Ministry of Human Resources and Social Security

HELMHOLTZ RESEARCH FOR GRAND CHALLENGES

2018 Helmholtz – OCPC – Program

for the involvement of postdocs in bilateral collaboration projects

KIT-07

PART A

Title of the project: Towards Plant Cell Fermentation of Anticancer Compounds from Rare Chinese Medical Plants

Helmholtz Centre and institute: Karlsruhe Institute of Technology, Botanical Institute

Project leader: Prof. Dr. Peter Nick

Web-address: http://www.botanik.kit.edu/botzell/

Description of the project (max. 1 page)**:** Plants produced an estimated 1 million of specific compounds that steer the interaction with other organisms. Many of these compounds are medically active and their use by humans dates back to the earliest roots of civilisation. Traditional Chinese Medicine with an estimated use of more than 10000 plant-based drugs, composed of more than 2000 systems is probably the most elaborate system for the use of medicinal plants. However, many of these plants are endangered and difficult to cultivate leading to different problems such as adulteration and surrogation of plant material, and overexploitation of endangered plant species. Plant Cell Fermentation, the production of valuable compounds by plant cell cultures, provides an interesting and sustainable alternative to traditional collection. The successful production of the anticancer compound Paclitaxel by Phyton Biotech in Ahrensburg using cell cultures of the endangered plant *Taxus chinensis* demonstrates the economic potential of this strategy. The extremely rare tree *Cephalotaxus hainanensis* is, endemic to Hainan and accumulates medically valuable alkaloids such as the highly potent anti-tumour harringtonines. The medical activity of this tree against cancer has stimulated unregulated, often illegal, over-exploitation. Together with partners from the Chinese Academy for Tropical Agriculture in Hainan the host lab have established the transcriptome of this species, which can now be used to mine genes of harringtonine synthesis. This pathway is highly compartmentalised and to understand the molecular cell biology of candidate enzymes of the final part of the pathway is therefore mandatory for any future biotechnological exploitation. Candidate members from the cytochrome P450 and acyltransferase families have been identified by the Chinese partners and should now be analysed for their subcellular localisation, spatial and temporal regulation *in planta*, their substrate specificity, and their biochemical activity *in vitro*. Using cellular phenotyping in suspension cells in combination with modular interaction based on a microfluidic biofermenter system developed in the host lab, signals coordinating metabolic activity and potency will be investigated. The results from this study provide a base for future plant cell fermentation of cephalotaxine alkaloids as sustainable alternative for the exploitation of this highly endangered tree.

Description of existing or sought Chinese collaboration partner institute (max. half page)**:**

The project is based upon an established, but so far un-funded cooperation between the chair of Molecular Cell Biology (Prof. Dr. Peter Nick, Botanical Institute, Karlsruhe Institute of Technology) and the group of Dr. Fei Qiao (Institute for Genetic Resources of Tropical Crops, Chinese Academy of Tropical Agricultural Sciences, Hainan). Both applicants have published together the transcriptome for *Cephalotaxus hainanensis* (Qiao F, Chong H, Wang R, Yin J, Qian D, Yang X, Jiang X, Nick P. 2014. De-novo characterization of a Cephalotaxus hainanensis transcriptome and genes related to paclitaxel biosynthesis. PloS ONE 9, e106900) and have worked out the cellular characteristics of a suspension cell line from this species in frame of a bilateral project funded by the two Agricultural Ministries (14/14-15-CHN Modernisierung Traditioneller Chinesischer Medizin)

Required qualification of the post-doc:

- PhD in Biology
- Experience with Plant Cell Culture
- Additional skills in Chemical Analytics

PART B

Documents to be provided by the post-doc, necessary for an application to OCPC via a postdoc-station in China, which is affiliated to a research institution like a university:

- Detailed description of the interest in joining the project (motivation letter)
- Curriculum vitae, copies of degrees
- List of publications
- 2 letters of recommendation
- Proof of command of English language

PART C

Additional requirements to be fulfilled by the post-doc:

- Max. age of 35 years
- PhD degree not older than 5 years
- Very good command of the English language
- Strong ability to work independently and in a team