Quality control in Ph D supervision

In *Current Science*, in recent times, several communications have highlighted the undesirable quality of Ph D theses from Indian universities. I would have examined at least two dozen Ph D theses from various Indian universities so far. One general impression I have gained, while marking them, is that the supervisors, in general, do not provide the right level of supervision to their wards. The ensuing tragedy is that the candidates, who 'manage' to get their doctor titles, think that the quality of work they had turned out in their theses was the best; unfortunately, when they start supervising students in their careers, quality declines further.

One key measure the university administrators need to launch is rigorous quality control on fresh Ph D graduates, who seek recognition as supervisors by their respective universities. I am vaguely aware that some universities stipulate that 2–3 journal publications are imperative to those who seek recognition as Ph D supervisors. I am not sure whether this rule prevails in all Indian universities.

I suggest that an apex body such as the University Grants Commission (UGC) must regulate approval of Ph D supervisors. I am aware that a majority of the European universities follow a dictum in such contexts, which adds a splendid dimension to quality control. They generally call such a quality control measure as 'habilitation' that can be crudely translated as 'accreditation to supervise research' (meaning doctoral students). For example, universities in Germany and Switzerland insist that fresh lecturers and young scientists seeking approval for being recognized for doctoral-study supervision must qualify as *Privatdozent*, although each of them holds a Ph D. To qualify as a *Privatdozent*, the German and Swiss university administrators demand 10 or more publications made in quality research journals. Technically to graduate as a *Privatdozent*, the academics write another thesis made of their original publications, not using the material from their Ph D thesis. Candidates generally take anywhere between 4 and 10 years to qualify for this supplementary academic title. I understand that in Humanities, publishing either a monograph or a book would be recognized for the title of a *Privatdozent*.

Unless UGC and/or the Ministry of Human Resources, Government of India awaken to this weakening trend in Indian Ph D scenario, our academic base would continue to worsen.

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Missed cites

According to Chargaff's second parity rule, the compositional abundance values of complementary nucleotides remain similar within individual DNA strands in a chromosome[1]. This is found to be true in chromosomes of prokaryotes and eukaryotes[1]. In 1995, Sueoka[2] described theoretically that Chargaff's second parity is possible in a DNA molecule if the two complementary strands are identical with respect to selection and mutation. He termed this as intra-strand parity or parity rule 2 (PR2). However, Wu and Maeda[3] had already published a paper in *Nature* in 1987 which stated that if the two strands are identical with respect to selection and mutation, complementary nucleotide abundance would remain the same within individual strands in a DNA molecule. But one will not find the citation of Wu and Maeda's[3] work in Sueoka[2]. It is possible that Sueoka had independently predicted the theoretical background of PR2 in chromosomes and was unaware of the publication of Wu and Maeda when he published his article on PR2.

The following is a more recent example where the authors have missed to cite an obvious reference. It is known that synonymous codons though encode the same amino acid, they are not used randomly in genomes. This phenomenon is known as codon usage bias that is common in all genomes. In 1990, Wright[4,5] had given an important measure, known as effective number of codons (Nc or ENC) that is widely used by scientists to estimate codon usage bias in organisms. Recently, in 2012, Sun *et al.*[6] pointed out some critical flaws in the earlier mathematical derivation given by Wright[5]. We applied the method of Sun *et al.*[6], in our work that was already published[7]. Recently we came to know that the analysis given by Sun *et al.*[6] had indeed been reported earlier by Fuglsan[8–11] almost seven years before. It was surprising that none of these publications[8–11] was cited by Sun *et al.*[6]. In another example, in one of our studies on nucleotide composition in chromosomes[12] that was published in 2005, we missed to cite a paper by Prabhu[13] that was published in 1993, the first work on the oligonucleotide symmetry in long DNA sequences.

Thus, it is not uncommon that particular scientific idea may occur independently to different scientists. As the number of scientific journals has increased significantly, it is possible that similar results are published without citation to the earlier work. We suggest that scientific journals have a section such as 'Addendum', where such scientific errors could be brought to the notice of the readers even by scientists who are not authors of the original manuscript.

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Pharmaceutical residues in India: impact on aquatic environment

India is the world's third largest manufacturer of pharmaceuticals, with exports to over 65 countries[1]. By 2020, the country would be ranked in top 10 largest pharmaceutical markets in the world[2]. Typically, pharmaceutical drugs (anti-inflammatory, antiepileptic, lipid lowering agents, β-blockers, antibiotics, diuretics–antihypertensive, androgens, estrogens, etc.) are widely produced and prescribed for human and veterinary, agriculture and aquaculture purposes for protection against various diseases and further to improve human health[3,4]. The large-scale production and extensive use of these compounds as well as their disposal from medical centres and discharge of domestic wastewaters has resulted in environmental contamination[5,6]. These compounds are not completely degraded in the environment and as a result a number of pharmaceuticals are being reported. Globally, in recent times, the presence of these active ingredients and their metabolites has been detected[6–8] in various segments of the environment such as treated and untreated sewage effluents, groundwater, surface water, drinking water, lakes, rivers, reservoirs, estuaries and seas, at concentrations ranging from ng l^{-1} to $\mu g\ l^{-1}$. Such low concentrations also cause public health problems[9–11] (Figure 1). Therefore, pharmaceutical contamination is an emerging concern worldwide and called as emerging pollutants by many scientists.

Pharmaceutical drugs contaminating in the environment have been reported in various countries like USA, UK, Germany, France, Spain, Canada, Australia, Ireland, Belgium, Switzerland, Italy, China and South Korea. However, there are no sufficient data on the occurrence and fate of pharmaceutical drugs in India[12]. There are many possibilities for the occurrence of pharmaceuticals in the water sources of India. Further, because of a large population and with many hospitals located in big cities, pharmaceutical drugs can easily be discharged to the nearby water system daily. So far, very few studies have been done in this regard, even though India has been increasingly producing and consuming pharmaceutical drugs. For instance, Larsson *et al.*[13] have reported elevated concentrations of pharmaceutical drugs such as ciprofloxacin, losartan, cetirizine, metoprolol, enrofloxacin, citalpram, norfloxacin, lomefloxacin, enoxacin, ofloxacin and ranitidin (range between 90 and 31,000 $\mu g\ l^{-1}$) in the effluent of sewage treatment plant in Patancheru Enviro Tech Ltd (PETL), Patancheru, Hyderabad, India. In addition, Fick *et al.*[14] reported that ciprofloxacin, enoxacin, cetirizine, terbinafine and citalopram were detected at more than 1 mg l^{-1} in several wells close to PETL. Very high concentrations of ciprofloxacin (up to 6.5 mg/l), cetirizine (up to 1.2 mg/l), norfloxacin (up to 0.52 mg/l) and enoxacin (up to 0.16 mg/l) were also detected in the two lakes in the proximity of PETL. Diwan *et al.*[15] quantified high concentrations of ciprofloxacin (218–236 $\mu g\ l^{-1}$), norfloxacin (6.4–22.8 $\mu g\ l^{-1}$), levofloxacin (5–8.8 $\mu g\ l^{-1}$) and ofloxacin (4.5–7.5 $\mu g\ l^{-1}$) in hospital wastewaters in Ujjain, India. Ramaswamy *et al.*[16] reported carbamazepine (antiepileptic drug) at 28.3 ng l^{-1} in the Kaveri, a major South Indian river. Recently, the occurrence of non-steroidal anti-inflammatory drugs such as diclofenac, ketoprofen, naproxen, ibuprofen, and acetylsalicylic acid was examined in Kaveri, Vellar, and Tamiraparani rivers in southern India[12]. Research has shown that the environmentally relevant concentrations of pharmaceutical drugs cause toxicological health impacts on various aquatic organisms. Therefore, occurrence and toxicity of pharmaceuticals and their derivatives in the aquatic environment are now a growing concern[5,16].

The rapid growth of pharmaceutical industry in India has posed an elevated risk of environmental contamination with residual pharmaceuticals. However, only a limited number of studies can be found

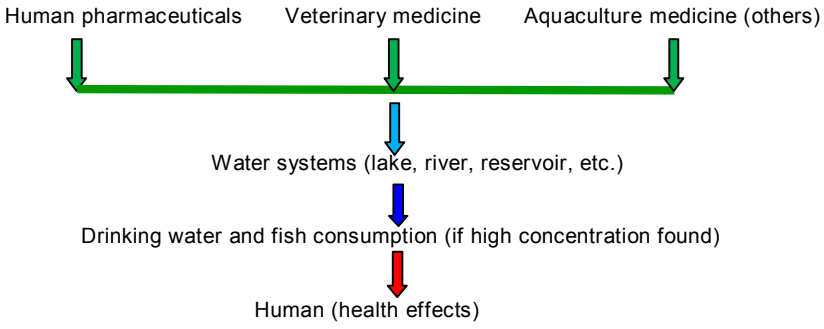

Figure 1. Major source and route of the pharmaceutical drugs to humans.