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EDITORIAL

The Memory of Water: a scientific heresy?

This special issue of Homeopathy is devoted to the 'memory of water', a concept forever linked to the name of the late Jacques Benveniste, although not coined by him. The term first appeared in the French newspaper Le Monde, commenting on a fierce controversy which blew up in the pages of the leading scientific journal Nature in 1988. In June of that year, Nature published a paper by a large international group led by Benveniste which made the sensational claim that the antibody anti-IgE in dilutions up to 10^{-120} molar, far into the 'ultramolecular' range, triggers degranulation of human basophils in vitro.[1]

Nature had resisted publishing the paper, and the then editor, John Maddox, agreed to do so only on the condition that Benveniste allowed an inspection team, nominated by Maddox, to visit his laboratory after publication. The team duly visited, and, a month later, published its report denouncing Benveniste's work as 'pseudoscience', but nevertheless justifying its decision to publish.[2] Two subsequent attempts to reproduce Benveniste's results failed,[3,4] although he remained defiant until his death in October 2004. Yolène Thomas, a long-term collaborator of Benveniste, recounts that episode and the subsequent history of the memory of water in this issue,[5] and Michel Schiff has given a detailed insider's account of the treatment Benveniste suffered for his heresy.[6]

A bad memory

Yet, the memory of water is a bad memory: it casts a long shadow over homeopathy and is just about all that many scientists recall about the scientific investigation of homeopathy, equating it with poor or even fraudulent science. So why revive it now? The reason of course is the claims made by homeopathy for the action of ultramolecular (also called ultra high) dilutions. Although the basic idea of homeopathy is similarity, the most controversial and, for many, implausible claim concerns the properties of the ultramolecular dilutions characteristic of it. Avogadro's constant, the number of particles (atoms or molecules) in a gram mole of a substance, is of the order of 10^{23}. The inescapable corollary is that dilutions of substances above this level are unlikely to contain a single molecule of the starting substance, whose name appears on the label. In homeopathic terminology, 10^{23} corresponds to a 23x/dH or 12c dilution. In fact, for reasons including the concentration of the starting substance(s) the ultramolecular limit is often passed well before 23x/12c. In any case, it is only a statistical probability and many homeopathic starting materials of biological origin are complex mixtures of many chemicals in varying concentrations.

It is this problem that links Benveniste's work to homeopathy: he claimed to have discovered that aqueous dilutions of a protein retained the essential properties of that protein many 1:100 dilution stages after it had been diluted out. The water diluent 'remembered' the anti-IgE long after it was gone. The underlying hypothesis can be stated as follows: 'Under appropriate circumstances, water retains information about substances with which it has previously been in contact and may then transmit that information to presensitised biosystems'. Note that this hypothesis has two parts: retention of information and transmission of information.

It is now generally accepted that Benveniste's original method does not yield reproducible results, so why has the idea of memory of water not faded away?

Competing hypotheses

In fact, there are competing theories for the effects of homeopathy. The most widespread is that no explanation is required: homeopathy has no specific effects, and its outcomes are attributable to purely placebo effects: psychological phenomena, including expectation of benefit in which the homeopathic medicine plays no role except to convince the patient that they are receiving a genuine medical treatment.

Among the counterarguments to this position is that homeopathic medicines and treatment regimes seem, from what is known about the factors which increase placebo effects, designed to minimise it![7] They are small and unimpressive, and often administered at low frequencies.

Of course the main counterargument is the steadily growing body of evidence from both clinical and bench science that homeopathy and homeopathic ultramolecular dilutions have effects which cannot be discounted in this way. Other hypotheses which accept that there is something to be explained have emerged, most notably a group involving 'macroscopic quantum entanglement'. These are represented in this issue in the papers by Weingärtner[8] and Milgrom.[9]

Yet, among those hypotheses which accept that there is something to explain about the properties of

homeopathic ultramolecular dilutions, the largest group involve what can be broadly described as 'memory of water' effects. In fact, as our Guest Editor Prof Martin Chaplin shows in his masterly overview, there is no doubt that, at a simple level, water memory effects do exist.[10] But this is far from proving that they have the features (such as the specificity to 'remember' individually all of the large number of substances used as the bases for homeopathic medicines), which would be required to account for the claimed effects of homeopathy.

The memory of pure water?

One interesting theme to emerge from several contributions is that the memory may not be that of water alone. As Jose Teixeira points out in his sceptical view the process of producing an homeopathic medicine produces very high dilutions, but not necessarily in very pure water.[11] There is a growing view that chemical contaminants, particularly silica leached from the walls of the glassware, may play a crucial role, a hypothesis developed in this issue by Anick and Ives.[12] Voeikov suggests that peroxide species created by the succussion process may be significant.[13] There may be homology here to the 'doping' of semiconductors. On a different theme, David Anick develops a mathematical model which elegantly accounts for the series ('octaves') of dilutions traditionally used in homeopathic practice, independent of the underlying mechanism of information retention.[14]

But perhaps most significant is the growing body of experimental evidence, based widely on different physico-chemical methods represented by the papers in this issue by Elia,[15] Rao *et al*,[16] Rey,[17] Vybíral and Voráček.[18] None of this work is final, conclusive or above criticism and in some cases the relevance to clinical homeopathy is not immediately obvious. But here are some remarkable convergences, for instance, Elia and Vybíral and Voráček, on the basis of entirely different methods, have detected properties that are unexpected, reflect large-scale organisation in liquid water, and, perhaps, mostly remarkably, increase with time.

The work collected in this special issue reflects convergent views from widely different perspectives that water can display memory effects and that homeopathic production methods might induce them. These findings represent a fundamental challenge to the complacent view which refuses even to think seriously about homeopathy. It may develop to the point at which, after over two centuries of controversy, there is finally consensus about the key to understanding mode of action of homeopathic high dilutions.

There is much work to be done, but at this stage we can say one thing with certainty: the assertion that homeopathy is impossible because the 'memory of water' is impossible is wrong.

References

1 Davenas E, Beauvais F, Amara J, et al. Human basophil degranulation triggered by very dilute antiserum against IgE. *Nature* 1988; **333**: 816–818.
2 Maddox J, Randi J, Stewart WW. 'High-dilution' experiments a delusion. *Nature* 1988; **334**: 287–290.
3 Ovelgönne JH, Bol AW, Hop WC, van Wisk R. Mechanical agitation of very dilute antiserum against IgE has no effect on basophil staining properties. *Experientia* 1992; **48**: 504–508.
4 Hirst SJ, Hayes NA, Burridge J, Pearce FL, Foreman JC. Human basophil degranulation is not triggered by very dilute antiserum against human IgE. *Nature* 1993; **366**: 525–527.
5 Thomas Y. The history of the Memory of Water. *Homp* 2007; **96**: 151–157.
6 Schiff M. *The Memory of Water*. London: Thorsons, 1995.
7 Evans D. *Placebo: Mind over Matter in Modern Medicine*. Oxford: Oxford University Press, 2003.
8 Weingärtner O. The nature of the active ingredient in ultramolecular dilutions. *Homp* 2007; **96**: 220–226.
9 Milgrom L. Conspicuous by its absence: the Memory of Water, macro-entanglement, and the possibility of homeopathy. *Homp* 2007; **96**: 209–219.
10 Chaplin M. The Memory of Water: an overview. *Homp* 2007; **96**: 143–150.
11 Teixeira J. Can water possibly have a memory? A sceptical view. *Homp* 2007; **96**: 158–162.
12 Anick D, Ives J. The silica hypothesis for homeopathy: physical chemistry. *Homp* 2007; **96**: 189–195.
13 Voeikov V. The possible role of active oxygen in the Memory of Water. *Homp* 2007; **96**: 196–201.
14 Anick D. The octave potencies convention: a mathematical model of dilution and succussion. *Homp* 2007; **96**: 202–208.
15 Elia V, Napoli E, Germano R. The Memory of Water: an almost deciphered enigma. Dissipative structures in extremely dilute aqueous solutions. *Homp* 2007; **96**: 163–169.
16 Rao ML, Roy R, Bell IR, Hoover R. The defining role of structure (including epitaxy) in the plausibility of homeopathy. *Homp* 2007; **96**: 175–182.
17 Rey L. Can low temperature thermoluminescence cast light on the nature of ultra-high dilutions?. *Homp* 2007; **96**: 170–174.
18 Vybíral B, Voráček P. Long term structural effects in water: autothixotropy of water and its hysteresis. *Homp* 2007; **96**: 183–188.

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