

Young Hae Choi

Natural Products Laboratory, Institute of Biology, Leiden University Phone: +31 71 527 4510 y.choi@chem.leidenuniv.nl

PERSONAL

- Name: Young Hae Choi
- Date of birth: May 8, 1968
- Gender: Male
- Nationality: South Korea
- Address (Work): Natural Products Laboratory, Institute of Biology, Leiden University, Sylviusweg 72, 2333 BE, Leiden, The Netherlands
- Telephone: +31 71 527 4510
- Fax: +31 527 4511
- E-mail: y.choi@chem.leidenuniv.nl

CURRENT POSITION

- Associate Professor in Leiden University, Leiden, The Netherlands since 2014
- Scientific Director of Metabolomics Facility of Leiden University (Plant Metabolomics Unit) since 2015
- Visiting Professor in Université de Picardie, Amiens, France (Lectures:1 month /year) since 2008

PROFESSIONAL CAREER

- 2014-Present: Associate Professor, Institute of Biology, Leiden University, Leiden, The Netherlands
- 2009–2014: Assistant Professor, Institute of Biology, Leiden University, Leiden, The Netherlands and Section Process Equipment, Delft University of Technology (TU Delft), Delft, The Netherlands
- 2008–2009: Researcher, Section Process Equipment, Delft University of Technology (TU Delft), Delft, The Netherlands
- 2003–2008: Senior Researcher, Division of Pharmacognosy, Section Metabolomics, Institute of Biology, Leiden University, Leiden, The Netherlands
- 2002–2003: Postdoctoral Fellow, Division of Pharmacognosy, Section Metabolomics, Institute of Biology, Leiden University, Leiden, The Netherlands
- 2000–2002: R&D Manager, GreenTek 21, Seoul Korea
- 2000–2002: Postdoctoral Fellow, College of Pharmacy, Seoul National University, Seoul, Korea

EDUCATIONAL BACKGROUND

- PhD: March 1994 – February 2000, College of Pharmacy, Seoul National University, Seoul, Korea (PhD Thesis: Supercritical Fluid Extraction of Nitrogen Containing Bioactive Natural Products, thesis advisor: Prof. Jinwoong Kim)
- Master of Pharmacy: March 1992 – February 1994, College of Pharmacy, Seoul National University, Seoul, Korea (M. S. Thesis: Studies on the Constituents of *Lepisorus ussuriensis*, thesis advisor: Prof. Jinwoong Kim)

Young Hae Choi

Natural Products Laboratory, Institute of Biology, Leiden University Phone: +31 71 527 4510 y.choi@chem.leidenuniv.nl

- B.S. of Pharmacy: March 1988 – February 1992, College of Pharmacy, Seoul National University, Seoul, Korea

EDUCATIONAL ACTIVITIES

International Metabolomics Workshop

- Annual Metabolomics Workshop held in Leiden, The Netherlands
- Three-weeks workshop consisting of theory of metabolomics (the 1st week), practice of metabolomics (the 2nd week) and identification of metabolites by NMR and MS (the 3rd week)
- Over 400 people from more than 30 countries have attended the workshop since 2008

Co-promotion of PhD Students

1. Muhammad Jahangir, Stress response and health affecting compounds in Brassicaceae, May 20, 2010, ISBN 978-90-9025306-0
2. Tony Lionel Palama, NMR-based metabolomics characterization of *Vanilla planifolia*, June 10, 2010, ISBN 978-90-9025389-3
3. Nancy Dewi Yuliana, Comprehensive extraction and NMR-based metabolomics: Novel approaches to natural products lead finding in drug discovery, June 9, 2011, ISBN 978-90-8570-762-2
4. Kashif Ali, NMR spectroscopy and chemometrics-based analysis of grapevine, September 20, 2011, ISBN 978-90-8570-838-4
5. Roman R. Romero Gozález, A metabolomic approach to thrips resistance in tomato, October 11, 2011, ISBN 978-90-8570-779-0
6. Erica G. Wilson, Contributions to the quality control of two crops of economic importance: hops and yerba mate, September 5, 2012, ISBN 978-94-6203-057-2
7. Andrea Lubbe, Ornamental bulb crops as sources of medicinal and industrial natural products, March 14, 2013, ISBN 978-94-6203-264-4
8. Justin T Fishedick, Terpenoids and medicine, March 14, 2013, ISBN 978-94-6203-281-1
9. Muhammad Tayyab Akhtar, Cannabinoids and zebra fish, May 22, 2013, ISBN 978-94-6203-345-0
10. Yuntao Dai, Natural Deep Eutectic Solvents and their Application in Natural Product Research and Development, September 24, 2013, ISBN 978-90-821172-0-2
11. Ngeh Joseph Toyang, A pharmacognosic Study of *Veronia guineensis* Benth. (Asteraceae), September 16, 2014, ISBN 978-94-6203-665-9
12. Qifang Pan, Metabolomic characteristics of *Catharanthus roseus* plants in time and space, April 16, 2014, ISBN 978-94-6203-558-4
13. Changsheng Wu, Discovery of Novel Antibiotics from Actinomycetes by Integrated Metabolomics & Genomics Approached, October 26th, 2016.

Supervision of MSc and International Students

- Supervision more than 100 students and researchers from approximately 50 countries since 2002

Young Hae Choi

Natural Products Laboratory, Institute of Biology, Leiden University Phone: +31 71 527 4510 y.choi@chem.leidenuniv.nl

International Teaching Appointments.

- Green Extraction Techniques in Food Science (FOOD STARS, Grant Agreement Number: 692776-FOODStars H2020-TWIN-2015), FINS, Novi Sad, Serbia March 27-29th, 2017 (Workshop Organizer)
- Green extraction techniques in food science: NADES application to plant extraction, Novi Sad, Serbia (Institute of Food Technology Novi Sad), March 27-29, 2017
- Omics of Reef Building Organisms: Status Quo and Emerging Techniques, 2016, Center of Excellence in Marine Science (CEMarin), September 28th – October 4th, Bogota, Colombia.
- 20th Summer School on Pharmaceutical analysis SSPA 2015, Advanced Analytical Methodologies for Medicinal Plant Characterization, September 16-28, 2015, Campus di Rimini, aula Briolini, Ruffi-Briolini, Corso d'Augusto 237, Rimini, Italy.
- Curso Metabolomica, La foundation de farmacognosia y medicina complementaria y alternativa de B.C.S., A. C. La Paz, Mexico, June 15-19, 2015.
- Metabolomics, Instituto de Química, Universidade Estadual Paulista-UNESP, Araraquara-SP, Brazil, November 5-6, 2014.
- Metabolomics Workshop. Science Lab Center, Naresuan University, March 10-14, 2014, Phitsanulok, Thailand.
- The 3rd Latin American School of NMR. September 17-24, 2012, Bogota, Colombia.
- The 26th annual series of lectures in Zermatt, Switzerland "Analysis on the top", Zermatt, Switzerland, September 5-9, 2011.
- One-week International Metabolomics Course (as Organizer and Lecturer): April 2011, Leiden University, Leiden The Netherlands
- One-week Metabolomics Course in Wageningen, The Netherlands, April 25-30, 2011.
- Metabolomics workshop: October 12-14, Kuala Lumpur, Malaysia
- One-week International Metabolomics Course (as Organizer and Lecturer): April 2010, Leiden University, Leiden The Netherlands
- 3-days Metabolomics Course (Lectures): October 19-21 2009 (International Communication and Cooperation, Metabolomics Course), Taiyuan, Shanxi, China
- One-week International Metabolomics Course (as Organizer and Lecturer): April 2009, Leiden University, Leiden, The Netherlands
- 5 days-Experimental and Modelling Methods for Studying Sugar Metabolism (as Guest Lecturer): November 2008, Expoo, Finland

International Activities (Invited Speakers).

- RDPA2017 (Recent Development of Pharmaceutical Analysis), September 20-23, 2017, Rimini, Italy (Keynote Speaker)
- XV Congress of the Italian Society of Phytochemistry, 1st International Congress on Edible, Medicinal and Aromatic Plants (ICEMAP 2017), June 28-30, Pisa, Italy (Plenary Lecture)
- Metabolomics for Plant Sciences: What to do, how to do and what to expect? April 6-7, 2017, Konkuk University (New Millenium Hall), Seoul, Korea (Keynote speaker)
- Metabolomics in Chemical Ecology. October 31th – November 1st, 2016, NIOO, Wageningen,

Young Hae Choi

Natural Products Laboratory, Institute of Biology, Leiden University Phone: +31 71 527 4510 y.choi@chem.leidenuniv.nl

The Netherlands.

- Metabolomics application to plant sciences: current issues and where to go, October 21th, 2016, Department of Drug Sciences, University of Pavia, Italy.
- JEP Symposium: Learning from Nature, learning from our Ancestors, April 14-15, 2016, Leiden, The Netherlands.
- The 3rd International Forum and Workshop of Metabolomics, October 24-25, 2015, International Hall2, Chang Gung University of Science and Technology, Taiwan.
- 1st MS-NATMedDay, Natural Molecules and Molecular Complexes: Characterization and Biomedical Effects. Aboca, Sancepolcro, September 21-22, 2015.
- 110^o Congresso della Società Botanica Italiana onlus, II International Plant Science Conference (IPSC), "Not only food: sustainable development, agrobiodiversity conservation & human well being", Pavia, Italia 14-17 September, 2015.
- 19th Journée Scientifiques, ccCTA (Centre de competences en Chimie et toxicology Analytiques), September 3-4 (Thursday-Friday), Les Diablerets, Switzerland. Strategy of NMR experiments for chemical identification in the complex mixture, the last step of metabolomics.
- 49th NMR-DG Meeting, Oss, The Netherlands, October 31, 2014
- 62nd International Congress and Annual Meeting of the Society for Medicinal Plant and Natural Product Research-GA2014, Guimaraes, Portugal, August 31 – September 4, 2014
- International Conference on Natural Products Utilization (ICNPU): From Plants to Pharmacy Shelf, Bansko, Bulgaria, November 3-6, 2013.
- The 2nd China-Holland International Cooperation Training Class for Metabolomics, Taiyuan, China October 14-16, 2013.
- São Paulo School of Advance Science on Bioorganic Chemistry, Instituto de Química, Universidade Estandual Paulista-UNESP, Araraquara-SP, Brazil, June 30-July 5, 2013.
- XXXV Finnish NMR Symposium, Helsinki, Finland, June 12-14, 2013.
- Cosmetopée 2013, Chartres, France, May 30, 2013.
- Frontiers in White Biotechnology, Delft, The Netherlands June 21-22, 2011
- 59th International Congress and Annual Meeting for Medicinal Plant and Natural Product Research, Antalya, Turkey, September 4-9, 2011.
- Research on fingerprints of Chinese Materia Medica to develop standard and research protocols evaluating their identity, safety and reproducibility, VUB, Brussel, Belgium, bilateral project of Belgium with China, May 18, 2011.
- 40th Meeting of National Working Group on Indonesian Medicinal Plant, Bogor, Indonesia, May 25-27, 2011.
- Research on fingerprints of Chinese Materia Meedica to develop standard and research protocols evaluating their identity, safety and reproducibility, VUB, Brussel, Belgium, bilateral project of Belgium with China, December 17, 2010.
- The 124th AOAC, Anual Meeting & Exposition, Orlando, FL, USA, September 2010.
- The 28th International Horticulture Congress, Lisbon, Portugal, August 2010.
- Actualités et futur : Phytomolécules actives – de l'origine à l'usage, Societe Francaise de Cosmetologie, Paris, France, December 2009.

Young Hae Choi

Natural Products Laboratory, Institute of Biology, Leiden University Phone: +31 71 527 4510 y.choi@chem.leidenuniv.nl

- Biomodels Applied in Development and Technology Innovation, III Regional Meeting ICLAS, FESSACAL, ACCMAL, Montevideo, Uruguay, June 2009.
- International Conference on Biodiversity and Natural Products ICOB-6 & ISCNP-26, Charlottetown, PEI, Canada, July 2008.
- Trends in Metabolomics, Analytics and Applications, Frankfurt am Main, Germany, June 2008.
- Plant Systems Biology, Leiden, The Netherlands, April 2008.
- The 38th Annual Meeting of the Korean Society of Pharmacognosy, Seoul, Korea, December 2007.
- The 11th International Congress Phytopharm 2007, Leiden, The Netherlands, June 2007.
- The 1st Russian Congress of Dietitians and Nutritionists "Dietology: Problems and Horizons", Moscow, Russia, December 2006.
- 12th Asian Symposium on Medicinal Plants, Spices and other Natural Products (ASOMPS XII), Padang, Indonesia, November 2006.
- Analytical Methods for Standardization of Herbal Medicines, Seoul, Korea, September 2006.
- Forschungsvereinigung der Arzneimittel-Hersteller e. V. (FAH) & the the German Pharmaceutical Society (DPhG) Joint-Symposium "Quantitative NMR in Pharmaceutical Analysis", Würzburg, Germany, May 2006.
- Joint European Network for Biodiversity Information (ENBI) & Species 2000-europa Demonstration Conference, Stockholm, Sweden, October 2005.

INTERNAL TEACHING ACTIVITIES

- September 2004 – Present: Structure Elucidation of Natural Products (for MSc and PhD Students), Leiden University, The Netherlands
- September 2004: Phytochemistry (for MSc and PhD Students), Leiden University, Leiden, The Netherlands
- September 2005 – Present: Metabolomics (for MSc and PhD Students), Leiden University, Leiden, The Netherlands
- June 2006 – Present: Systems Biology (for Undergraduate Students), Leiden University (in charge of Metabolomics)
- September 2001: Phytochemistry (for Undergraduate Students), Sungkyunkwan University, Suwon, Korea

SCIENTIFIC ACTIVITIES

- Author/co-author of 200 scientific peer-reviewed papers and 11 book chapters.
- 4 patent applications
- More than 150 Conference abstracts and proceedings
- Guest Editor of the Special Issue of Phytochemical Analysis (Metabolomics in Natural Products, January/February, 2010)
- Guest Editor of the Special Issue of Phytochemical Analysis (Pre-analytical methods in metabolomics: sample preparation and extraction, July/August 2014)
- Associate Editor of Phytochemical Analysis (Wiley, 2010-2014)

Young Hae Choi

Natural Products Laboratory, Institute of Biology, Leiden University Phone: +31 71 527 4510 y.choi@chem.leidenuniv.nl

- Editorial Board of Phytochemistry (Elsevier, 2016-Present)

CURRENT RESEARCH INTERESTS

- Untargeted plant metabolomics and building up database plants metabolome (horticulture, agriculture and medicinal plants) depending on their biotic and abiotic stress
- Targeted plant metabolomics and plant-microbial chemical interaction for symbiotic cooperation against plant pathogens
- Investigation of natural deep eutectic solvents in plant cells
- Development of biofungicides using metabolomics data, development of natural drug formulation based on natural deep eutectic solvents, and development of antibiotics and antifungal reagents targeting synergisms or potentiation.

GRANTS

- Application of natural deep eutectic solvents to solubilizing non-water soluble bioactive metabolites, Project no.: 93519012, Netherland Genomics Initiative, 2013-2014.
- Natural deep eutectic solvents: the missing link in understanding cellular metabolism in physiology, Project no.: 711.012.010, NWO Chemical Sciences, 2013-2016.
- High-throughput metabolic and safety assessment of *Catharanthus* cell cultures in relation to gene-function analysis, Project no.: IGE11003, IOP Genomics, September 14, 2011.
- Research on biomarker for blood function and new metabolic profiling method, The Rural Development Administration (RDA) of the Republic of Korea, 2012-2014.
- Deconvolution of plant phenolic metabolism using multidimensional metabolomics (Horizon Programme Breakthrough projects round 6; Project No.: 93519012; September 1, 2009 – March 1, 2011).
- STW Genbiotics Project (2009-2012, no. 10467) GENomics and EXpression of Peptide ANTibiotics and Derivatives (GENEXPAND) with Dr Gilles van Wesel (from Leiden University Institute of Chemistry, Leiden University, Leiden, The Netherlands)
- Development of overseas marine biological resources and utilization system. July 1, 2011 – June 30, 2014 (Project no.: PM56091). Ministry of Land, Transport and Maritime Affairs, Korea.

GRANTS FROM COMPANIES AND ADVISOR ACTIVITIES

- **Winclove** (Amsterdam, The Netherlands): Effect of Probiotics on Human Faeces Metabolome (2014 – 2015)
- **Frutarom** (Zürich, Switzerland): Targeted Metabolomics of Food Products (2013 – 2015)
- **Gattefossé** (Lyon, France): Application of Natural Deep Eutectic Solvents to Cosmetics (Purchased Execution Right of Patent for Cosmetic Application (2013 – Present)
- **Winclove** (Amsterdam, The Netherlands): Application of NADES to Bacterial Storage (2012 – 2014)
- **Fytagoras** (Leiden, The Netherlands): Metabolomics of Tomato and Tea (2010 – Present)
- **In Ovo** (Leiden, The Netherlands): Application of Metabolomics Tools to Discrimination of Chicken

Young Hae Choi

Natural Products Laboratory, Institute of Biology, Leiden University Phone: +31 71 527 4510 y.choi@chem.leidenuniv.nl

Gender (2012 - Present)

PRIZES AND COMMUNICATION TO PUBLIC

- Namkang Award for Young Scientist (December 2000, Korean Society of Pharmacognosy).
- Discoverer of the Year (2011) of Biology Institute at Leiden University.
- NRC Handelblad (October 8, 2013): De derde oplossing van de natuur (The 3rd media from Nature).
- Origin (July 2013): De ontdekking van een klasse van nieuwe oplosmiddelen gemaakt van natuurlijke vaste stoffen (Discovery of newly classified media from natural products).
- Chemical & Engineering News: Nontoxic Solvents Extract Compounds from Plants.
- A research paper (Plant Physiology 2011) was selected by Faculty of 1000 (2% of Published Articles in Biology and Medicine).
- Biotechniques: The Metabololites of Sin, Vol 54, No. 5, 2013.
- Bionieuws: Nieuwe natuurlijke oplosmiddelen (New natural media), Vol 18, November 12, 2011.

LIST OF PUBLICATIONS

General Statistics

- H-index: 51
- Total number of citation: 8700

Top 10 Publications Related to Metabolomics in 2011-2016

1. Looking to nature for a new concept in antimicrobial treatments: isoflavonoids from *Cytisus striatus* as antibiotic adjuvants against MRSA. A. C. Abreu, A. Coqueiro, A. R. Sultan, N. Lemmens, H. K. Kim, R. Verpoorte, W. J. B. van Warmel, M. Simões, Y. H. Choi. Scientific Reports, in press, 2017 . **[Proving synergism of plant metabolites for a new concept of antibiotics]**
2. Expanding the chemical space for natural products by *Aspergillus niger* and *Streptomyces coelicolor* co-cultivation and biotransformation. C. Wu, B. Zacchetti, A. F. J. Ram, G. P. van Wezel, D. Claessen, Y. H. Choi. Nature Scientific Reports, in press 2015 **[Application of Metabolomics to interaction between bacteria and fungus]**
3. Natural deep eutectic solvents as a new extraction media for phenolic metabolites in *Carthamus tinctorius* L. Y. Dai, G. –J. Witkamp, R. Verpoorte, Y. H. Choi. Analytical Chemistry, 85, 6272-6278, 2013 **[Interviewed by Chemical & Engineering News]**
4. NMR-based plant metabolomics: where do we stand, where do we go? H. K. Kim, Y. H. Choi, R. Verpoorte. Trends in Biotechnology, 29, 267-275, 2011 **[Invited co-first author with H. K. Kim]**
5. Are Natural Deep Eutectic Solvents the Missing Link in Understanding Cellular Metabolism and Physiology? Y. H. Choi, J. van Spronsen, Y. Dai, M. Verberne, F. Hollmann, I. W. C. E. Arends,

Young Hae Choi

Natural Products Laboratory, Institute of Biology, Leiden University Phone: +31 71 527 4510 y.choi@chem.leidenuniv.nl

- G.-Jan Witkamp, R. Verpoorte. *Plant Physiology*, 156, 1701-1705, 2011 [Selected by Faculty of 1000 (2% of of Published Articles in Biology and Medicine)]
6. Comprehensive extraction method integrated with NMR metabolomics - a new bioactivity screening method for plants: adenosine A1 receptor binding compounds in *Orthosiphon stamineus* Benth. N. D. Yuliana, A. Khatib, R. Verpoorte, Y. H. Choi. *Analytical Chemistry*, 83, 6902-6906, 2011 [Innovative Preanalytical Method Development for Metabolomics]
 7. Seasonal accumulation of major alkaloids in organs of pharmaceutical crop *Narcissus Carlton*. A. Lubbe, H. Gude, R. Verpoorte, Y. H. Choi. *Phytochemistry*, 88, 43-53, 2013 [Application of Metabolomics to Agricultural Products for Targetted Analysis]
 8. Effect of fertilizers on galanthamine and metabolite profiles in *Narcissus* bulbs by ^1H NMR. A. Lubbe, P. Vreeburg, Y. H. Choi, R. Verpoorte. *Journal of Agricultural and Food Chemistry*, 59, 3155-3161, 2011 [Application of Metabolomics to Agricultural Products for untargetted Analysis]
 9. Identification of bioactive metabolites against adenosine A1 receptor using NMR-based Metabolomics. K. Ali, M. Iqbal, N. D. Yuliana, Y. -J Lee, S. Park, S. Han, J. -W. Lee, H. -S. Lee, R. Verpoorte, Y. H. Choi. *Metabolomics*, 9, 778-785, 2013 [Application of Metabolomics to Agricultural Products for untargetted Analysis]
 10. Pre-analytical method for NMR-based grape metabolic fingerprinting and chemometrics. K. Ali, F. Maltese, A. M. Fortes, M. S. Pais, Robert Verpoorte, Y. H. Choi. *Analytica Chimica Acta*, 703, 179-186, 2011 [Application of Metabolomics to Food Chemistry for untargetted Analysis of wine]