Bhagwat Prasad

Position

Postdoctoral Research Fellow

PhD

Pharmaceutical Analysis

Research area

Drug Metabolism and Transport

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Supervisor's supporting comments

It gives me immense pleasure to nominate Bhagwat Prasad for the *Bioanalysis* Young Investigator Award 2011. He was my direct student since he joined the National Institute of Pharmaceutical Education and Research in July 2004 until February 2011. I had been his teacher and later his guide during his Masters and PhD programs. Since March 2011 Bhagwat has been affiliated with the Department

of Pharmaceutics, University of Washington, Seattle (WA, USA) as a post-doctoral fellow. His research projects include bioanalysis of transporter proteins in human tissues using modern LC–MS platforms and clinical studies for understanding drug–drug interactions. Under my direct supervision Bhagwat completed his MS (Pharm) and PhD. Bhagwat has used modern qualitative and quantitative LC–MS approaches during his research. He has first-hand experience of using multiple mass spectrometers. He has published several excellent research and review papers in journals such as, *European Journal of Pharmaceutical Sciences*, *Trends in Analytical Chemistry*, *Journal of Pharmaceutical and Biomedical Analysis* and *Drug Discovery Today: Therapeutic Strategies*. In a nutshell, Bhagwat Prasad is an outstanding bioanalytical researcher. I am deeply impressed by his drive and determination and, therefore, strongly nominate him for the *Bioanalysis* Young Investigator Award 2011.

Nominated by: Saranjit Singh, Department of Pharmaceutical Analysis, National Institute of Pharmaceutical Education & Research, Sector 67, SAS Nagar 160 062, India
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Q What drove you to choose a career in bioanalysis?

I graduated with my Masters in Pharmaceutical Analysis, where I learnt the basics and applications of most of the analytical and bioanalytical techniques. I later joined a pharmaceutical company in the drug metabolism and bioanalysis department before starting my PhD. While working in the industry, I realized that bioanalysis has a greater importance in drug-discovery research from target identification, through lead optimization and bioavailability estimation to therapeutic drug monitoring. Moreover, it helps understand biological and biochemical processes, both qualitatively and quantitatively, and hence there is enormous scope if I choose this field as my career.

Q Describe the main highlights of your bioanalytical research & its importance to the bioanalytical community both now & in the future

The main objective of my current research is to determine the absolute quantity of various

drug-transporter proteins in human tissues using LC–MS technology. Through this study, we will be able to understand interindividual variations in the expression of these proteins. In addition, as the quantitative data also explain the reasons for differential drug response in humans and animals, the information will serve as a ready reference for drug-discovery industries for deciding first-in-human dose.

In the past, I was involved in identification of comprehensive metabolites of anti-tuberculosis drugs. We characterized multiple novel metabolites for these drugs using modern LC–MS. As these drugs are associated with multiple toxicities, the newer information is clinically important. Moreover, reaction phenotyping studies were performed on rifamycins using individual CYP450 isozymes, where we concluded that rifabutin is metabolized extensively and exclusively by CYP3A4, which results in its low and variable clinical bioavailability. I was also involved in early metabolism studies of newer molecules for tuberculosis, which will help further development of these molecules.

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Q Where do you see your career in bioanalysis taking you?

I am interested in applying my current bioanalytical knowledge to understand human physiological processes. I am particularly interested in the application of LC–MS technology to the study of cellular transport. Since transporters are important cellular proteins determining entry and efflux of components (including xenobiotics) in the cell, better qualitative and quantitative understanding of drug transporters in different cell systems is warranted. It is of particular importance that each isoform of transporters is quantified in biological tissues. Another aspect of my career objectives is to measure up-/down-regulation of cellular proteins in diseased conditions or during drug treatment.

“I am particularly interested in the application of LC–MS technology to the study of cellular transport.”

I also see stable isotope labeling (SIL) hyphenated with MS as an area of my future research. As drug transport and metabolism are considerably important processes determining drug action and toxicity, the SIL approach can give an important insight to our understanding of these processes. I am interested in venturing into this area to help in developing new drugs with higher target potency and significantly lower side effects. In addition, I am interested to apply PET imaging in clinical bioanalysis as a newer noninvasive tool in the future.

Q How do you envisage the field of bioanalysis evolving in the future?

Certainly considering evolution in bioanalytical tools, we should see emerging applications of newer tools in research. As far as biology is concerned, I believe noninvasive tools, such as PET imaging, will pave the ways to study physiological functions of humans/animals to a greater extent. I think microscopy and imaging tools will be of greater value in bioanalysis. Moreover, metabolic SIL (in cell cultures or animals) followed by LC–MS analysis is also going to be a blockbuster bioanalytical approach. Following the human genome project, we should see some remarkable advancements in our understanding of proteomics and metabolomics in the future through bioanalysis. Advancements in both quantitative and

qualitative bioanalytical tools will help biologists to understand and treat life-threatening diseases, such as cancers. The challenges such as interindividual differences in protein expression could be quantified by noninvasive means in the future, thereby allowing individualized drug therapy.

“...metabolic stable isotope labeling (in cell cultures or animal/humans) followed by LC–MS analysis is also going to be a blockbuster bioanalytical approach.”

Hopefully, in the future bioanalysis will encompass advantages such as noninvasiveness, sensitivity, selectivity and high-throughput. Therefore, these tools will help in mechanistic understanding of disease pathophysiology, inter-individual differences, drug targets, drug action, toxicity, drug delivery and so on.

Financial & competing interests disclosure

The author has no relevant affiliations or financial involvement with any organization or entity with a financial interest in or financial conflict with the subject matter or materials discussed in the manuscript. This includes employment, consultancies, honoraria, stock ownership or options, expert testimony, grants or patents received or pending, or royalties.

No writing assistance was utilized in the production of this manuscript.

Representative publications

- Prasad B, Garg A, Takwani H, Singh S. Metabolite identification using liquid chromatography–mass spectrometry. *Trends Anal. Chem.* 30, 360–387 (2011).
- Prasad B, Singh S. Identification of rat urinary metabolites of rifabutin using LC–MSn and LC–HR–MS. *Eur. J. Pharm. Sci.* 41, 173–188 (2010).
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- Prasad B, Singh S. *In vitro* and *in vivo* investigation of metabolic fate of rifampicin using optimized sample preparation approach and modern tools of liquid chromatography–mass spectrometry. *J. Pharm. Biomed. Anal.* 50, 475–490 (2009).
- Garg A, Prasad B, Takwani H, Jain R, Singh S. LC–MS studies on identification of glutathione and *N*-acetylcysteine adducts of primaquine and its novel analogues 2-tert-butylprimaquine (NP-96) in human and rat liver microsomes. *J. Chromat. B* 879, 1–7 (2011).

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Young Investigators should be early career researchers, including Masters and Doctorate students, Postdoctorate researchers and those working in industry.

If you wish to nominate a Young Investigator, please contact the Editor for more details.

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