

Ultrasound imaging: A boon or bane?

In medical imaging ultrasound plays an important role, which has numerous applications in imaging abdominal, breast, musculoskeletal, obstetric, pelvic, prostate, thyroid and vascular tissues. New developments such as three- and four-dimensional ultrasound imaging systems¹ are especially useful in knowing the foetal health-status. These images are critical in case of any biopsy needed for the foetus. With these new techniques, parents can see the three-dimensional foetal images that reveal the facial expressions.

The sad part of this ultrasound imaging is that it is being used for sex determination and discrimination in most parts of India. The recent census (2001)² shows that the sex ratio (females:males) among children in the 0–6 age group is 927/1000 which is low compared to the 1991 census (945/1000). This ratio is one of the world's lowest; the statistical norm is 1050 females for every 1000 males. The number of ultrasound centres throughout India is growing rapidly, for example, a survey by the *Times of India*³ shows, in the city of Hyderabad that these centres are multiplied by 4 times in just 5 years. Such a massive increase is making this sex determination test available at a cheap rate as low as Rs 500.

Even though the Indian Medical Association (IMA), which regulates the medical profession, made it clear that licenses of doctors who carry out such practices will be cancelled, I am not aware of any case, in the past eight years, where license is cancelled. Many officials agree that the Pre-Natal Diagnostic Techniques (PNDT) (Regulation and Prevention of Misuse) act passed in 1994, has not been effective in stopping the girl child extermination. Most of the ultrasound centres in India are unregistered, even though PNDT requires all the ultrasound centres to be registered. The alarming decrease in this sex-ratio needs serious thinking by officials and the medical community.

On the other hand, a recent article⁴ in *JAMA* deals with these ethical issues of ultrasound imaging and there is an argument that the foetal images seen by the mother encourage her to stay healthy during pregnancy and may establish a stronger bond which improves the health of the baby and the mother. Hence people are encouraged to have these scans.

We have another problem in ultrasound imaging when these examinations are carried out by untrained staff. Such examinations are not good as the foetus may be exposed to more ultrasonic waves

than necessary. According to the US Food and Drug Administration (FDA), ultrasound energy is potentially harmful, even though till now there is no evidence in establishing the biological effect of this technology; harmful effects could be discovered in future. There must be awareness campaigns on these issues of sex determination and ultrasound imaging by NGOs and government officials. The question of whether ultrasound is a boon or bane reverts to the same dilemma as to whether technology is making us better or bitter.

1. Fenster, A., Downey, D. B. and Cardinal, H. N., *Phys. Med. Biol.*, 2001, **46**, R67–R99.
2. Website: <http://www.censusindia.net/>
3. Ultrasound under sex ratio scanner, *Times of India*, 27 November 2004.
4. Voelker, R., *JAMA*, 2005, **293**, 25–27.

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Who wants biochemical engineers?

Biochemical engineers, a fraternity into which I have become eventually accepted, are expressing increasing anguish that they are becoming professionally marginalized. Like all aggrieved groups, they blame other professions, mainly biologists and chemical engineers, for their alienation.

There may be some truth in these accusations. Biologists in academic and research organizations are reluctant to acknowledge the contributions of biochemical engineers to biotechnology. Paradoxically, they also complain that biochemical engineers do not easily integrate with biologists. This self-contradiction has resulted in most biotechnology faculties in India being devoid of biochemical engineers.

While accepting biochemical engineers nominally, chemical engineering bodies relegate them to fringe activities. Thus, biochemical engineering gets only minor roles in chemical engineering curricula, conferences and symposia.

However, biochemical engineers may have to share some of the blame for their own predicament. Since theirs is a relatively young profession that straddles biology and chemical engineering, they have the difficult task of blending the two older disciplines and evolving new concepts. This will take both time and a change in their mind-sets. To avoid the danger of their profession becoming just a hybrid of biology and chemical engineering, bio-

chemical engineers need to absorb from both disciplines and venture into niche areas such as metabolic and immunological engineering and lab-on-chip technologies, where their special skills will propel them toward the recognition and respect they deserve.

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