

A Tribute to Professor Maike Petersen

Shiva Hemmati^{1,*}

¹Department of Pharmaceutical Biotechnology, School of Pharmacy, Shiraz University of Medical Sciences, Shiraz, Iran.

Admiring a remarkable human being - heart, soul, and intellect beautifully in synch has persuaded me to a tribute to Professor Dr. Maike Petersen on the occasion of her 62nd birthday. When in 2003, I joined as a Ph.D. student to the Institute for Developmental and Molecular Biology of Plants at Heinrich-Heine University, Düsseldorf, Professor Petersen was just a pioneer who had left the lab with magnificent achievements. She worked in Düsseldorf from 1986 to 1997 as a Scientific Research Assistant (1) to get her Habilitation entitled "The biosynthesis and accumulation of rosmarinic acid in suspension cultures of *Coleus blumei*". She could then get an appointment as a professor in Pharmaceutical Biology at the Philipps University of Marburg (Germany). Her name, manner, and the protocols she left were valuable for all of us who were the next generation in the lab. Her legacy and the knowledge of enzyme biochemistry and enzyme kinetic were so profound that I was proud of working in a lab wherein Maike worked as a "Habilitation" previously. In addition to her work as a professor of pharmaceutical biology in Marburg, Professor Petersen was also active as the (Vice) President of the Phytochemical Society of Europe (PSE) and as the chairwoman of the "Herbal Natural Products" section of the German Botanical Society. Indeed, my inspiration fully formed when I experienced her attitude toward young scientists as the PSE chair. I was impressed by her character, her academic talent, and her humanity. After a short communication, one feels the presence of a person of wisdom, enthusiasm, and superb communication skills. This communication continued from time to time in other meetings. It was an impressive, indeed joyous encounter. I did not have the privilege to visit her lab. However, I have heard from her students that she is everything that you would want in a biochemist, a mentor, a teacher, and a friend. I believe this feeling in the next generation is due to Maike's believes that every student is worthy of deep respect and consideration.

In addition to all the marvelous attributes of her personality, her reputation as a phytochemist is truly deserved. A brief review of her achievements shows that she is one of the pioneers in the identification and characterization of enzymes, especially in vitro plant cultures, to shed light on the biosynthetic pathways in the way of the production of valuable metabolites. Her deep understanding of enzyme biochemistry and kinetics backs to the time she joined the working group of Professor Seitz at Eberhard-Karls University, Tübingen to obtain her Dr. rer. Nat (1986) with a dissertation entitled "Digitoxin 12 β -Hydroxylase, a cytochrome P450 dependent enzyme from cell cultures of *Digitalis lanata* Ehrh." (2). Thereafter, identification and characterization of hydroxyphenylpyruvate reductase, rosmarinic acid synthase, and cytochrome P450-dependent hydroxylation enzymes such as hydroxycinnamoyl-hydroxyphenyllactate 3- and 3'-hydroxylases from cell-cultures of *Coleus blumei* via conventional biochemistry has supported proposing the biosynthetic pathway of rosmarinic acid (3-6). Her achievements in deciphering the role of deoxypodophyllotoxin 6-hydroxylase, a cytochrome P450 monooxygenase from cell cultures of *Linum flavum* and β -peltatin 6-O-methyltransferase from suspension cultures of *Linum nodiflorum* shed light on

Corresponding Author: Shiva Hemmati, Department of Pharmaceutical Biotechnology, School of Pharmacy, Shiraz University of Medical Sciences, Shiraz, Iran.

Email: hemmatish@sums.ac.ir

the biosynthetic pathway of lignans (precursors of antitumor metabolites) (7-8).

As we are all always in the position of being both student and teacher, Maïke in all of her endeavors optimized both. In this regard, to get the advantages of reverse genetics in the elucidation of biosynthetic pathways; she joined the University of Ghent (Belgium) as a Postdoctoral Researcher from 1990 to 1991. Thereafter, she purified recombinant enzymes involved in rosmarinic acid biosynthesis (9-11).

Trends of her research show her focused and oriented investigations in the field, which has resulted in being a member of the editorial board of several prestigious journals. Currently, she is the Editor-in-Chief of “Phytochemistry Reviews”

and a member of the editorial boards of “Plant Cell Reports”, and “Phytochemistry Letters”.

Her scientific trend, mesmerizing character, discipline, and good nature make her a role model for the generation of students and colleagues. Her behavior can profoundly influence the thoughts on scholarship, leadership, and humanity. Born in 1959, Professor Petersen is at the beginning of the sixth decade of her life. However, she is still active, tireless, and caring colleagues. A rare combination of a personality trait with simultaneous brilliance and humbleness makes her so loved and respected. Therefore, within this letter, her commitment to innovation, pluralism, generosity of spirit with all due respect has been admired.

References

1. Petersen M. Current status of metabolic phytochemistry. *Phytochemistry*. 2007 Nov-Dec;68(22-24):2847-60. doi: 10.1016/j.phytochem.2007.07.029. Epub 2007 Sep 18. PMID: 17881017.
2. Petersen M, Seitz HU. Reconstitution of cytochrome P-450-dependent digitoxin 12 beta-hydroxylase from cell cultures of foxglove (*Digitalis lanata* EHRH.). *Biochem J*. 1988 Jun 1;252(2):537-43. doi: 10.1042/bj2520537. PMID: 3137929; PMCID: PMC1149177.
3. Petersen M, Alfermann AW. Two new enzymes of rosmarinic acid biosynthesis from cell cultures of *Coleus blumei*: hydroxyphenylpyruvate reductase and rosmarinic acid synthase. *Z Naturforsch C*. 1988 Aug 1;43(7-8):501-4.
4. Petersen MS. Characterization of rosmarinic acid synthase from cell cultures of *Coleus blumei*. *Phytochemistry*. 1991 Jan 1;30(9):2877-81.
5. Petersen M, Häusler E, Karwatzki B, Meinhard J. Proposed biosynthetic pathway for rosmarinic acid in cell cultures of *Coleus blumei* Benth. *Planta*. 1993 Jan 1;189(1):10-4.
6. Petersen M. Cytochrome P450-dependent hydroxylation in the biosynthesis of rosmarinic acid in *Coleus*. *Phytochemistry*. 1997 Jul 1;45(6):1165-72.
7. Molog G, Empt U, Kuhlmann S, van Uden W, Pras N, Alfermann A, Petersen M. Deoxypodophyllotoxin 6-hydroxylase, a cytochrome P450 monooxygenase from cell cultures of *Linum flavum* involved in the biosynthesis of cytotoxic lignans. *Planta*. 2001 Dec 1;214(2):288-94.
8. Kranz K, Petersen M. β -Peltatin 6-O-methyltransferase from suspension cultures of *Linum nodiflorum*. *Phytochemistry*. 2003 Sep 1;64(2):453-8.
9. Berger A, Meinhard J, Petersen M. Rosmarinic acid synthase is a new member of the superfamily of BAHD acyltransferases. *Planta*. 2006 Nov 1;224(6):1503-10.
10. Sander M, Petersen M. Distinct substrate specificities and unusual substrate flexibilities of two hydroxycinnamoyltransferases, rosmarinic acid synthase and hydroxycinnamoyl-CoA: shikimate hydroxycinnamoyl-transferase, from *Coleus blumei* Benth. *Planta*. 2011 Jun 1;233(6):1157-71.
11. Hücherig S, Petersen M. RNAi suppression and overexpression studies of hydroxyphenylpyruvate reductase (HPPR) and rosmarinic acid synthase (RAS) genes related to rosmarinic acid biosynthesis in hairy root cultures of *Coleus blumei*. *Plant Cell Tiss Organ Cult*. 2013 Jun 1;113(3):375-85.