THE METAMORPHOSIS OF AMPHIBIANS AND INFORMATION OF THYROXIN STORAGE VIA THE BIPOLAR FLUID WATER AND ON A TECHNICAL DATA CARRIER; TRANSFERENCE VIA AN ELECTRONIC AMPLIFIER

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Stimulating effect: It is known that the thyroid hormone thyroxin (tetraiodothyronine, T_4) has a decisive influence on the speed of metamorphosis in amphibians. If thyroxin is added to the water in a test basin until the final concentration in the basin is approx. 10^{-8}, then this induces and accelerates the laboratory animal's metamorphosis [1,2,3]. In previous experiments involving grass frog larvae *(Rana temporaria)* in the two-legged stage, L-thyroxin-sodiumpentahydrate at a concentration of 10^{-9} also accelerated the speed of metamorphosis in comparison to the control solutions (see methods) [4].

Inhibiting effect: However, thyroxin is able to do more than simply accelerate metamorphosis activity. At a thyroxin concentration of 10^{-7}, acceleration occurs at such a rate that malformations develop [5]. At a concentration level of 10^{-7}-10^{-6}, such thyroxin-induced malformations lead to a developmental block, or even to death, in Rana temporaria (unintentional results of earlier studies, see [4]).

1. Earlier work had provided indications that thyroxin at medium concentration levels may have an inhibiting effect, and that this effect may be varied by way of the preparation process, especially via gradual dilution and succussion of the trial substance [6]. However, experiments involving high dilutions suggest that this inhibition occurs only when the animals are in a certain starting position. When conducting experiments which progress relatively quickly thyroxin solutions at medium concentration levels

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could also be expected to have a stimulating effect, analogous to the conditions which apply to high dilutions.

The experiments described later in this text (1.1) aimed to examine the effect of conventionally prepared thyroxin solutions at lower and medium dilution levels. The experiments described in 1.2 explored the question whether effects determined in 1.1 could be influenced using a special preparation process, particularly by way of gradual dilution and succussion. These experiments were conducted in view of the possible risks in the production of conventional hormone preparations [6], as well as of a certain production method used in homoeopathy [7,8, see also the article regarding research classification in homoeopathy in this book].

2. Further experiments dealt with the biophysical properties of the process of information transference. Since even dilutions which should theoretically no longer contain a single thyroxin molecule have a biological effect, it must also be possible to transfer "molecular bio-information" through water ([8-15], an overview can be found in [16]). The observed inhibition of young frogs' climbing activity, for example, can only be explained in this way [8]. It has been assumed that perimolecular energy fields play a role in the interactions between biologically active substances and the organism [further literature in 16, pp. 246].

In the experiments described in 2.1.1, the effect of the thyroxin dilution DH30 (concentration nominally 10^{-30}, test basin concentration after the first dose accordingly 10^{-35}), which was added to the basin water drop by drop, was examined. In the experiments described in 2.1.2, this thyroxin dilution was put into glass vials, which were subsequently sealed and hung into the basin water. In the experiments described in 2.2, an attempt was made to digitize the information contained in the thyroxin dilution.

3. In these tests, an attempt was made to transfer the information contained in molecular thyroxin dilutions by way of an electronic device (bio-resonance amplifier).

4. In these experiments, a thyroxin solution with an inhibiting effect on metamorphosis activity, and one with a stimulating effect, were administered together. The intention was to examine the "principle of similarity" known from homoeopathy as to its applicability in this case [7, and Research Classification in this volume].

5. The examinations described above were supplemented by additional experimental variations. Based on initial, rather coincidental indications, as well as on theoretical considerations (see Table 1), the question was explored, whether a stimulating effect could also be created with a thyroxin dilution which had shown an inhibiting effect in previous studies.

Note: This article focuses above all on experiments which were initially carried out in one of the Graz laboratories by W.P or C.E. and on account of their positive outcome were later repeated by other researchers in Graz or at other research centres. It does not include experimental variants which showed no significant effects of the test substances upon first trial in Graz. These experiments depart from those presented here only in terms of the time of season, and consequently the average speed of metamorphosis, or the elevation of the biotopes from which the animals were taken. For further details on this the reader is referred to [4].

OVERVIEW

The series of studies presented here was conducted during the years 1990-1997, mostly by several independent researchers and in several independent laboratories. Next to a critical examination of older data, it concerns the assumption that low energy (correlated, long-range) electromagnetic oscillations are a part of bio-information.

1. Lower and medium dilution levels

The effect of thyroxin solutions on the speed of transition from the two-legged to the four-legged stage in the grass frog *Rana temporaria* was examined. The solutions were added directly to the basin water at regular intervals. Starting from the first dose, the dilution was each time increased by the factor 10^5.

1.1 Conventional dilution of thyroxin

Reversal of the known hormonal effect?

A thyroxin solution, which was prepared in one step and without planned succussion, i.e. to a large extent merely with the aid of diffusion, and which, after the initial dose into the basin, was present at a concentration of 10^{-9} g/ml (10^{-9} M, from here onwards

simply called 10^{-9}), had a stimulating effect on metamorphosis activity. This effect was no longer detectable at a concentration of 10^{-11ff}.

1.2 Special (homoeopathic) dilution process, low dilution level - reversal of the known hormonal effect?

In some, but not all of the experiments carried out, an inhibiting effect was found at a concentration of 10^{-11} and 10^{-13} , if the thyroxin solution had been prepared according to homoeopathic rules, that is using gradual steps of dilution and intermittent succussion. Certain components of the production process of conventional hormone preparations could unintentionally neutralize the preparations' desired effect, or even reverse it. On the other hand, such an effect reversal could be deliberately used therapeutically.

2. Non-molecular transference of hormonal information in homoeopathic high dilutions -clear reversal of the hormonal effect

2.1 Water as intermediate storage medium

In the experiments described in 2.1.1, the influence of high thyroxin dilutions on metamorphosis activity was examined. The solution added in drop form, and the corresponding water control, were also diluted in accordance with the procedure described above, i.e. in steps of 1:10, with subsequent succussion after each step. Based on the way it is produced and on its nominal concentration of 10^{-30}, this high-level thyroxin dilution is called DH30. After the initial dose was added to the basin, the nominal concentration stood at 10^{-35}. The thyroxin solution DH30 caused metamorphosis activity to slow down. In the experiments described in 2.1.2, the thyroxin solution DH30 and the corresponding water control were put into soft soda glass vials, which were subsequently sealed and hung into the basin water. In some, but not all experiments, this, too, caused a metamorphosis inhibition.

2.2 A data carrier as intermediate storage medium (CD)

In the experiments described in 2.2, vials containing the same solutions as in 2.1 were put into an input coil, which was connected to a filter and an amplifier. Frequencies were digitized, transferred onto CD in a multiplex procedure, and from there transferred onto an output spool, into which glass vials filled with water were put as "receivers". The trial substances thus produced were put directly into the basin water in regular intervals. In this first experiment, an inhibiting effect was found, comparable to that in 2.1.

3. Transference using electronic amplifiers (bio-resonance device)

In these experiments, glass vials containing an unsuccussed thyroxin one-step dilution of the (toxic, metamorphosis inhibiting) concentration 10^{-3} (10 mg for 10 ml ethanol, 1,25 mM, from here on called DD3), or water respectively, were placed into an input coil, one end of which was connected to a special amplifier (frequency linear from the DC region to the HF region) via an isolated individual wire. Glass vials containing water were placed into an output coil connected in the same way. The substances thus produced were put directly into the basin water at regular intervals. Again, an inhibiting effect was found.

4. Curative effect in cases of hormonal hyperstimulation

A combination of the unsuccussed one-step dilution thyroxin 10^{-4} (from here on called DD4) and a thyroxin solution 10^{-8} (DH8), prepared according to homoeopathic rules, was examined in a direct pipetting procedure, as had been done in 2.1. Hence, after the initial dose, both solutions had been diluted by the factor 10^{-5}. In this explorative experiment the stimulating effect of Thyroxin DD4 (see 1.1) was reversed by simultaneously adding a dose of DH8.

This finding is interpreted with the "similarity rule" in mind, one of homeopathy's fundamental principles (see the article regarding the classification of pure research in homoeopathy in this book).

5. Symptom reduction and symptom increase as bivalent possibilities of one and the same aspect of hormonal information

With the continuation of treatment as in study 2.1.2 (constant presence of thyroxin DH30 in glass vials) beyond the juvenile stage, a clear acceleration of the water-land transition could be observed when the juvenile frogs left the basin water, after an initial inhibition of the transition to the four-legged stage. On the other hand, an inhibiting effect was observed with regards to climbing activity, when as yet untreated juveniles were treated with thyroxin DH30 on a short-term basis (minutes). The results of study 5 are discussed to the effect that, next to the animals' starting position, it is the frequency at which signals are given, which decides whether the information of thyroxin DH30 leads to inhibition or stimulation.

1. Study concerning the reversal of the known hormonal effect at the medium dilution level

Origin and developmental stage of the animals. The main experiments were carried out with Rana temporaria from various Austrian ponds (altitude 400m - low site - and 1500m above sea level - highland -, see results section) in the summer. Additional experiments were carried out with Bufo bufo. For the experiments only tadpoles in a two-legged stage were used. This stage is defined by the degree to which the hind legs, which are little developed at this point, are spread. Ideally, the spread is such that it is just possible to look through the triangle formed by the tail and the upper and lower thighs, and it thus corresponds to the range of Gosner's stage 31 [17]. In the different experiments, the tadpoles were observed all in all 10 - 20 times in eight-hourly intervals. During this observational period, it only took a few minutes each time for the pre-formed forelegs to break through their skin pockets. Due to its temporal discreteness, the attainment of the four-legged stage appears to be a very good parameter.

Other experimental conditions. The animals' development was observed in disposable synthetic basins. The room temperature normally was 23+/-1-C. Indirect daylight was predominantly used as a source of light, and blanched lettuce leaves as food ad libitum. Each basin contained 300 ml of tap water per animal. The number of animals per basin was the same in each experiment (usually 10 - 20).

Preparation of the solution and its administration to the laboratory animals. The tadpoles were exposed to the following solutions.

1.1 Conventional dilution process

Preparation of one-step thyroxin dilutions by diffusion. These solutions were prepared by slowly dissolving L-tetraiodothyronine-sodiumpentahydrate (T_4) (careful turning of the containers, diffusion) in mixtures of ethanol and bi-distilled water: 10 mg T_4 in 100 ml 40% ethanol for DD4, which thus stood at 10^{-9} T_4 after a single dose was added to the basin water; 1 mg T4 in 100 ml 4% ethanol for DD5 corresponding to 10^{-10} T_4; and 0.5 mg T4 in 500 ml 0.4% ethanol for DD6, leading to a concentration of 10^{-11} T_4. Analogue ethanol-water mixtures were used as *controls.*

Preparation of thyroxin dilutions by gradual pipetting. In the preparation of these solutions, 10 mg of T_4 was dissolved in 100 ml of 40% ethanol (intermediate product: 10^{-4} T_4), by slowly turning the bottle (medicine bottle with screw-on lid) at a temperature of 35 °C. Using disposable material, 1 ml of this was then pipetted into a sterile, 20 ml medicine bottle containing 9 ml of bi-distilled water (dilution 1:10). The thyroxin dilution thus produced was called DP5. From it, the thyroxin dilutions DP6 ff were produced in an analogous fashion. Normally, analogue ethanol-water mixtures were used as *controls*.

1.2 Special ("homoeopathic") dilution process

Gradually diluted and strongly succussed thyroxin. In the preparation of these solutions, the same process as above was used (pipetting). The derived dilution of 10^{-5} T_4 was then succussed according to a standardized procedure [8]:

in short, regular intervals, and with the lid tightly screwed on, the medicine bottle's bottom is struck 30 times against a solid hard rubber base, in order to create a mechanical shock effect. Afterwards it is left standing for one minute (rest period). In principle, this procedure is in accordance with the rules of homoeopathic practice. The thyroxin dilution produced in this way was called DH5. From it, the thyroxin dilutions DH6 ff were produced in an analogous fashion.

Control solutions. In different experimental blocks, a.) unsuccussed water and analogue water-alcohol mixtures (b. unsuccussed, c. succussed - WDH -) were used as control solutions (see results).

All DD, DP, and DH thyroxin solutions and their matched water controls were sampled several times for analysis with a total T_4 assay (measuring range 4.10^{-9} to $2.4.10^{-7}$ gT4/ml). Except for occasional threshold-level reactions in the water controls and a single overshooting value in one of the thyroxin dilutions the measured values never deviated from the nominal concentration by more than a factor of 2 [45].

Administration of the solution. In eight-hourly intervals, 3ml of test solution (thyroxin solution and control solution) per animal and 300 ml of water was altogether pipetted 20 times into the basin. This means that DH6, for instance, was 10^5 times diluted after the first dose had been added, bringing it to a T_4-concentration of 10^{-11}, while the tenth dose raised it to 10^{-10}

Ascertaining and evaluating the data. As the duration of the experiments differed according to the time of season (range 3-10 days) it was decided to normalize the obtained data with respect to time. This was done on the assumption that differences in speed of metamorphosis attributable to thyroxine treatment would override differences in duration between experiments. Following a suggestion by R. Liidtke, Institut fiir Medizinische Informationsverarbeitung Tübingen University, the points in time when the 10th, 20th, 30th etc. percentile of water control animals had reached the 4-legged stage were defined as reference points. The time interval between reference points ranged 6-26 hours. In this way it was possible to aggregate for each of the reference points the cumulative frequency of animals treated with a specific solution having reached the 4-legged stage. Aggregate values obtained at the reference points for each of the types of treatment were analysed by chi-square tests using 4-field Tables with aggregate frequencies of 2- or 3-legged animals as complement. Unless stated otherwise the p-values quoted in the text refer to chi square tests. In addition, data of studies with homoeopathically prepared dilutions DH6, DH8 and DH30, added directly to the basin water, were compared by means of survival analysis.

Note: as a consequence of the above mentioned method of ascertaining the data, p-values may eventually be different from those calculated for previous publications.

Laboratory, researchers and coding. For details on laboratories and researchers, see the results section. The full names and affiliations of the researchers are to be found in the acknowledgments section. All experiments were carried out blindly.

2. Non-molecular transfer of the high dilution's hormonal information

2.1 Water as intermediate storage medium for hormonal information

2.1.1 Use **of a succussed solution added to the basin water in drop form**

Animals as is described in 1) were used. For details, see results section.

Other experimental conditions. During the main experiments, room temperature stood at 19+/-1 oo C. Further details are described in 1.

Preparation of the solutions and their administration to the laboratory animals. The principle of the preparation of the thyroxin dilution DH30, and of the analogue water control, has been described in 1.2. In order to exclude the possibility of hormone-specific pollutions, we took the precautions described in [4, p. 46]. In 48-hourly intervals, doses of 2-3 drops were added respectively to the 51 and 81 test basins containing tap water. The effect of the gradually diluted, strongly succussed thyroxin solution DH30 on the tadpoles was observed as described in 1.

Ascertaining and evaluating the data. This was done as in 1. The development towards the juvenile stage was followed by determining the corresponding cumulative frequencies *(fb).* Standard deviations were found using a process of variance analysis.

For *experimental laboratories and researchers*, see results section.

2.1.2 Use of a succussed solution contained in sealed glass vials

Administration of the solutions to the laboratory animals. The solutions (DH30) were administered to the animals as follows: 8ml of the test- or the control solution were poured into soft soda glass vials with an optic transmission spectrum >350 nm, which were subsequently sealed. The coded vials were hung into the respective basins. In one experiment (C.L.), thyroxine *DH6* was compared to control. The use of substances in sealed glass vials for scientific and therapeutic purposes has been tried on several occasions (van Wijk and Wiegant, Smith, Flyborg, Hoffmann, cited in [16, p.48]). *For further details, see 1. and results section.*

2.2 A data carrier as an intermediate storage medium

Preparation of the solutions and their administration to the animals. Brown glass bottles (medicine bottles) containing thyroxin solution DH30 or control water DH30 respectively were placed into an input coil connected to a filter and an amplifier with an amplification of 10 . Frequencies in the Hz and the kHz regions were digitized via the Nyquist frequency, buffered in a RAM, and transferred onto CD using a multiplex procedure. The noise-muted, filtered signal was brought back to the original analogue level by the factor 10^{-6} . During the playback process, only the region between 20 Hz and 20 kHz was taken into account. The glass bottles were placed into the output coil for 4 minutes (manufacturer of the utilized device: Subwave, Austria). Following this process, the original substances were again strongly succussed (30 strikes). Of the trial substances thus produced, 3 drops were added to the basin water after light succussion in 48-hourly intervals. *For further details, see 1. and results section.*

3. Transference via bio-resonance device

Preparation of the trial substances and their administration to the animals. After repeated light succussion, brown glass bottles containing a 1 mM thyroxin solution (DD3), or control water respectively, were placed into an input cup connected to a special amplifier (linear from DC to HF; manufacturer: Regumed and Med-Tronik, both FRG) via an isolated individual wire. Brown glass bottles containing water (200 ml in a 220

ml volume) were placed into an output beaker, which had been connected in the same way, for 4 minutes (device built by Regumed) and 15 minutes (device built by Med-Tronik) respectively. The options "A" (no phase reversal) and "Amplification 40", offered by the manufacturers, were selected. Following this process, the substances in the output bottles were struck 30 times in short, regular intervals against a base, as in the process of "succussion" (method 1.2). For each of the trial substances thus produced in the output spool, 8 ml of basin water were replaced by 8 ml of trial substance in eight-hourly intervals. Before being added, the substances were again lightly succussed. Explanations concerning the standardization of this method can be found in [20-25]. *For further details, see 1. and results section.*

4. Curative effect in cases of hormonal hyperstimulation

In these experiments the combined administration of the thyroxin solutions DEM (concentration: 10^{-4}, basin water concentration after the initial dose: 10^{-9}, after the tenth: 10^{-8}) and DH8 (10^{-8}, final basin concentration: 10^{-13} or 10^{-12} respectively) was compared to the combined administration of thyroxin DD4 and water. In addition, a water control group was used. In eight-hourly intervals, all in all 20 doses of 3ml of trial substance (or 6ml, under combined administration) were added in drop form per animal and 300 ml of basin water. *For further details, see 1. and results section.*

5. Symptom reduction and symptom intensification as bivalent possibilities of one and the same aspect of hormonal information

The target criterion of these experiments was, next to the attainment of the four-legged and the juvenile stages, the animals' water-land transition. The respective treatments (see results section) were continued beyond the four-legged and the juvenile stages, until the animals had climbed out of the water of suitable aquaterraria. In the main study presented here, the treatment applied in study 2.1.2 (constant presence of thyroxin DH30 in glass vials) was continued until the target criterion of water-land transitions had also been attained.

Ascertaining and evaluating the data. The animals were first all put back into the water. Then, the number of animals climbing out of the water was monitored after 1, 2 and 3 minutes. Details of the monitoring method have been described in [8]. Aggregate values obtained at the reference points for each of the types of treatment were analysed by chi-square tests using 4-field Tables with aggregate frequencies of animals in the water as complement.

For further details, see 1. and results section.

RESULTS

1. Study concerning the reversal of the known hormonal effect at medium dilution levels

1.1 Conventional dilution process

Thyroxin solutions produced by pure diffusion. In these experiments carried out by C.E. et al. in Graz and by C.H. in Tubingen with an overall number of 170 - 200 animals per group according to the treatment, the effects of the one-step thyroxin dilutions DD4, DD5 and DD6 (no repeated pipetting, no succussion, see methods) were compared to those of the corresponding water controls. For DD4 (concentration after a single dose: 10^{-9}), the fa-levels for four-legged animals in the course of treatment stood at 10-30% above those of the respective water controls. These differences are statistically significant ($p<0.01$). The overall fa-levels for DD5 or DD6 (10^{-10} or 10^{-11}, after the first dose) were practically not different to those of the water control.

Thyroxin solutions produced by gradual pipetting. Also with thyroxine dilution DP5, DP6 or DP8, there was practically no difference to the control.

1.2 Special ("homoeopathic") dilution process

Thyroxin solutions produced by gradual pipetting and succussion.

DH4. In these experiments carried out by C.H. in Tubingen with a total of 120 animals per group, the effect of the succussed thyroxin dilution DH4 was compared to that of the corresponding water. For the test substance (concentration after a single dose: 10^{-9}), the fa-levels for four-legged animals in the course of treatment stood at 20-40% above those of the respective water controls. This difference is statistically significant ($p<0.01$).

DH6 and DH8. The effect of the dilutions DH6 and DH8 were compared to water controls. Experiments were carried out by different researchers in different laboratories. E.L., W.P. and C.H. performed experiments (blocks have a different meaning here than experiments) in Graz; J.A. and C.H. in Tubingen, and C.L. in Vienna [26; 45-47]. A total of 2300 animals was used to test thyroxine DH6 versus water control and a total of about 1400 animals to test DH8 versus control. As can be seen in Figure 1 and Table 1, in 6 out 10 different experiments the fa-values of the DH8 series were lower for the thyroxin dilution than for the matched control, three experiments showed

practically no difference, and in one there was an opposite trend. Pooling the values for all DH6 - experiments leaves practically no difference between the two groups, save for a weak inhibition (trend) in the TDH- group relative to water control towards the end of the experiment. Pooling all DH8 blocks reveals a somewhat more distinct inhibition by thyroxin relative to water control towards the end of the experiment (trend). An overall weakly significant inhibition ($p<0.05$) towards the end of the experiment is found only when the results from the medium dilution steps DH6 and DH8 are pooled. Data are not significant, when survival analysis is used, fb-levels were not recorded in these experiments. Data on further test- and control- dilutions are presented in [45,46].

DH6

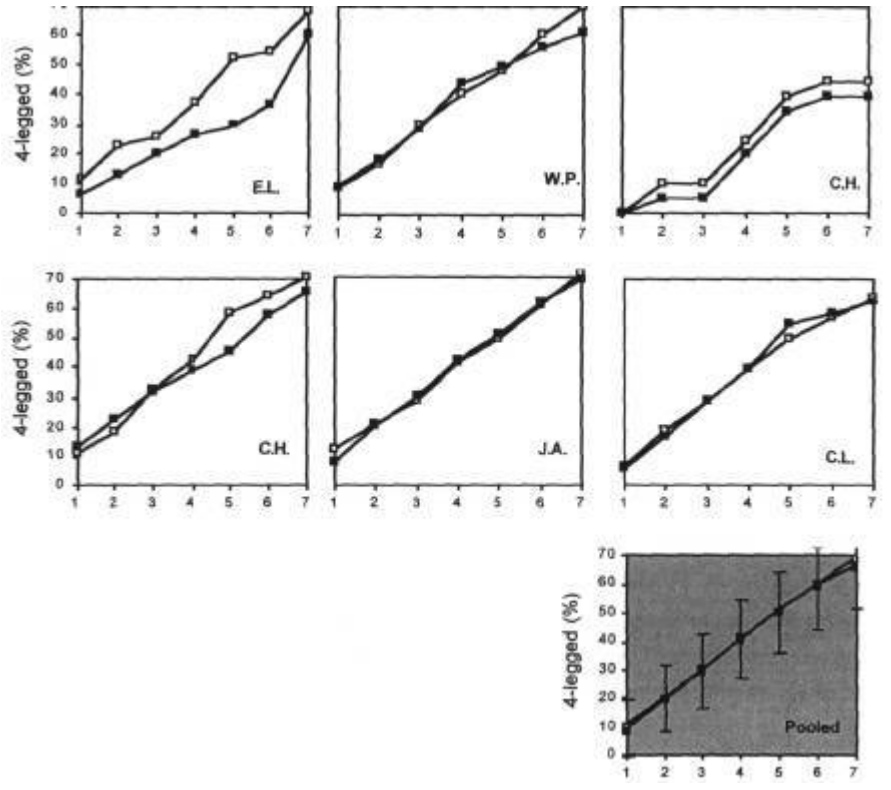


Figure 1: see figure caption next page.

DH8

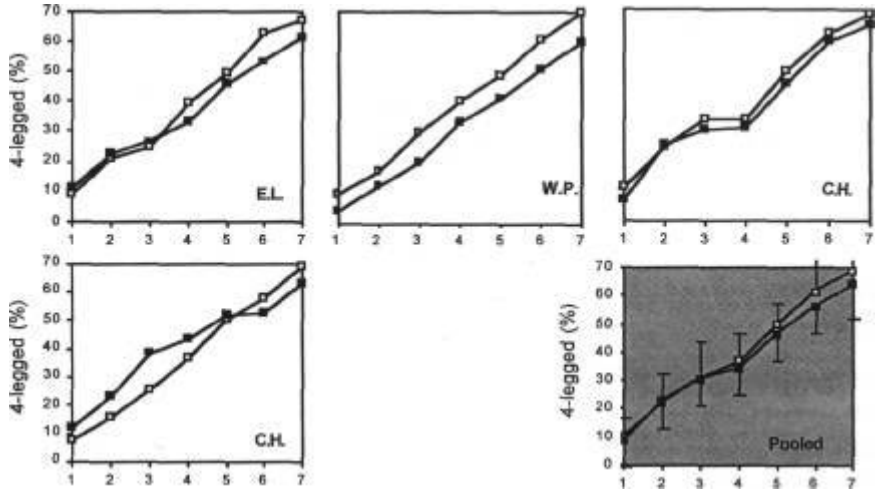


Figure 1: The effect of gradually diluted, succussed thyroxin solutions 10^{-11} and 10^{-13} on the speed of the metamorphosis from the 2- to the 4-legged stage in tadpoles. Ordinate: cumulative number of animals reaching the four-legged stage *(fa*, in %); abscissa: course of development, see methods. White squares:fa-levels of the water controls; black squares:/a-levels of animals treated with the respective test substances. TDH6, TDH8: gradually diluted, succussed thyroxin solutions, added dropwise to the basin water. WDH: homoeopathically prepared control. W: pooled data of homoeopathically and not homoeopathically prepared water controls. Absolute animal numbers are shown in Table 3.

2. Non-molecular transference of a highly diluted solution's hormonal information

2.1 Water as an intermediate information storage medium

2.1.1 Use of a succussed solution added to the basin water in drop form

DH30. The effect of the thyroxin dilution DH30 was compared to a water control. Experiments were carried out by different researchers in different laboratories: C.E. and W.P. performed experiments in Graz and R.v.W. in Utrecht [28]. A total of almost 1900 animals was used. As can be seen in Figure 2 and Table 2, in all three cases the fa-values of the TDH30 group were lower than their matched control values. This effect is retained upon pooling ($p<0.01$). Data are also significant when survival analysis is

used ($p<0.01$). Also the fb-levels (observed in Graz and in Utrecht) were significantly below those of the control groups [4].

2.1.2 Use of a succussed solution contained in sealed glass vials

"DH30V/DH6V". The dilutions DH30 or DH6 (see Figure 3), sealed in glass vials, were compared to water controls. Experiments were carried out by different researchers in different laboratories as is shown in Figure 1 and Table 3. *DH30V:* C.E., M.G., W.P., D.D. performed experiments in Graz; C.V. in Turino and H.H. in Vienna [26; 47,48]. A total of about 3400 animals was used. As can be seen from Figure 3 and Table 3 five out of altogether 6 experiments on DH30V showed lower fa-values for the test than for the control group; one (very large experiment) showed practically no difference. Pooling all DH30V experiments revealed a significant inhibition by thyroxin DH30V relative to matched water control ($p<0.01$).

As the DH6V curve in Figure 3 shows (C.L. in Vienna), this experiment also yielded lower *fa*- values for the test than for the control group (trend).

In some, but not all experiments (Graz), also the *fb*-values were monitored. There was practically no difference between the test- and the control values.

2.2 A data carrier as intermediate storage medium

"DH30CD". Here, it was aimed to store information from thyroxin dilution DH30 or from water DH30 as control on data carrier and to replay it on water that was added to the basins. Experiments were carried out by one researcher (W.P.) in Graz, involving almost 500 animals. As can be seen from Figure 4, this experiment resulted in lower fa-values for the test than for the control group ($p<0.01$). Also the fb-levels were significantly below those of the control groups [44].

3. Transference via electronic amplifier

"DD3A ". Here, it was aimed to transfer information from thyroxin DD3 or from water as control via an electronic amplifier. Experiments were carried out by two researchers: W.P. in Graz and C.V. in Torino, involving altogether more than 900 animals. As can be seen in Figure 5 and Table 5 in both experiments the fa-values for the test group were lower than in the control group. Pooling these figures led to an analogous result ($p<0.01$). Also the *fb*- levels were significantly below those of the control groups [44].

E.L. Graz 1 II r				W.P. Graz 2 II r				C.H Graz 1 IIr			
	W	TDH6			W	TDH6			WDH6	TDH6	
	(160)	(30)			(160)	(80)			(20)	(20)	
1	18	2	-	1	15	8	-	1	0	0	-
2	36	4	-	2	28	15	-	2	2	1	-
3	42	6	-	3	48	23	-	3	2	1	
4	60	8	-	4	65	35		4	5	4	-
5	84	9	**	5	78	40	-	5	8	7	-
6	88	11	-	6	97	45	-	6	9	8	-
7	109	18	-	7	112	49	-	7	9	8	-
8	115	19	-	8	127	58		8	9	8	-

C.H Tubingen 1 II r				J.A. Tubingen 2 II r				C.L. Vienna II r			
	WDH6	TDH6			WDH6	TDH6			W	TDH6	
	(120)	(120)			(600)	(600)			(300)	(300)	
1	13	16	-	1	72	50	*	1	20	18	
2	22	27	-	2	125	121	-	2	57	51	-
3	39	38	-	3	176	184	-	3	87	88	
4	51	47	-	4	251	254	-	4	119	119	-
5	70	55	-	5	299	305	-	5	149	165	-
6	77	69	-	6	365	370		6	172	175	-
7	85	79	-	7	432	418	-	7	190	187	-
8	92	90	-	8	432	418	-	8	251	238	-

	W	TDH6	
	(1150)	(115«)	
1	116	94	-
2	227	219	-
3	336	340	-
4	470	467	-
5	581	581	-
6	688	678	-
7	792	759	-
8	869	831	

Table 1: Onset of the four-legged stage in the experiments represented in Figure 1, expressed in absolute numbers. 11 r: Rana temporaria from a low site; hl r: from the highland biotope. -: $p>0.05$; *: $p<0.05$; **: $p<0.01$ (differences between test group and control group, chi-square test). Note: When, as in two out of altogether 6 cases, the test and matched control group within an experiment were of different size, then the larger group was accorded a correspondingly smaller weight in the overall pooling. For example, if N was 80 for the tests group and 160 for the control group, then all *fa* -values of the control group were divided by 2 so that the subsequent pooling would be applied to groups of equal weight.

E.L. Graz 1 II r			
	W	TDH8	
	109	177	
1	10	20	
2	23	39	
3	27	47	-
4	43	58	-
5	54	81	
6	68	94	-
7	73	109	-
8	84	126	-

W.P Graz 2 II r			
	W	TDH8	
	160	80	
1	15	3	-
2	28	10	-
3	48	16	-
4	65	27	-
5	78	33	
6	97	41	-
7	112	48	
8	127	56	-

C.H Graz 1 II r			
	W	TDH8	
	320	320	
1	37	23	
2	79	80	
3	107	97	
4	109	98	-
5	158	145	-
6	199	190	-
7	219	208	
8	253	253	_

C.H Tubingen 1 II r			
	WDH8	TDH8	
	120	120	
1	8	14	-
2	19	28	-
3	31	46	*
4	44	52	-
5	60	62	-
6	69	63	-
7	83	76	-
8	91	92	-

Pooled data			
	W	TDH8	
	629	629	
1	63	52	
2	135	142	
3	189	188	
4	229	213	
5	311	290	
6	385	352	
7	431	399	-
8	491	478	-

Table 1 continued.

In summary, in most, but not all experiments, the following treatment forms lead to a delay (trend or significant effect) in metamorphosis in comparison to the animals correspondingly treated with water: 8-hourly addition of thyroxin dilution DH6 or DH8 in drop form (poor effect when the respective data are pooled); 48-hourly addition of thyroxin dilution DH30 in drop form; treatment with a thyroxin dilution DH30 sealed inside of glass vials by hanging the vials into the basin water (small effect when the data are pooled); addition in drop form of water, which had previously been exposed to digitized information of the thyroxin dilution DH30 stored on CD, into the basin water (only one set of experiments performed); addition of water, which had previously been exposed to electronically transferred information of the thyroxin dilution DD3, into the basin water.

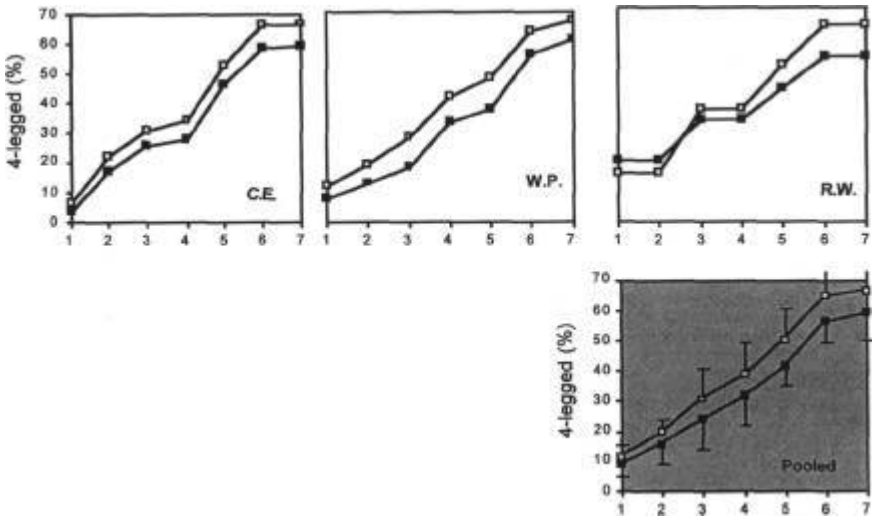


Figure 2: The effect of succussed thyroxin solution 10^{-35}. DH30: gradually diluted, succussed thyroxin solutions, added dropwise to the basin water. Absolute animal numbers are shown in Table 2.

C.E, Graz 1 hl r				W.P. Graz 2 hl r				R.W. Utrecht 1 hl r			
	WDH30	TDH30			WDH30	TDH30			WDH30	TDH30	
	273	276			475	475			180	180	
1	17	10	-	**1**	58	36	*	1	29	36	-
2	60	48	-	2	91	61	**	2	29	36	-
3	84	70		3	132	89	**	3	66	60	-
4	94	76	-	4	198	159	**	4	66	60	-
5	145	129	-	5	226	177	**	5	92	78	-
6	181	161	–	6	299	264	#	6	116	98	
7	182	164	-	7	319	287	*	7	116	98	-
8	227	211	-	8	403	352	**	8	153	151	-

	WDH30	TDH30	
	92g	928	
1	104	82	-
2	180	144	*
3	282	218	**
4	358	294	**
S	463	383	**
6	596	521	**
7	617	547	**
8	783	712	**

Table 2: Onset of the four-legged stage in the experiments represented in Figure 1.

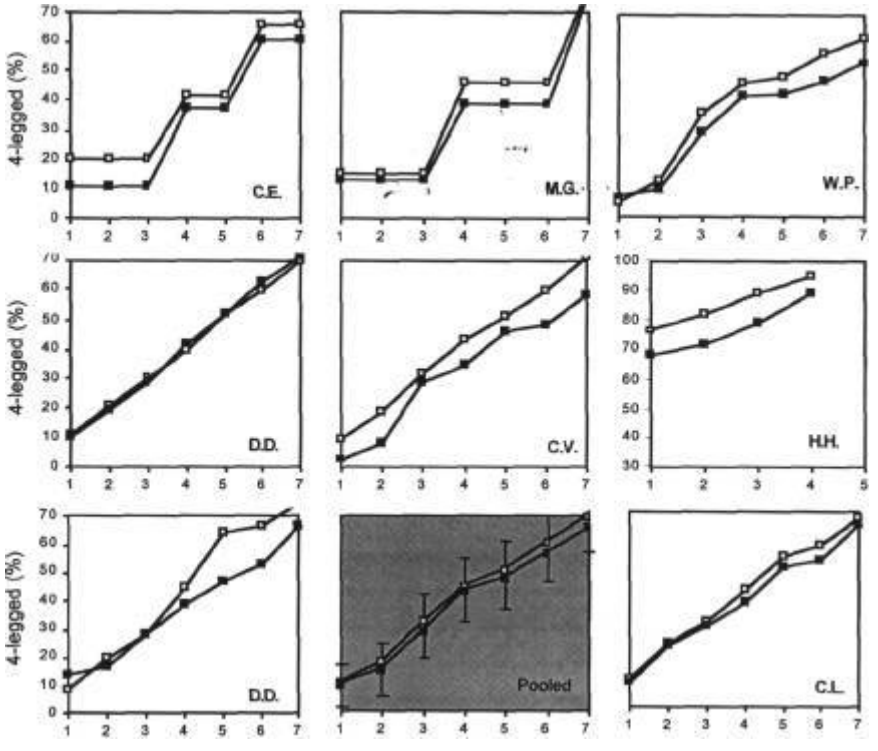


Figure 3: The effect of succussed thyroxin solution 10^{-235}, sealed in glass vials. DH30V: gradually diluted, succussed thyroxin solution, sealed in glass vial and hung into the water basin. Absolute animal numbers are shown in Table 3.

4. Curative effect in cases of hormonal hyperstimulation

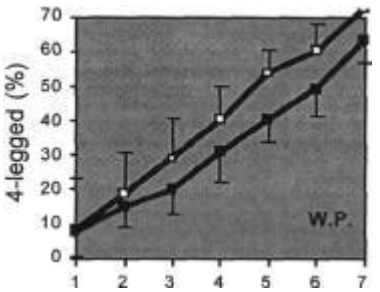
A combined administration of the thyroxin dilution DD4 (which, when administered on its own, has a stimulating effect, see 1.1) and the thyroxin dilution DH8 (which, on its own, has an inhibiting effect, see 1.2) was compared to the combined administration of DD4 and water, and to a water control. This first experiment was carried out by C.H. in C.E.'s laboratory, using 20 animals in each of the three groups.The combined addition of DD4 and water caused an acceleration of metamorphosis activity in reference to the water control, while the combined addition of DD4 and DH8 caused metamorphosis activity *to slow down*. The difference in the fa-levels of both groups was 20-25% ($p<0.01$) at the same sampling points [26].

C.E.	Graz 1 II b			M.G.	Graz 1 hl r			W.P.	Graz 2 IIr		
	WDH30V	TDH30V			WDH30V	TDH30V			WDH30V	TDH30V	
	180	180			126	126			612	612	
1	36	20	*	**1**	19	16	-	**1**	32	45	_
2	36	20	*	**2**	19	16	-	**2**	76	62	_
3	36	20	*	**3**	19	16	-	**3**	221	183	*
4	75	67	-	**4**	58	49	-	**4**	281	258	
5	75	67	-	**5**	58	49	-	**5**	297	260	*
6	118	109	-	**6**	58	49	-	**6**	346	288	**
7	118	109		**7**	99	96	_	**7**	377	325	**
8	159	153		**8**	99	96	-	**8**	451	413	*

D.D.	Graz 2 II r			C.V.	Turin II r			H.H.	Vienna 2 hl r		
	WDH30V	TDH30V			WDH30V	TDH30V			WDH30V	TDH30V	
	612	612			72	72			108	108	
1	68	62	-	1	7	2	-	**1**	4	6	-
2	128	121	-	2	14	6		2	9	15	-
3	184	178	-	3	23	21	-	3	47	53	-
4	242	255	-	**4**	31	25	-	**4**	50	58	-
5	316	318	-	5	37	33	-	**5**	50	58	-
6	365	382	-	6	43	35	-	6	69	73	-
7	428	438	-	7	51	42	-	**7**	83	74	-
8	480	496	-	8	55	47	-	8	89	78	

D.D.	Graz 2 II r (Quartz)			POOLED DATA				C.L.	Vienna 2 hi r		
	WDH30V	TDH30V				**TDH30V**			WDH6V	TDH6V	
	36	36			**1746**	**1746**			300	300	
1	3	5	-	**1**	**173**	**15?**		**1**	32	27	-
2	7	6		**2**	**295**	**251**	*	2	68	65	-
3	10	**10**	-	3	**551**	**491**	*	3	93	86	-
4	16	**14**	-	**4**	769	**741**	-	**4**	127	111	-
5	23	17	-	**5**	**874**	819		5	161	150	-
6	24	19	-	6	1045	975	*	6	173	157	-
7	27	24	-	7	1208	1131	* *	7	202	196	
8	28	28	-	**8**	**1390**	1339		8	232	229	-

Table 3: Onset of the four-legged stage in the experiments represented in Figure 3.11 b: Bufo bufo from a low site. Quartz: in this experiment, quartz glass vials were used instead of soft soda glass vials. For further information, see Figure 3. Note: One of these experiments (C.E.) was carried out with Bufo bufo. They have been included in the pooling to give a preliminary overview.



W.P Graz 2 II r			
	WDH30 CD	TDH30 CD	
	234	**234**	
1	**20**	**19**	
2	**44**	**36**	
3	**68**	**47**	
4	**95**	**73**	
5	**126**	**95**	* *
6	**141**	**115**	*
7	**169**	**148**	*
8	**183**	**160**	*

Figure and Table 4: The effect of information from thyroxin, stored on a compact disk (DH30CD). Absolute animal numbers are shown in Table 4.

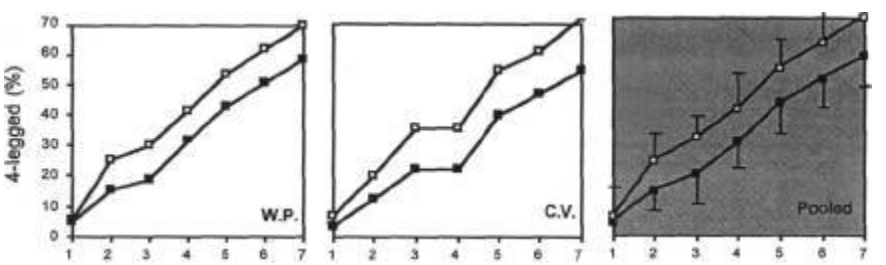


Figure 5: The effect of information from thyroxin, transferred via an electronic amplifier. (DD3A). Absolute animal numbers are shown in Table 5.

W.P. Graz2 IIГ					C.V. Turin II r					Pooled data,		
	WDD3A	TDD3A			WDD3A	TDD3A			WDD3A	TDD3A		
	378	378			90	90			468	468		
1	21	17	-	1	6	3	-	1	27	20		
2	95	57	**	2	18	11	-	2	113	68		
3	114	71	**	3	32	20	*	3	146	91		
4	158	120	**	4	32	20	*	4	190	140	**	
5	203	162	**	5	49	36	-	5	252	198		
6	234	192	**	6	55	42	-	6	289	234	*#	
7	262	220	**	7	65	49	*	7	327	269	**	
8	291	244	**	8	70	50	**	8	361	294	**	

Table 5.: DD3A

Table 5: Onset of the four-legged stage in the experiments represented in Figure 5. For further information, see there. The complete set of raw data has been published in [44].

5. Symptom reduction and symptom intensification as bivalent possibilities of one and the same aspect of hormonal information

This section summarizes a series of studies. When the test substance thyroxine DH30 was added at intervals of 8 hours, an *acceleration* was achieved as a result of experiments carried out on highland animals in autumn, when the dose interval in protocol 2.1.1 was reduced to 1/6. In fact, both the transition from the two-legged to the four-legged stage as well as that from the four-legged to the land stage [4, p.57] were accelerated.

Furthermore, in Graz, C.E. et al. performed experiments with 360 highland animals treated with thyroxin DH30 and 360 animals treated with water DH30, added at intervals of 8 hours. Again as above, the thyroxin *fa-level* was *above* the control level (5 to 10%, $p<0.05$). CE et al. also performed several experiments with lowland animals, with unclear results ($p>0.05$). In Tubingen, C.H. performed experiments with 120 lowland animals per group. Again as above, the thyroxin *fa-level* was *above* the control level (5 to 10%, $p>0.05$).

However, in the absence of an interval reduction (continuation of study 2.1.1), neither the transition from the 2 to 4-legged stage nor that from water to land was stimulated, the inhibiting effect prevailing instead in both cases [4, p.56]. The inhibiting effect was also observed with regard to climbing activity (water-land), when as yet untreated juveniles were treated with thyroxin DH30 on a short-term basis (minutes), irrespective

of whether the test substance was added directly in drop form (C.E., W.P., [8], significant results), or locked into vials (C.E., W.P., M.G., F.W., [4, p.45-48], trends).

With the continuation of treatment as in study 2.1.2 (constant presence of thyroxin DH30 in glass vials) beyond the juvenile stage, a clear acceleration of the metamorphosis leading to the land stage could be observed upon leaving the basin water, after an initial inhibition of metamorphosis [4, p.58].

Experiments were carried out by different researchers: C.E., W.P. and M.G. performed experiments in Graz and H.H. performed experiments in Vienna. As can be seen in Figure 6 all four experiments yielded higher fa-values for the thyroxin DH30 group than for water control. Pooling the fa-values led to analogous result ($p<0.01$).

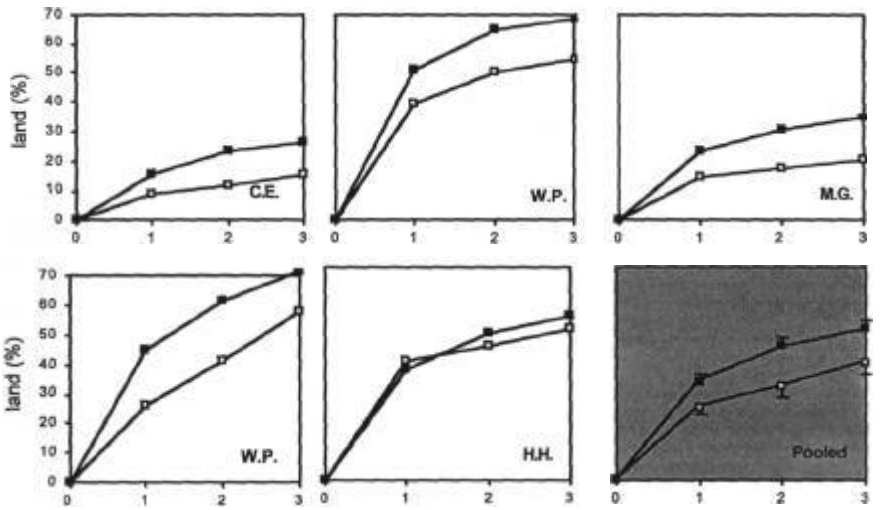


Figure 6: The effect of the test substance thyroxin DH30, sealed in glass vials, on the speed of the transition from water to land, expressed in terms of climbing activity of the juvenile frogs. Ordinate: cumulative number of animals going on land *(fc*, in %); abscissa: time in minutes, see methods. White squares: *fc*-levels of the water controls; black squares: fc-levels of animals treated with the test substance. N: absolute numbers of animals. Explanation on further symbols can be found in the legend to Figure 1.

Note: In taking account of the different number of animals per basin in the studies performed by the different researchers (e.g. 16, 18 or 20), the Standard deviations given in the grey fields were always calculated sets of data where the number of animals per basin was the same (e.g. 18 animal). Thus, the Standard deviations shown do not refer to the pooled data, but are representative of identically performed experiments.

In summary, long-term treatment with thyroxin DH30, sealed in glass vials leads to stimulation of metamorphosis to the land animal, observed in terms of climbing activity.

DISCUSSION

It is well known from experimental zoological physiology that conventionally produced thyroxin solutions in concentrations of 10^{-8} have a stimulating effect on amphibian metamorphosis. Explorative experiments indicate that this stimulation does not depend on whether the final concentration was reached via a single dose of an appropriately concentrated thyroxin solution at the start of the experiment, or via several doses added in intervals of 8 hours.

C.E Graz 1 II b				W.P **Graz 2 II b**				M.G. Graz 1 II r			
	WDH30V	TDH30V			WDH30V	TDH30V			WDH30V	TDH30V	
	90	90			26	26			72	72	
0	0	0		**0**	0	0		0	0	0	-
1	8	14	-	**1**	10	13	-	1	10	16	
2	11	21	*	**2**	13	17	-	2	12	22	
3	14	24		**3**	14	18	-	3	14	25	
W.P Graz 2 II r				**H.H. Vienna 1 hl r**				Pooled data			
	WDH30V	TDH30V			WDH30V	TDH30V			WDH50V	TDH30V	
	112	**112**			80	90			380	380	
0	0	0		**0**	0	0	-	0	0	0	
1	29	50	*	1	31	33	-	1	89	**123**	*
2	46	67	*	2	35	43	-	2	**118**	**167**	* *
3	64	80		3	40	49	-	3	**147**	**189**	* *

Table 6.: DH30V, climb.

Table 6: Onset of the land stage in the experiments represented in Figure 6. For further information, see there. Note: this Table gives the means of the aggregate values of animals for five consecutive runs of the water-to-land experiment.

The solutions with final concentrations of 10^{-11} ff, which were tested in our study, in some, but not all experiments, deviated from current expectations with regard to the effects of thyroxin solutions. In cases of solutions prepared by gradual dilution *without* succussion, the concentration-effect curve normally aligned itself with that of the water control, as expected. However, by one researcher, with progressive dilution, a trend towards inhibition at the final concentration level of 10^{-13} ff has been reported [26]. In the case of solutions prepared *via gradual dilution and succussion,* in some, but not all

experiments, inhibition already occurred at low levels of dilution (10^{-11}, DH6, and 10^{-13}, DH8).

These trends, however, may be in line with fundamental assumptions concerning hormesis [27] and homoeopathy. The concept of hormesis refers to unsuccussed dilutions especially of xenobiotic substances (substances biologically unknown to the organism) at the medium concentration level. It states that dilutions can cause effects which are opposite to those of the original solution from which they are derived [27]. These trends point to the possibility that the production process used with conventional hormonal preparations may neutralize, or even reverse, the letter's intended effect [6]. They are also noteworthy, and should be discussed, with regards to the methods of medicine production commonly used in homoeopathy.

Homeopathy's "potency rule" [7] states that such effect reversals may be intensified by preparing the dilution according to a standardized procedure of gradual dilution and strong succussion [7, 27].

The experiments involving thyroxin DH30 conducted in study 2 provided additions to the corresponding results of study 1. In particular, it seemed that the thyroxin DH6- and DH8-induced effect reversal observed in (1) intensifies at the extremely high dilution level (DH30). An inhibiting effect was most apparent with 48-hourly doses in autumn [13] (2.1.1), where natural development progresses relatively slowly. Development may also be stimulated when metamorphosis progresses relatively quickly, as a result of the season (summer). The fact that, in appropriate seasonal conditions, thyroxin DH30 can apparently also develop its inhibiting effect through glass walls, (2.1.2, [28]) and that it is possible to store the underlying information on a data carrier [29,44], confirms the suspected non-molecular nature of the effect of this solution, which was in principal prepared according to the homoeopathic pharmacopoeia [30].

Study 3 provided further confirmation of the results of study 2.2. By way of transference via an electronic amplifier, it seems to be possible to imprint information of the thyroxin solution DD3 onto a water sample. The result was, again, an inhibition of metamorphosis activity [44].

In all experimental variations looked at in studies 1, 2 and 3, to different degrees, the cumulative frequency of four-legged animals started to fall behind that of the control

animals in the course of treatment when the respective data were pooled. However, it has to be stressed that two comparatively large experiments, one with DH6 and one with DH30, sealed in glass vials, could not confirm the respective overall results with DH6 and with sealed DH30, and that one experiment with DH8 was contradictory to the overall result with DH8. We have no obvious explanation for the apparent trend that results initially obtained for a certain experimental variant generally turned out more significant than in subsequent attempts at reduplication by other researchers or in other laboratories. With regard to this case and to similar findings in analogous cases one might hypothesize that the senior researcher on account of his experience may be using some sort of preconscious know-how to optimise the experimental protocol in details too small to be standardised [50]. Directly researcher-dependent effects have also been discussed in the literature [50,51].

Though we have no really incontestable findings to offer, the present studies in our view do nevertheless suggest that information of thyroxin may be transferred in several ways: it may pass over to the solution via gradual dilution in water and succussion according to a special procedure, it may exert an influence through the glass wall of a sealed glass vial, it may be transferred via electronic switching circuits and stored on CD, or it may be directly transferred electronically. This strengthens the assumption [16] that this bio-information is of an electromagnetic nature, or rather contains an electromagnetic aspect. The underlying order of such (long-range) fields, which are correlated as distinct from noise from other sources, should be described in terms of electrodynamics or quantum physics (see review article by Schulte this volume).

An explorative experiment showed that the simultaneous administration of the succussed solution DH8 reduces the stimulating effect of DD4. The finding indicating that metamorphosis activity in frogs, which has been additionally stimulated by exogenous thyroxin, can be slowed down by a dilution of that same substance, accords with homeopathy's so-called principle of similarity [7, 38, 39, 50]. In its simplest form, this rule states that a living thing, which has been poisoned by a certain substance, can be cured by the administration the same substance in crude or in highly diluted form [39]. The results suggest that the starting positions determined by a) exogenously administered synthetic L-thyroxin-sodiumpentahydrate, and b) the tadpoles' natural development, need to be differentiated.

With the continuation of treatment as in study 2.1.2 (constant presence of thyroxin DH30 in glass vials) beyond the juvenile stage, metamorphosis activity was accelerated rather than inhibited. In contrast, the respective preceding effect prevailed, at least in the autumn experiments, when thyroxin DH30 was continuously added in drop form (studies 1.2 and 2.1) until the animals reached the juvenile stage, i.e. the completion of metamorphosis was accelerated by 8-hourly doses and inhibited by 48-hourly doses. An inhibiting effect on climbing activity (water-land) was also observed when as yet untreated juveniles were treated with thyroxine DH30 on a short-term basis (minutes), irrespective of whether the test substance was added in drop form directly (statistically significant) , or locked into vials (trend). The results of study 5.1 can be discussed to the effect that, next to the animals' starting position, it is the frequency at which signals are given, which decides whether the information of thyroxin DH30 leads to inhibition or stimulation.

It seems reasonable to consider these results in relation to some typical characteristics of homoeopathic medicine. There are many reports in homoeopathic literature about high dilutions, which are capable of either intensifying or reversing the effects of their original substance in molecular concentration, depending on the experimental and clinical conditions. The amphibian model described here (high dilution level) appears to be especially suitable for demonstrating such a bivalent effect, since in this case the effect is created using one and the same experimental design.

In order to describe such effects, which are identical or opposite to those of the original substance, the terms "orthotaxic" and "antitaxic" are used (which were coined by P. Fisher in an unpublished statement).

Both of the possibilities discussed here can also be observed in humans, and have gained fundamental importance in the area of homoeopathic pharmaceutics.

Orthotaxic and antitaxic effects

Two unusual features of the effect of thyroxin DH30 have been described in the results section on results, and in [4]:

1, In experiments progressing relatively slowly, a) an initial further *inhibition* of the development towards the four-legged stage may be followed by b) a *stimulation* of the development towards the land-stage.

2. In experiments progressing relatively quickly, an initial and continued stimulation of development.

The fact that a substance in highly diluted form can have an effect of the same kind as the original substance in molecular concentration is not a new finding, but rather the basis of all homoeopathic drug testing of high dilutions [38, p.221; 40; 7]. [41] contains a report on a case of drug testing for thyroidinum, using healthy experimentees. This study was based on the hypothesis that a high dilution should, amongst other things, cause similar effects as a thyroxin solution of molecular concentration ("empirical homoeopathic poisoning study" or pathogenetic study). As in all homoeopathic drug testing, the study's aim was to identify the symptoms caused by this substance, in order to deduce, by way of the principle of similarity, those symptoms whose presence in a patient would indicate that treatment with thyroidin dilutions would be promising. The voluntary experimentees took the homoeopathically prepared thyroidin dilution DH30 in short intervals. It was a double blind experiment. Many volunteers in the verum group showed symptoms such as unrest and hyperactivity. This was attributed to the regular intake of thymidine dilution.

If one wishes to get a general idea about a living system's defence reaction to the intake of a high dilution, or its original substance, an overall view of the concepts of the so-called rebound effect, of hormesis, and of homoeopathic fundamental research proves to be revealing [42]. A dynamic process, which manifests itself as a reversal of the primary toxic effect (recovery, see [39]), is the organism's reaction to the impact of a strong pharmacon or poison. High concentrations may here lead to effects which are opposite to those brought about by low concentrations (Arndt-Schultz law, [27]).

"Recovery is the organism's reaction to aggression. It uses specific, suitable means in order to fight the aggression. Such a reaction may also be caused by an appropriate pretreatment, or by treatment after poisoning. The pretreatment triggers a learning process in the organism, while in the after-treatment, the recovery process is accelerated via a dose of additional information. The reaction may be caused by the molecule itself, or directly by the information contained in a high dilution of the toxic molecule. Both trigger a learning process" [42].

Attempts have also been made to detect in our study a parallel to various detoxification studies (F. Wiegant, [13]). Generally, during detoxification experiments, an organism is initially poisoned by a high, toxic dose of a substance, and subsequently treated with

a low dose, or a highly diluted, succussed solution, of the same substance. In a multitude of studies involving various organisms, the detoxification process could thus be accelerated in comparison to the respective control groups [see the article Classification of Fundamental Research into Homoeopathy].

In the course of our research there was only one case of hyperstimulation ("poisoning") of the animals with thyroxin.

It seems obvious to assume that the orthotaxic and antitaxic effects achieved with the homoeopathically prepared high thyroxin dilution are to be attributed to the same laws which are the basis of the orthotaxic and antitaxic effects observed in homoeopathy for the past 200 years.

Resonant frequencies of the test solutions

In laboratory collaboration with C.W. Smith, samples of the trial substances used in this study were examined as to their possible natural resonant frequency patterns. Resonance-related phenomena had already been observed in a preceding study [16, p.203; 42].

By scanning several oscillators, a frequency range of 0,1 Hz to 10 MHz was examined, in the course of which it was observed that certain frequencies seemed to lead to an interaction with the trial substance introduced into the field. This coupling of resonances was monitored via a standardized biological reaction (test person's microtremor).

In the case of gradually diluted and succussed trial substances, each of the successive preparatory steps lead to the appearance of two additional (higher) natural frequencies [16, pp. 204].

Table 7 (overleaf), left, shows the natural resonant frequency levels obtained in seven independently conducted experiments (frequency range 1-100 Hz, corresponding to thyroxin DH12).

Table 7, right, shows the levels of the trial substances 2.2 (intermediate storage on a data carrier) and 3 (transference via bio-resonance device) (frequency range 1-100 Hz, one sample point each). In this range, untreated water only shows a resonance at

8,0 Hz. In cases where a partial formation of clusters of levels occurs in samples 1-7 (for example around 3, 7, 10, 12, 16, 19, 90 Hz), corresponding frequencies can usually also be found in the electronically processed trial substances.

Keeping in mind the limitations mentioned in [16, p.206], these findings seem to be helpful in facilitating both an expanded theoretical concept of information transference, and thus also the possibility of goal-orientated physiological experiments. It is hoped that the automatic (technical) determination of such natural frequencies, as well as biological experiments involving these frequencies, will provide essential information (see also [16, p.215-218]).

Frequencies found by C.W. Smith have been generously arranged and transferred onto CD by Dr. Robert Holdrich at the Institute of Electronic Music in the College of Music, Graz.

As could be shown by way of experiments, phenomena of life are usually linked to the emission of electromagnetic waves. These emissions are fundamentally connected to all biological phenomena. Living systems possess highly developed electromagnetic systems of bio-communication. The correlation or coherency of these signals enables extraordinary characteristics of living systems to develop, e.g. the maximum possible sensibility towards low energy information at a maximum possible signal/noise ratio [16, p.250].

Specific information may be transmitted via electromagnetic frequencies when they are in phase, which distinguishes them from a multitude of unordered influences, and renders them similar to a technical laser [16, Outlook].

During the laboratory collaboration between C.E. and C.S. it was possible, through the influence of various frequencies (from Table 10), to clearly stimulate or slow down spontaneous, rhythmically swelling and fading emission activity in amphibian larvae in the low frequency range (1-100 Hz) (currently being prepared for publication). It seems reasonable to assume that this emission activity is typical for all organisms [42; measuring method as in 16, pp. 203]. The animals may be introduced either into an

	succassed		***dilution;***				***via***	*via*
1	***2***	***3***	***4***	5	***6***	7	***CD***	*amplifier*
1,3	1,5	1,5	-	-	-	-		
2,6	3,0	-	-	-	3,0	-	3,0	3,0
-	-	4,0	4,0	-	-	-		
4,8	5,0	-	-	-	-	-		
6,3	6,5	-	-	7,0	7,0	7,0	7,0	7,0
8,4	8,5	8,0	-	-	-	-		
-	-	-	9,0	-	-	-		
10,0	10,0	-	-	10,0	-	-		
-	12,0	12,0	12,0	-	-	-	12,5	13,5
-	16,0	-	15,5	14,5	16,5	16,0	16,5	
18,0	-	19,0	19,0	18,9	19,0	19,0	19,0	18,0
-	-	-	-	22,0	-	-		
42,0	45,0	-	-	-	-	-	47,0	45,0
-	-	-	-	55,0	50,0	50,0		
67,0	70,0	60,0	65,0	-	-	-		
89,0	90,0	-	-	-	90,0	90,0	87,0	90,0

Table 7: Resonant frequencies (Hz) of a trial substance from studies 2.1, 2.2 and 3. Explanations can be found in the text.

Oscillations of the living system and influence of trial substance-typical frequencies

appropriate electrical field, or into a vector-potential field (16, p. 193), which alters the speed of the emissions' swelling and fading by up to the factor 10. The animals' emission activity is synchronized as is shown in the following protocol.

Minute 0: vector-potential field, generated via oscillator and toroid coil, is switched on. Minute 10: synchronization has occurred. Three biological frequency emissions take place before minute 40. Minute 40: vector-potential field is switched off. Up to minute

80: emission activity does not materialize, beginnings of desynchronization. Minute 82: vector-potential field is switched on, followed by a frequency emission by the animals. The natural incidence of emission activity without interference lies outside the time frame of observation. In order to determine the biological frequencies emitted, the oscillator was switched on intermittently between Minutes 40 and 82 for short intervals.

This synchronization may be neutralized by way of optical separation. Further experiments showed that the animals needed to have optical contact with each other for wavelengths of up to 495 nm (yellow light, $6x10^{14}$ Hz), in order for their biological emissions to synchronize in the low frequency range. This finding could point to secondary communication via biophotons [see Bischof s article in ref. 49].

It seems that an interpretation of the findings discussed here is most feasible when the biological system is viewed as a macroscopic system (Ho, this volume). In this context, we would also like to point out the possibility of viewing the substance 'water' as a macroscopic quantum system.

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