

GUEST EDITORIAL

Highland amphibians and high potencies: a 20-year metamorphosis

In the late 1980s, the Austrian biologists Christian Endler and Waltraud Scherer–Pongratz, based at the time at the Zoological Institute of Graz University and the Boltzmann Institute Graz, picked up a long-forgotten line of research on amphibian metamorphosis and homeopathic potencies.¹ Rather than merely replicate König's original experiments conducted in the 1920s, using metal salts they chose to study amphibians' response to that most amphibian-specific hormone thyroxine.² This was a bold innovation in the field of fundamental homeopathic research.

Their experimental approach was isopathic: metamorphosing frog larvae, especially those from highland biotopes, such as were mostly used, are exquisitely sensitive to thyroxine. Their physiologically elevated thyroxine level puts them in a state referred to as thyroxine stress. The idea was that this might make them particularly responsive to thyroxine potencies. And the bet came off. First results were published in 1991, with thyroxine 30× clearly slowing down activity and metamorphosis speed in animals from highland biotopes of *Rana temporaria*, the common European frog.^{2,3}

Since then, working in their own or others' laboratories, the team have varied the core parameters in different versions of the original experiment, some with promising, others with unfruitful or contradictory outcomes.⁴

Independent replication

The mainstay of this fundamental zoological research on homeopathy, however, has remained the experiment on highland amphibians and thyroxine 30×. These results have been the subject of multiple repetitions by the original team at the Interuniversity College Graz^{2,5,6} as well as by others: the Department for Molecular Cell Biology Utrecht University,² the Federal Institute of Veterinary Medical Investigation, Graz,⁵ the Zoological Institute Vienna University⁵ and by an observer suggested by KIKOM, Bern University.⁷ The outcome proved extremely reproducible, with thyroxine 30× clearly slowing metamorphosis in highland *Rana temporaria* in all 6 of the 6 experiments performed by the external researchers between 1990 and 2010, and in 13 of the 15 experiments performed by the original team.

Bernhard Harrer, former assistant to J. Hornung at the Free University Berlin, and author of "Independent replication experiments on a model with extremely diluted thy-

roxine and highland amphibians" in this issue of Homeopathy,⁸ has searched and systematically reviewed Pubmed listed literature on the research and publication activities of the groups which have reproduced the potentized thyroxine in amphibians model. This includes a little-known German-language study on highland larvae performed at Vienna University, published in a journal edited by Edzard Ernst,⁵ who is not known as a supporter of homeopathy.

In his paper in this issue, Harrer also reports an experiment which he conducted himself, observing the number of animals entering the 4-legged stage in groups treated either with thyroxine 30× or water 30× for control over the course of time. He, too, observed a clear trend of thyroxine 30× animals being slower than control animals. Due to the small numbers of animals (only 60 per group, the maximum allowed by the nature conservation authorities) the differences found in this study were not statistically significant ($p > 0.05$). Harrer's conclusion is that the results of his own replication experiment, though not statistically significant, are in line with those of the initial team and with those obtained by the other independent researchers.

Meta-analysis

Next, Harrer compared the pooled results from the initial team with those from external (independent) researchers including himself. For the experiments of the initial team (2 researchers, 1290 animals per group) the frequency of 4-legged animals treated with thyroxine 30× was 10.6% smaller than in the control group, while for the pooled external (independent) experiments (5 researchers, 430 animals per group), it was 12.4% smaller. Statistical significance was high ($p < 0.01$) and the effect size was large ($d > 0.8$) in either case.⁸

The research of Endler and Scherer–Pongratz has further been backed by Guedes et al. in Brazil who studied the influence of homeopathic high dilutions prepared from thyroid glands on amphibian larvae of a different species and found a decreased rate of metamorphosis as well as histological changes during tail absorption evidenced by higher rates of programmed cell death (apoptosis) in the test group.^{9,10}

So, after a metamorphosis of more than 20 years, the amphibian model now seems to be fully hatched. Its outcome can be viewed as a new cornerstone of fundamental research on high dilutions. The strategy of the initial team, to be patient, to explore side alleys while always coming back to one and the same set of parameters, and to be transparent about their methods, allowing others to follow up on

Received 24 October 2012; accepted 24 October 2012

their work, should give pause for thought to those who are eager to get quick results and shooting star publications.

Endler and Scherer–Pongratz have always abstained from standardizing their model to make it workable for experiments with animals available from breeders (i.e. animals that would have to be sacrificed after the experiment), as they have also from invasive investigation methods harmful to the animals. This might be seen as a disadvantage from the viewpoint of industrialized biology and high tech biochemistry. On the other hand, their avowal that this is how they want to work in the field of “life sciences” has undoubtedly helped to strengthen the general perception of homeopathy as being a gentle medicine. And it may not be the least reason why the frog project has today grown into something of a prince.

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