meal and avoid ingesting unripe litchi fruit. A beautiful piece of investigative medicine indeed!
(*The Lancet Global Health 31 January 2017*)

US FDA BANS ANTIBIOTICS IN LIVESTOCK

The US FDA has banned the use of 'medically important' antibiotic use in livestock used for food. It has been a long and arduous road to reach this point. In the 1940's, it was discovered that mixing sub-therapeutic doses of antibiotics in the feed of poultry and cattle resulted in increased weight. In the 1950's, FDA approved use of penicillin and tetracyclines as feed additives for livestock as a cost-effective strategy of increasing food production. Thereafter, the Swan report from UK warned of increasing antibiotic resistance in humans due to their overuse in livestock. Efforts by the FDA to ban use of these antibiotics in livestock were vigorously resisted and finally thwarted by the farmer and pharmaceutical lobbies.

For 34 years, the world slept as antibiotic resistance mounted. Around 70% of all medically important antibiotics were being used in the farming sector. In 2011, a group of consumer protection activists sued the FDA for not taking any action in the face of glaring evidence of the evils of antibiotics in the livestock industry. The FDA finally woke up, and in 2013, recommended voluntary reductions in antibiotic use. In 2016, the UN held an unprecedented meeting declaring antibiotic use in livestock feed as a global health emergency. In the wake of the ban by the FDA, now in the US, livestock can receive antibiotics only after a prescription from a vet.
(*Nature News January 2017*)

THE 'PAPERFUGE – FRUGAL MEDICAL TECHNOLOGY

Manu Prakash, an Assistant Professor of Bioengineering in Stanford, went to a rural clinic in Uganda, and noticed that an expensive centrifuge was being used as a doorstopper because there was no electricity to use it. He began musing on ways to develop a low cost centrifuge for the laboratory there with his postdoctoral research fellow. They decided to use a common toy called a whirligig. This is basically a wheel that is made to spin by both hands pulling on a thread looped through the centre. He set up a high speed camera, and was astonished to find that it was spinning at 10000–15000 rpm. Three undergraduate students from MIT were roped in to develop a mathematical model.

The team created a computer simulation to capture design variables like disc size, string elasticity and pulling force. They then created a prototype that could spin at 125,000 rpm. They put in a capillary of blood into it, and were able to separate the blood into layers. From laboratory-based trials, they found that malarial parasites could be separated from red blood cells in 15 minutes. And by spinning the sample in a capillary precoated with acridine orange dye, glowing malarial parasites could be identified by simply placing the capillary under a microscope.

They call this paper centrifuge a 'paperfuge.' Field trials to use it in diagnosis of malaria have just been completed in Madagascar. Manu Prakash's laboratory believes in frugal design philosophy. They dream of developing medical equipments, which do not need a whole lot of money. By thinking, we can transform medicine.
(*Nature News 10 January 2017*).

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