

# THE ROLE OF NON-THERMAL LOW ELECTRIC TREATMENT ON THE ELIMINATION OF CHLOROPHENOLS FROM HUMAN BODY

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## ABSTRACT

In this work the effects of non-thermal low electric treatment on the excretion of toxicologically relevant chlorophenols from 10 probands was investigated. After the treatment with PowerTube QuickZap® (level 3, for 21 min minimum) the blood and urine samples were examined for chlorophenols including their metabolites, such as chlorophenolglucuronides. The obtained results showed a significant elimination of these substances in all investigated proband samples after the therapy. These findings point out that there is a possibility to eliminate these hazardous substances rapidly from the human body using low electric treatment.

**key words:** low electric treatment, chlorophenoles, excretion

## 1. INTRODUCTION

Chlorophenols are toxicologically risky substances and can exist in all humans living especially in middle Europe [1–9]. The sources of these substances are wood protection products, available on the European market in the years between 1970 and 1980 [10–12]. Within different studies, it was demonstrated that these products were significantly contaminated by these hazardous compounds [6, 7]. Analytical measurements of blood and urine samples from different areas in Germany confirmed these findings of contamination [8, 11]. In order to rapidly eliminate these substances from the human body, different methods were applied, but without significant success [11].

In this work we determined the extraction rates of these substances from the human body by applying PowerTube QuickZap technology. The electric field was produced from the therapeutic device Powertube QuickZap from Fritonex AG (Switzerland), which is intended for the electric stimulation of nerves. It is primarily used for

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self-treatment of different symptoms [16]. Recently, a proteomic study on the cellular responses to non-thermal low electric field in yeast revealed that a stress protein, homoserin dehydrogenase, was over-expressed [17, 18].

## 2. MATERIALS AND METHODS

All experiments with probands were carried out in Turkey because of the strong restrictions and rules in Germany concerning “Human Experiments”. The organization of the study in Turkey were accomplished by the Dr.Y.Z.P-Consulting Ltd- Muvezzi Cad. Akademik Palas.Besiktas-Istanbul. Blood was sampled from the probands on an empty stomach and immediately stabilized afterwards using a citrate buffer for avoiding coagulation. 10 ml of blood were taken two-times by venipuncture. For sampling the urine, at first the morning-urine was taken, which, however, delivered no satisfying information about metabolization, because it showed that the glucuronides contained in the urinary bladder were hydrolyzed to chlorophenols. For this reason, an additional urine sample was taken one hour after the first sampling of the morning-urine, when the bladder was completely empty, to obtain a representative urine sample. The sample was stored at –20 °C without further stabilization. All samples were frozen in super-clean sealed glass vessels, as losses of chlorophenols can be expected when applying plastic- or metal-composed containers. After applying the PowerTube device for 21 min at level 3, the blood and urine samples of all probands were analyzed once again for their chlorophenol and chlorophenolglucuronide content.

For the analysis of substances, high resolution gas chromatography (HRGC) was applied, in the following mode: Detector: 63Ni-ECD; injection: Split/Splitless; separation column: DB 1701; carrier gas: N<sub>2</sub> (3 ml/min); split gas: N<sub>2</sub> (27 ml/min); make-up-gas: N<sub>2</sub> (30 ml/min); split ratio: 1:10; injector temperature: 230 °C; detector tempera-

ture: 280 °C; temperature program: 80 – 175 °C (4 °C/min), 175 – 220 °C (15 min); injection volume: 1 µl. In the following the retention times ( $R_t$ ) of the chlorophenolacetates are listed (Table 1); the stability, response factors and calibration curves were determined for all chlorophenolacetates, and the parameters determined fulfilled all requirements for a successful quantification of chlorophenolacetates.

After liquid-solid extraction and determination of the recovery rates, the chlorophenols contained in blood and urine samples of 10 probands with characteristics as outlined in Table 2 were determined. From these probands, each three blood and urine samples were taken and ana-

lyzed with HRGC-ECD, and in cases necessary also with HRGC-MS.

### 3. RESULTS AND DISCUSSION

In Table 3 the results of the chlorophenol measurements of blood and urine samples according to proband are listed, whereby a differentiation was made between prior and after application of PowerTube QuickZap technology. For a better illustration, the results of the chlorophenol concentrations in blood and urine of each proband are additionally depicted in Figure 1.

For proband No. 1, the initial concentration of the total pentachlorophenol content in blood was ca. 16 µg/kg prior to the treatment. About 1/3 of this amount belongs

TABLE 1 - Retention times ( $R_t$ ) of investigated chlorophenolacetates.

| Substance                     | $R_t$ (min) | Substance                        | $R_t$ (min) |
|-------------------------------|-------------|----------------------------------|-------------|
| 3,4-Dichlorophenolacetate     | 10.24       | 2,4,5-Trichlorophenolacetate     | 14.99       |
| 2,4/2,5-Dichlorophenolacetate | 10.79       | 2,3,4-Trichlorophenolacetate     | 16.62       |
| 2,3-Dichlorophenolacetate     | 11.97       | 2,3,5,6-Tetrachlorophenolacetate | 17.98       |
| 2,4,6-Trichlorophenolacetate  | 12.88       | 2,3,4,6-Tetrachlorophenolacetate | 18.13       |
| 2,3,6-Trichlorophenolacetate  | 14.61       | 2,4,6-Trichlorophenolacetate     | 21.07       |
| 2,3,5-Trichlorophenolacetate  | 14.78       | Pentachlorophenolacetate         | 22.07       |

TABLE 2 - Individual characteristics of the probands

| Proband-No. | Characteristic                      | Proband-No. | Characteristic                      |
|-------------|-------------------------------------|-------------|-------------------------------------|
| 1           | 62 years of age, smoker, male       | 6           | 33 Years of age, non-smoker, male   |
| 2           | 66 years of age, smoker, female     | 7           | 38 Years of age, non-smoker, female |
| 3           | 33 Years of age, non-smoker, female | 8           | 16 Years of age, non-smoker, female |
| 4           | 40 Years of age, smoker, female     | 9           | 18 Years of age, non-smoker, female |
| 5           | 34 Years of age, non-smoker, female | 10          | 30 Years of age, smoker, male       |

TABLE 3 - Chlorophenol concentrations (in µg/kg) in blood and urine samples according to each proband.

#### Proband-No.: 1

|                           | Blood (empty stomach) |             | Morning urine |             |
|---------------------------|-----------------------|-------------|---------------|-------------|
|                           | Free                  | Glucuronide | Free          | Glucuronide |
| 2,4,6-Trichlorophenol     | 1,2 ± 0,1             | 0,5 ± 0,1   | 0,7 ± 0,1     | 1,0 ± 0,1   |
| 2,4,5-Trichlorophenol     | 6,3 ± 0,2             | 2,7 ± 0,3   | 2,9 ± 0,2     | 4,5 ± 0,2   |
| 2,3,4-Trichlorophenol     | 0,2 ± 0,1             | 0,3 ± 0,1   | 1,0 ± 0,1     | 0,1 ± 0,1   |
| 2,3,4,6-Tetrachlorophenol | 0,0 ± 0,0             | 1,3 ± 0,1   | 0,0 ± 0,0     | 0,0 ± 0,0   |
| Pentachlorophenol         | 12,0 ± 0,3            | 3,7 ± 0,2   | 4,3 ± 0,4     | 38,0 ± 1,2  |

|                           | Blood (empty stomach);<br>Time of urine deliverance |             | First urine sample<br>after morning urine |             |
|---------------------------|---|-------------|---|-------------|
|                           | Free  | Glucuronide | Free                                      | Glucuronide |
| 2,4,6-Trichlorophenol     | 1,1 ± 0,1   | 0,3 ± 0,1   | 0,4 ± 0,1                                 | 1,3 ± 0,1   |
| 2,4,5-Trichlorophenol     | 6,0 ± 0,3   | 2,7 ± 0,3   | 1,5 ± 0,2                                 | 5,5 ± 0,2   |
| 2,3,4-Trichlorophenol     | 0,0 ± 0,0   | 0,2 ± 0,1   | 0,3 ± 0,1                                 | 0,7 ± 0,1   |
| 2,3,4,6-Tetrachlorophenol | 0,0 ± 0,0   | 1,1 ± 0,1   | 0,0 ± 0,0                                 | 0,0 ± 0,0   |
| Pentachlorophenol         | 11,7 ± 0,4  | 3,5 ± 0,2   | 2,4 ± 0,4                                 | 39,4 ± 1,2  |

|                           | Blood after therapy; 1,5 h |             | Urine after therapy; 1,5 h |             |
|---------------------------|----------------------------|-------------|----------------------------|-------------|
|                           | Free                       | Glucuronide | Free                       | Glucuronide |
| 2,4,6-Trichlorophenol     | 3,0 ± 0,2                  | 1,0 ± 0,1   | 1,2 ± 0,1                  | 2,2 ± 0,1   |
| 2,4,5-Trichlorophenol     | 8,8 ± 0,3                  | 3,3 ± 0,3   | 2,3 ± 0,2                  | 8,5 ± 0,4   |
| 2,3,4-Trichlorophenol     | 2,2 ± 0,2                  | 0,5 ± 0,1   | 1,4 ± 0,1                  | 3,1 ± 0,3   |
| 2,3,4,6-Tetrachlorophenol | 1,5 ± 0,1                  | 2,4 ± 0,2   | 1,2 ± 0,1                  | 1,2 ± 0,1   |
| Pentachlorophenol         | 15,8 ± 0,5                 | 5,0 ± 0,2   | 6,3 ± 0,2                  | 44,5 ± 1,6  |

|                           | Blood after therapy; 24 h |             | Urine after therapy; 24 h |             |
|---------------------------|---------------------------|-------------|---------------------------|-------------|
|                           | Free                      | Glucuronide | Free                      | Glucuronide |
| 2,4,6-Trichlorophenol     | 1,2 ± 0,2                 | 0,0 ± 0,0   | 0,0 ± 0,0                 | 0,7 ± 0,1   |
| 2,4,5-Trichlorophenol     | 2,5 ± 0,2                 | 1,2 ± 0,1   | 1,0 ± 0,1                 | 1,5 ± 0,2   |
| 2,3,4-Trichlorophenol     | 1,0 ± 0,1                 | 0,0 ± 0,0   | 0,3 ± 0,1                 | 0,0 ± 0,0   |
| 2,3,4,6-Tetrachlorophenol | 0,3 ± 0,1                 | 0,0 ± 0,0   | 0,0 ± 0,0                 | 0,0 ± 0,0   |
| Pentachlorophenol         | 8,2 ± 0,3                 | 2,1 ± 0,2   | 1,7 ± 0,2                 | 12,5 ± 0,5  |

**Proband-No.: 2**

|                           | Blood (empty stomach) |             | Morning urine |             |
|---------------------------|-----------------------|-------------|---------------|-------------|
|                           | Free                  | Glucuronide | Free          | Glucuronide |
| 2,4,6-Trichlorophenol     | 0,0 ± 0,0             | 0,0 ± 0,0   | 0,2 ± 0,1     | 0,2 ± 0,1   |
| 2,4,5-Trichlorophenol     | 0,9 ± 0,1             | 0,4 ± 0,2   | 5,0 ± 0,2     | 9,0 ± 0,3   |
| 2,3,4-Trichlorophenol     | 2,9 ± 0,3             | 1,1 ± 0,2   | 0,0 ± 0,0     | 0,4 ± 0,1   |
| 2,3,4,6-Tetrachlorophenol | 0,3 ± 0,1             | 1,3 ± 0,3   | 0,0 ± 0,0     | 0,0 ± 0,0   |
| Pentachlorophenol         | 19,2 ± 0,5            | 3,0 ± 0,3   | 8,2 ± 0,6     | 27,0 ± 1,1  |

|                           | Blood (empty stomach);<br>Time of urine deliverance |             | First urine sample<br>after morning urine |             |
|---------------------------|---|-------------|---|-------------|
|                           | Free  | Glucuronide | Free                                      | Glucuronide |
| 2,4,6-Trichlorophenol     | 0,0 ± 0,0   | 0,0 ± 0,0   | 0,2 ± 0,1                                 | 0,2 ± 0,1   |
| 2,4,5-Trichlorophenol     | 0,8 ± 0,1   | 0,3 ± 0,1   | 2,3 ± 0,2                                 | 4,5 ± 0,3   |
| 2,3,4-Trichlorophenol     | 2,7 ± 0,1   | 0,7 ± 0,2   | 0,2 ± 0,1                                 | 0,8 ± 0,2   |
| 2,3,4,6-Tetrachlorophenol | 0,2 ± 0,1   | 1,0 ± 0,1   | 0,0 ± 0,0                                 | 0,0 ± 0,0   |
| Pentachlorophenol         | 18,0 ± 0,4  | 2,2 ± 0,2   | 4,3 ± 0,3                                 | 25,0 ± 1,2  |

|                           | Blood after therapy; 1,5 h |             | Urine after therapy; 1,5 h |             |
|---------------------------|----------------------------|-------------|----------------------------|-------------|
|                           | Free                       | Glucuronide | Free                       | Glucuronide |
| 2,4,6-Trichlorophenol     | 2,1 ± 0,2                  | 1,0 ± 0,1   | 0,8 ± 0,2                  | 1,2 ± 0,2   |
| 2,4,5-Trichlorophenol     | 3,2 ± 0,4                  | 1,7 ± 0,2   | 5,1 ± 0,4                  | 12,0 ± 0,4  |
| 2,3,4-Trichlorophenol     | 4,0 ± 0,4                  | 2,3 ± 0,2   | 1,2 ± 0,1                  | 0,6 ± 0,2   |
| 2,3,4,6-Tetrachlorophenol | 1,7 ± 0,2                  | 2,9 ± 0,3   | 1,0 ± 0,1                  | 1,2 ± 0,1   |
| Pentachlorophenol         | 25,3 ± 1,5                 | 6,3 ± 0,4   | 9,4 ± 0,7                  | 44,5 ± 1,7  |

|                           | Blood after therapy; 24 h |             | Urine after therapy; 24 h |             |
|---------------------------|---------------------------|-------------|---------------------------|-------------|
|                           | Free                      | Glucuronide | Free                      | Glucuronide |
| 2,4,6-Trichlorophenol     | 0,0 ± 0,0                 | 0,0 ± 0,0   | 0,0 ± 0,0                 | 0,0 ± 0,0   |
| 2,4,5-Trichlorophenol     | 0,0 ± 0,0                 | 0,2 ± 0,1   | 0,0 ± 0,0                 | 3,2 ± 0,4   |
| 2,3,4-Trichlorophenol     | 1,2 ± 0,1                 | 0,3 ± 0,1   | 0,0 ± 0,0                 | 0,0 ± 0,0   |
| 2,3,4,6-Tetrachlorophenol | 0,0 ± 0,0                 | 0,6 ± 0,2   | 0,0 ± 0,0                 | 0,0 ± 0,0   |
| Pentachlorophenol         | 7,1 ± 0,3                 | 1,7 ± 0,2   | 1,2 ± 0,2                 | 10,0 ± 0,6  |

**Proband-No.: 3**

|                           | Blood (empty stomach) |             | Morning urine |             |
|---------------------------|-----------------------|-------------|---------------|-------------|
|                           | Free                  | Glucuronide | Free          | Glucuronide |
| 2,4,6-Trichlorophenol     | 0,2 ± 0,1             | 0,1 ± 0,1   | 0,1 ± 0,1     | 0,3 ± 0,1   |
| 2,4,5-Trichlorophenol     | 5,1 ± 0,2             | 3,0 ± 0,4   | 4,7 ± 0,4     | 8,7 ± 0,3   |
| 2,3,4-Trichlorophenol     | 6,2 ± 0,2             | 3,8 ± 0,4   | 0,0 ± 0,0     | 0,5 ± 0,2   |
| 2,3,4,6-Tetrachlorophenol | 2,0 ± 0,1             | 2,2 ± 0,2   | 1,2 ± 0,1     | 1,1 ± 0,2   |
| Pentachlorophenol         | 15,8 ± 1,6            | 2,7 ± 0,2   | 7,4 ± 0,6     | 22,5 ± 1,8  |

|                           | Blood (empty stomach);<br>Time of urine deliverance |             | First urine sample<br>after morning urine |             |
|---------------------------|---|-------------|---|-------------|
|                           | Free  | Glucuronide | Free                                      | Glucuronide |
| 2,4,6-Trichlorophenol     | 0,1 ± 0,1   | 0,0 ± 0,0   | 0,0 ± 0,0                                 | 0,0 ± 0,0   |
| 2,4,5-Trichlorophenol     | 4,7 ± 0,3   | 2,9 ± 0,4   | 3,1 ± 0,3                                 | 6,7 ± 0,4   |
| 2,3,4-Trichlorophenol     | 3,5 ± 0,3   | 3,2 ± 0,5   | 0,0 ± 0,0                                 | 0,0 ± 0,0   |
| 2,3,4,6-Tetrachlorophenol | 1,0 ± 0,1   | 2,0 ± 0,4   | 0,0 ± 0,0                                 | 0,0 ± 0,0   |
| Pentachlorophenol         | 11,8 ± 1,2  | 2,1 ± 0,4   | 4,2 ± 0,4                                 | 20,4 ± 1,9  |

|                           | Blood after therapy; 1,5 h |             | Urine after therapy; 1,5 h |             |
|---------------------------|----------------------------|-------------|----------------------------|-------------|
|                           | Free                       | Glucuronide | Free                       | Glucuronide |
| 2,4,6-Trichlorophenol     | 0,4 ± 0,2                  | 0,2 ± 0,1   | 0,2 ± 0,1                  | 0,8 ± 0,2   |
| 2,4,5-Trichlorophenol     | 6,3 ± 0,4                  | 5,7 ± 0,3   | 3,1 ± 0,2                  | 10,3 ± 0,3  |
| 2,3,4-Trichlorophenol     | 7,4 ± 0,4                  | 6,0 ± 0,3   | 3,5 ± 0,2                  | 14,5 ± 1,0  |
| 2,3,4,6-Tetrachlorophenol | 3,2 ± 0,2                  | 1,9 ± 0,2   | 1,7 ± 0,2                  | 6,5 ± 0,5   |
| Pentachlorophenol         | 17,5 ± 1,8                 | 4,0 ± 0,2   | 7,8 ± 0,4                  | 38,2 ± 2,0  |

|                           | Blood after therapy; 24 h |             | Urine after therapy; 24 h |             |
|---------------------------|---------------------------|-------------|---------------------------|-------------|
|                           | Free                      | Glucuronide | Free                      | Glucuronide |
| 2,4,6-Trichlorophenol     | 0,0 ± 0,0                 | 0,0 ± 0,0   | 0,0 ± 0,0                 | 0,0 ± 0,0   |
| 2,4,5-Trichlorophenol     | 2,1 ± 0,2                 | 1,7 ± 0,2   | 1,5 ± 0,2                 | 3,7 ± 0,3   |
| 2,3,4-Trichlorophenol     | 1,5 ± 0,2                 | 1,2 ± 0,2   | 0,0 ± 0,0                 | 0,0 ± 0,0   |
| 2,3,4,6-Tetrachlorophenol | 0,0 ± 0,0                 | 0,0 ± 0,0   | 0,0 ± 0,0                 | 0,0 ± 0,0   |
| Pentachlorophenol         | 9,2 ± 0,8                 | 1,0 ± 0,1   | 2,8 ± 0,4                 | 8,7 ± 0,8   |

**Proband-No.: 4**

|                           | Blood (empty stomach) |             | Morning urine |             |
|---------------------------|-----------------------|-------------|---------------|-------------|
|                           | Free                  | Glucuronide | Free          | Glucuronide |
| 2,4,6-Trichlorophenol     | 0,5 ± 0,2             | 0,1 ± 0,1   | 0,3 ± 0,1     | 0,3 ± 0,1   |
| 2,4,5-Trichlorophenol     | 6,5 ± 0,4             | 3,0 ± 0,4   | 7,2 ± 0,4     | 10,0 ± 0,6  |
| 2,3,4-Trichlorophenol     | 0,0 ± 0,0             | 0,0 ± 0,0   | 0,0 ± 0,0     | 0,0 ± 0,0   |
| 2,3,4,6-Tetrachlorophenol | 0,7 ± 0,2             | 1,4 ± 0,3   | 0,0 ± 0,0     | 2,8 ± 0,2   |
| Pentachlorophenol         | 6,5 ± 0,4             | 2,0 ± 0,2   | 5,2 ± 0,2     | 12,6 ± 0,8  |

|                           | Blood (empty stomach);<br>Time of urine deliverance |             | First urine sample<br>after morning urine |             |
|---------------------------|---|-------------|---|-------------|
|                           | Free  | Glucuronide | Free                                      | Glucuronide |
| 2,4,6-Trichlorophenol     | 0,0 ± 0,0   | 0,0 ± 0,0   | 0,0 ± 0,0                                 | 0,0 ± 0,0   |
| 2,4,5-Trichlorophenol     | 5,3 ± 0,3   | 2,0 ± 0,4   | 6,4 ± 0,5                                 | 6,9 ± 0,3   |
| 2,3,4-Trichlorophenol     | 0,0 ± 0,0   | 0,0 ± 0,0   | 0,0 ± 0,0                                 | 0,0 ± 0,0   |
| 2,3,4,6-Tetrachlorophenol | 0,5 ± 0,2   | 1,1 ± 0,2   | 0,0 ± 0,0                                 | 1,5 ± 0,3   |
| Pentachlorophenol         | 6,2 ± 0,4   | 2,0 ± 0,2   | 5,2 ± 0,4                                 | 15,6 ± 0,8  |

|                           | Blood after therapy; 1,5 h |             | Urine after therapy; 1,5 h |             |
|---------------------------|----------------------------|-------------|----------------------------|-------------|
|                           | Free                       | Glucuronide | Free                       | Glucuronide |
| 2,4,6-Trichlorophenol     | 1,5 ± 0,3                  | 0,4 ± 0,1   | 0,7 ± 0,2                  | 1,2 ± 0,3   |
| 2,4,5-Trichlorophenol     | 10,2 ± 0,4                 | 4,5 ± 0,3   | 8,2 ± 0,6                  | 15,2 ± 1,2  |
| 2,3,4-Trichlorophenol     | 1,3 ± 0,1                  | 0,8 ± 0,2   | 1,0 ± 0,1                  | 1,0 ± 0,1   |
| 2,3,4,6-Tetrachlorophenol | 1,7 ± 0,2                  | 2,3 ± 0,3   | 1,5 ± 0,3                  | 1,9 ± 0,6   |
| Pentachlorophenol         | 12,0 ± 0,4                 | 6,9 ± 0,6   | 7,5 ± 0,8                  | 28,0 ± 1,0  |

|                           | Blood after therapy; 24 h |             | Urine after therapy; 24 h |             |
|---------------------------|---------------------------|-------------|---------------------------|-------------|
|                           | Free                      | Glucuronide | Free                      | Glucuronide |
| 2,4,6-Trichlorophenol     | 0,0 ± 0,0                 | 0,0 ± 0,0   | 0,0 ± 0,0                 | 0,0 ± 0,0   |
| 2,4,5-Trichlorophenol     | 1,7 ± 0,2                 | 1,0 ± 0,1   | 2,1 ± 1,3                 | 4,9 ± 0,5   |
| 2,3,4-Trichlorophenol     | 0,0 ± 0,0                 | 0,0 ± 0,0   | 0,0 ± 0,0                 | 0,0 ± 0,0   |
| 2,3,4,6-Tetrachlorophenol | 0,0 ± 0,0                 | 0,4 ± 0,1   | 0,0 ± 0,0                 | 0,0 ± 0,0   |
| Pentachlorophenol         | 3,4 ± 0,2                 | 1,0 ± 0,1   | 1,5 ± 0,2                 | 5,2 ± 0,4   |

**Proband-No.: 5**

|                           | Blood (empty stomach) |             | Morning urine |             |
|---------------------------|-----------------------|-------------|---------------|-------------|
|                           | Free                  | Glucuronide | Free          | Glucuronide |
| 2,4,6-Trichlorophenol     | 1,5 ± 0,3             | 0,4 ± 0,2   | 0,5 ± 0,1     | 1,3 ± 0,2   |
| 2,4,5-Trichlorophenol     | 0,6 ± 0,2             | 1,0 ± 0,1   | 0,7 ± 0,2     | 2,1 ± 0,3   |
| 2,3,4-Trichlorophenol     | 0,7 ± 0,3             | 0,5 ± 0,2   | 0,2 ± 0,1     | 0,2 ± 0,1   |
| 2,3,4,6-Tetrachlorophenol | 0,6 ± 0,2             | 0,7 ± 0,2   | 0,5 ± 0,2     | 0,8 ± 0,2   |
| Pentachlorophenol         | 1,2 ± 0,1             | 1,2 ± 0,1   | 1,2 ± 0,2     | 4,9 ± 0,3   |

|                           | Blood (empty stomach);<br>Time of urine deliverance |             | First urine sample<br>after morning urine |             |
|---------------------------|---|-------------|---|-------------|
|                           | Free  | Glucuronide | Free                                      | Glucuronide |
| 2,4,6-Trichlorophenol     | 1,2 ± 0,2   | 0,2 ± 0,1   | 0,2 ± 0,1                                 | 0,6 ± 0,2   |
| 2,4,5-Trichlorophenol     | 0,3 ± 0,1   | 0,7 ± 0,2   | 0,4 ± 0,1                                 | 1,4 ± 0,4   |
| 2,3,4-Trichlorophenol     | 0,3 ± 0,1   | 0,2 ± 0,1   | 0,0 ± 0,0                                 | 0,2 ± 0,1   |
| 2,3,4,6-Tetrachlorophenol | 0,2 ± 0,1   | 0,2 ± 0,1   | 0,3 ± 0,1                                 | 0,4 ± 0,1   |
| Pentachlorophenol         | 0,6 ± 0,2   | 0,7 ± 0,2   | 0,8 ± 0,2                                 | 3,2 ± 0,3   |

|                           | Blood after therapy; 1,5 h |             | Urine after therapy; 1,5 h |             |
|---------------------------|----------------------------|-------------|----------------------------|-------------|
|                           | Free                       | Glucuronide | Free                       | Glucuronide |
| 2,4,6-Trichlorophenol     | 2,1 ± 0,4                  | 0,4 ± 0,1   | 1,0 ± 0,2                  | 3,0 ± 0,3   |
| 2,4,5-Trichlorophenol     | 1,2 ± 0,2                  | 1,6 ± 0,4   | 0,5 ± 0,1                  | 2,1 ± 0,4   |
| 2,3,4-Trichlorophenol     | 1,0 ± 0,2                  | 0,5 ± 0,1   | 0,8 ± 0,2                  | 1,6 ± 0,3   |
| 2,3,4,6-Tetrachlorophenol | 0,4 ± 0,1                  | 0,4 ± 0,1   | 0,2 ± 0,1                  | 0,7 ± 0,2   |
| Pentachlorophenol         | 1,2 ± 0,2                  | 1,6 ± 0,4   | 1,2 ± 0,2                  | 12,5 ± 0,6  |

|                           | Blood after therapy; 24 h |             | Urine after therapy; 24 h |             |
|---------------------------|---------------------------|-------------|---------------------------|-------------|
|                           | Free                      | Glucuronide | Free                      | Glucuronide |
| 2,4,6-Trichlorophenol     | 0,2 ± 0,1                 | 0,1 ± 0,1   | 0,1 ± 0,1                 | 0,6 ± 0,2   |
| 2,4,5-Trichlorophenol     | 0,5 ± 0,1                 | 0,8 ± 0,2   | 0,4 ± 0,1                 | 1,0 ± 0,2   |
| 2,3,4-Trichlorophenol     | 0,0 ± 0,0                 | 0,0 ± 0,0   | 0,0 ± 0,0                 | 0,0 ± 0,0   |
| 2,3,4,6-Tetrachlorophenol | 0,0 ± 0,0                 | 0,0 ± 0,0   | 0,0 ± 0,0                 | 0,0 ± 0,0   |
| Pentachlorophenol         | 0,2 ± 0,1                 | 0,2 ± 0,1   | 0,5 ± 0,1                 | 1,9 ± 0,3   |

**Proband-No.: 6**

|                           | Blood (empty stomach) |             | Morning urine |             |
|---------------------------|-----------------------|-------------|---------------|-------------|
|                           | Free                  | Glucuronide | Free          | Glucuronide |
| 2,4,6-Trichlorophenol     | 0,6 ± 0,2             | 0,2 ± 0,1   | 0,5 ± 0,1     | 0,5 ± 0,0   |
| 2,4,5-Trichlorophenol     | 7,1 ± 0,4             | 4,3 ± 0,3   | 8,3 ± 0,3     | 12,0 ± 0,6  |
| 2,3,4-Trichlorophenol     | 1,0 ± 0,1             | 0,5 ± 0,1   | 0,0 ± 0,0     | 0,0 ± 0,0   |
| 2,3,4,6-Tetrachlorophenol | 1,0 ± 0,1             | 2,0 ± 0,2   | 0,0 ± 0,0     | 4,0 ± 0,4   |
| Pentachlorophenol         | 10,5 ± 0,8            | 4,6 ± 0,4   | 7,6 ± 0,6     | 20,2 ± 0,8  |

|                           | Blood (empty stomach);<br>Time of urine deliverance |             | First urine sample<br>after morning urine |             |
|---------------------------|---|-------------|---|-------------|
|                           | Free  | Glucuronide | Free                                      | Glucuronide |
| 2,4,6-Trichlorophenol     | 0,0 ± 0,0   | 0,0 ± 0,0   | 0,0 ± 0,0                                 | 0,0 ± 0,0   |
| 2,4,5-Trichlorophenol     | 7,4 ± 0,4   | 3,2 ± 0,5   | 8,4 ± 0,6                                 | 10,2 ± 0,6  |
| 2,3,4-Trichlorophenol     | 0,0 ± 0,0   | 0,0 ± 0,0   | 0,0 ± 0,0                                 | 0,0 ± 0,0   |
| 2,3,4,6-Tetrachlorophenol | 0,8 ± 0,2   | 1,9 ± 0,3   | 0,0 ± 0,0                                 | 2,1 ± 0,3   |
| Pentachlorophenol         | 9,2 ± 0,5   | 5,4 ± 0,4   | 8,9 ± 0,3                                 | 20,1 ± 1,0  |

|                           | Blood after therapy; 1,5 h |             | Urine after therapy; 1,5 h |             |
|---------------------------|----------------------------|-------------|----------------------------|-------------|
|                           | Free                       | Glucuronide | Free                       | Glucuronide |
| 2,4,6-Trichlorophenol     | 2,5 ± 0,4                  | 0,7 ± 0,3   | 1,0 ± 0,2                  | 3,0 ± 0,6   |
| 2,4,5-Trichlorophenol     | 15,4 ± 0,6                 | 6,8 ± 0,4   | 11,2 ± 0,6                 | 21,0 ± 1,2  |
| 2,3,4-Trichlorophenol     | 3,4 ± 0,2                  | 1,0 ± 0,1   | 1,7 ± 0,3                  | 1,5 ± 0,2   |
| 2,3,4,6-Tetrachlorophenol | 2,5 ± 0,4                  | 3,4 ± 0,4   | 4,5 ± 0,6                  | 5,9 ± 0,6   |
| Pentachlorophenol         | 18,0 ± 1,0                 | 10,2 ± 0,6  | 14,0 ± 1,0                 | 33,5 ± 1,2  |

|                           | Blood after therapy; 24 h |             | Urine after therapy; 24 h |             |
|---------------------------|---------------------------|-------------|---------------------------|-------------|
|                           | Free                      | Glucuronide | Free                      | Glucuronide |
| 2,4,6-Trichlorophenol     | 0,0 ± 0,0                 | 0,0 ± 0,0   | 0,0 ± 0,0                 | 0,0 ± 0,0   |
| 2,4,5-Trichlorophenol     | 2,1 ± 0,2                 | 1,2 ± 0,2   | 3,4 ± 0,4                 | 3,9 ± 0,6   |
| 2,3,4-Trichlorophenol     | 0,0 ± 0,0                 | 0,0 ± 0,0   | 0,0 ± 0,0                 | 0,0 ± 0,0   |
| 2,3,4,6-Tetrachlorophenol | 0,0 ± 0,0                 | 0,0 ± 0,0   | 0,0 ± 0,0                 | 0,0 ± 0,0   |
| Pentachlorophenol         | 4,2 ± 0,4                 | 2,1 ± 0,3   | 3,5 ± 0,3                 | 6,1 ± 0,3   |

**Proband-No.: 7**

|                           | Blood (empty stomach) |             | Morning urine |             |
|---------------------------|-----------------------|-------------|---------------|-------------|
|                           | Free                  | Glucuronide | Free          | Glucuronide |
| 2,4,6-Trichlorophenol     | 0,2 ± 0,1             | 0,1 ± 0,1   | 0,0 ± 0,0     | 0,4 ± 0,2   |
| 2,4,5-Trichlorophenol     | 6,1 ± 0,3             | 4,2 ± 0,6   | 5,8 ± 0,4     | 10,2 ± 0,6  |
| 2,3,4-Trichlorophenol     | 8,2 ± 0,4             | 4,9 ± 0,5   | 0,0 ± 0,0     | 0,8 ± 0,2   |
| 2,3,4,6-Tetrachlorophenol | 1,9 ± 0,3             | 2,1 ± 0,3   | 1,9 ± 0,3     | 1,2 ± 0,2   |
| Pentachlorophenol         | 21,1 ± 0,7            | 1,7 ± 0,3   | 8,9 ± 0,6     | 31,0 ± 1,6  |

|                           | Blood (empty stomach);<br>Time of urine deliverance |             | First urine sample<br>after morning urine |             |
|---------------------------|---|-------------|---|-------------|
|                           | Free  | Glucuronide | Free                                      | Glucuronide |
| 2,4,6-Trichlorophenol     | 0,0 ± 0,0   | 0,0 ± 0,0   | 0,0 ± 0,0                                 | 0,0 ± 0,0   |
| 2,4,5-Trichlorophenol     | 5,9 ± 0,5   | 2,9 ± 0,3   | 3,8 ± 0,4                                 | 7,1 ± 0,3   |
| 2,3,4-Trichlorophenol     | 7,8 ± 0,6   | 3,7 ± 0,4   | 0,0 ± 0,0                                 | 0,0 ± 0,0   |
| 2,3,4,6-Tetrachlorophenol | 1,0 ± 0,1   | 2,0 ± 0,2   | 0,0 ± 0,0                                 | 0,0 ± 0,0   |
| Pentachlorophenol         | 16,8 ± 0,8  | 1,4 ± 0,6   | 10,6 ± 0,6                                | 28,4 ± 2,0  |

|                           | Blood after therapy; 1,5 h |             | Urine after therapy; 1,5 h |             |
|---------------------------|----------------------------|-------------|----------------------------|-------------|
|                           | Free                       | Glucuronide | Free                       | Glucuronide |
| 2,4,6-Trichlorophenol     | 1,0 ± 0,1                  | 1,2 ± 0,2   | 0,2 ± 0,1                  | 1,8 ± 0,2   |
| 2,4,5-Trichlorophenol     | 7,8 ± 0,4                  | 6,0 ± 0,4   | 6,8 ± 0,4                  | 11,0 ± 0,5  |
| 2,3,4-Trichlorophenol     | 10,2 ± 0,8                 | 5,8 ± 0,4   | 1,6 ± 0,2                  | 2,7 ± 0,3   |
| 2,3,4,6-Tetrachlorophenol | 3,5 ± 0,3                  | 3,9 ± 0,6   | 2,8 ± 0,3                  | 3,1 ± 0,5   |
| Pentachlorophenol         | 25,0 ± 1,2                 | 5,8 ± 0,8   | 14,6 ± 0,8                 | 37,0 ± 2,2  |

|                           | Blood after therapy; 24 h |             | Urine after therapy; 24 h |             |
|---------------------------|---------------------------|-------------|---------------------------|-------------|
|                           | Free                      | Glucuronide | Free                      | Glucuronide |
| 2,4,6-Trichlorophenol     | 0,0 ± 0,0                 | 0,0 ± 0,0   | 0,0 ± 0,0                 | 0,0 ± 0,0   |
| 2,4,5-Trichlorophenol     | 2,0 ± 0,2                 | 1,7 ± 0,6   | 2,5 ± 0,5                 | 6,9 ± 0,3   |
| 2,3,4-Trichlorophenol     | 3,2 ± 0,4                 | 2,8 ± 0,2   | 0,0 ± 0,0                 | 0,5 ± 0,1   |
| 2,3,4,6-Tetrachlorophenol | 0,0 ± 0,0                 | 0,0 ± 0,0   | 0,0 ± 0,0                 | 0,0 ± 0,0   |
| Pentachlorophenol         | 9,2 ± 0,4                 | 0,0 ± 0,0   | 2,8 ± 0,2                 | 6,0 ± 0,6   |

**Proband-No.: 8**

|                           | Blood (empty stomach) |             | Morning urine |             |
|---------------------------|-----------------------|-------------|---------------|-------------|
|                           | Free                  | Glucuronide | Free          | Glucuronide |
| 2,4,6-Trichlorophenol     | 0,0 ± 0,0             | 0,0 ± 0,0   | 0,0 ± 0,0     | 0,0 ± 0,0   |
| 2,4,5-Trichlorophenol     | 10,2 ± 0,4            | 3,0 ± 0,3   | 7,5 ± 0,5     | 12,6 ± 0,8  |
| 2,3,4-Trichlorophenol     | 8,1 ± 0,3             | 5,2 ± 0,6   | 0,0 ± 0,0     | 1,2 ± 0,2   |
| 2,3,4,6-Tetrachlorophenol | 2,0 ± 0,2             | 2,3 ± 0,3   | 2,0 ± 0,2     | 0,9 ± 0,3   |
| Pentachlorophenol         | 24,0 ± 0,8            | 1,6 ± 0,3   | 9,3 ± 0,6     | 34,2 ± 1,8  |

|                           | Blood (empty stomach);<br>Time of urine deliverance |             | First urine sample<br>after morning urine |             |
|---------------------------|---|-------------|---|-------------|
|                           | Free  | Glucuronide | Free                                      | Glucuronide |
| 2,4,6-Trichlorophenol     | 0,0 ± 0,0   | 0,0 ± 0,0   | 0,0 ± 0,0                                 | 0,0 ± 0,0   |
| 2,4,5-Trichlorophenol     | 6,0 ± 0,5   | 3,0 ± 0,4   | 4,2 ± 0,04                                | 8,2 ± 0,4   |
| 2,3,4-Trichlorophenol     | 8,1 ± 0,7   | 3,5 ± 0,5   | 0,0 ± 0,0                                 | 0,0 ± 0,0   |
| 2,3,4,6-Tetrachlorophenol | 0,0 ± 0,0   | 0,0 ± 0,0   | 0,0 ± 0,0                                 | 0,0 ± 0,0   |
| Pentachlorophenol         | 19,6 ± 0,8  | 1,0 ± 0,2   | 10,2 ± 0,8                                | 30,2 ± 1,6  |

|                           | Blood after therapy; 1,5 h |             | Urine after therapy; 1,5 h |             |
|---------------------------|----------------------------|-------------|----------------------------|-------------|
|                           | Free                       | Glucuronide | Free                       | Glucuronide |
| 2,4,6-Trichlorophenol     | 1,6 ± 0,4                  | 1,5 ± 0,3   | 0,2 ± 0,1                  | 2,0 ± 0,2   |
| 2,4,5-Trichlorophenol     | 8,0 ± 0,6                  | 6,2 ± 0,6   | 7,4 ± 0,6                  | 13,5 ± 1,3  |
| 2,3,4-Trichlorophenol     | 16,0 ± 0,8                 | 8,2 ± 0,4   | 3,0 ± 0,4                  | 4,2 ± 0,6   |
| 2,3,4,6-Tetrachlorophenol | 8,4 ± 0,4                  | 4,3 ± 0,7   | 2,9 ± 0,3                  | 4,0 ± 0,5   |
| Pentachlorophenol         | 30,0 ± 1,6                 | 8,2 ± 0,4   | 11,2 ± 0,4                 | 42,0 ± 2,0  |

|                           | Blood after therapy; 24 h |             | Urine after therapy; 24 h |             |
|---------------------------|---------------------------|-------------|---------------------------|-------------|
|                           | Free                      | Glucuronide | Free                      | Glucuronide |
| 2,4,6-Trichlorophenol     | 0,0 ± 0,0                 | 0,0 ± 0,0   | 0,0 ± 0,0                 | 0,0 ± 0,0   |
| 2,4,5-Trichlorophenol     | 2,2 ± 0,2                 | 1,9 ± 0,4   | 2,8 ± 0,6                 | 7,2 ± 0,4   |
| 2,3,4-Trichlorophenol     | 3,8 ± 0,4                 | 3,2 ± 0,4   | 0,0 ± 0,0                 | 0,6 ± 0,2   |
| 2,3,4,6-Tetrachlorophenol | 0,0 ± 0,0                 | 0,0 ± 0,0   | 0,0 ± 0,0                 | 0,0 ± 0,0   |
| Pentachlorophenol         | 12,0 ± 0,6                | 0,0 ± 0,0   | 3,4 ± 0,4                 | 8,2 ± 0,8   |

**Proband-N.: 9**

|                           | Blood (empty stomach) |             | Morning urine |             |
|---------------------------|-----------------------|-------------|---------------|-------------|
|                           | Free                  | Glucuronide | Free          | Glucuronide |
| 2,4,6-Trichlorophenol     | 1,4 ± 0,2             | 0,6 ± 0,2   | 0,6 ± 0,2     | 1,4 ± 0,2   |
| 2,4,5-Trichlorophenol     | 0,8 ± 0,2             | 1,6 ± 0,4   | 0,8 ± 0,2     | 2,4 ± 0,4   |
| 2,3,4-Trichlorophenol     | 0,8 ± 0,2             | 0,6 ± 0,2   | 0,2 ± 0,1     | 0,2 ± 0,1   |
| 2,3,4,6-Tetrachlorophenol | 0,8 ± 0,2             | 0,8 ± 0,2   | 0,6 ± 0,2     | 0,8 ± 0,2   |
| Pentachlorophenol         | 1,6 ± 0,4             | 1,4 ± 0,2   | 1,4 ± 0,2     | 5,5 ± 0,5   |

|                           | Blood (empty stomach);<br>Time of urine deliverance |             | First urine sample<br>after morning urine |             |
|---------------------------|---|-------------|---|-------------|
|                           | Free  | Glucuronide | Free                                      | Glucuronide |
| 2,4,6-Trichlorophenol     | 1,4 ± 0,2   | 0,2 ± 0,1   | 0,2 ± 0,1                                 | 0,8 ± 0,4   |
| 2,4,5-Trichlorophenol     | 0,5 ± 0,2   | 0,8 ± 0,2   | 0,4 ± 0,1                                 | 1,8 ± 0,6   |
| 2,3,4-Trichlorophenol     | 0,0 ± 0,0   | 0,0 ± 0,0   | 0,0 ± 0,0                                 | 0,0 ± 0,0   |
| 2,3,4,6-Tetrachlorophenol | 0,4 ± 0,2   | 0,2 ± 0,1   | 0,2 ± 0,1                                 | 0,2 ± 0,1   |
| Pentachlorophenol         | 0,8 ± 0,4   | 1,4 ± 0,4   | 1,0 ± 0,2                                 | 3,4 ± 0,4   |

|                           | Blood after therapy; 1,5 h |             | Urine after therapy; 1,5 h |             |
|---------------------------|----------------------------|-------------|----------------------------|-------------|
|                           | Free                       | Glucuronide | Free                       | Glucuronide |
| 2,4,6-Trichlorophenol     | 2,4 ± 0,4                  | 0,6 ± 0,2   | 1,8 ± 0,4                  | 4,6 ± 0,6   |
| 2,4,5-Trichlorophenol     | 2,0 ± 0,4                  | 2,0 ± 0,2   | 0,8 ± 0,2                  | 2,7 ± 0,5   |
| 2,3,4-Trichlorophenol     | 1,5 ± 0,3                  | 0,9 ± 0,3   | 0,9 ± 0,3                  | 2,0 ± 0,4   |
| 2,3,4,6-Tetrachlorophenol | 1,6 ± 0,4                  | 1,0 ± 0,2   | 0,2 ± 0,1                  | 1,6 ± 0,3   |
| Pentachlorophenol         | 2,0 ± 0,4                  | 2,0 ± 0,4   | 1,4 ± 0,4                  | 14,5 ± 0,9  |

|                           | Blood after therapy; 24 h |             | Urine after therapy; 24 h |             |
|---------------------------|---------------------------|-------------|---------------------------|-------------|
|                           | Free                      | Glucuronide | Free                      | Glucuronide |
| 2,4,6-Trichlorophenol     | 0,2 ± 0,1                 | 0,0 ± 0,0   | 0,2 ± 0,1                 | 0,7 ± 0,3   |
| 2,4,5-Trichlorophenol     | 0,6 ± 0,2                 | 0,8 ± 0,2   | 0,4 ± 0,2                 | 1,2 ± 0,4   |
| 2,3,4-Trichlorophenol     | 0,0 ± 0,0                 | 0,0 ± 0,0   | 0,0 ± 0,0                 | 0,0 ± 0,0   |
| 2,3,4,6-Tetrachlorophenol | 0,0 ± 0,0                 | 0,0 ± 0,0   | 0,0 ± 0,0                 | 0,0 ± 0,0   |
| Pentachlorophenol         | 0,6 ± 0,2                 | 0,6 ± 0,2   | 0,4 ± 0,2                 | 2,0 ± 0,4   |

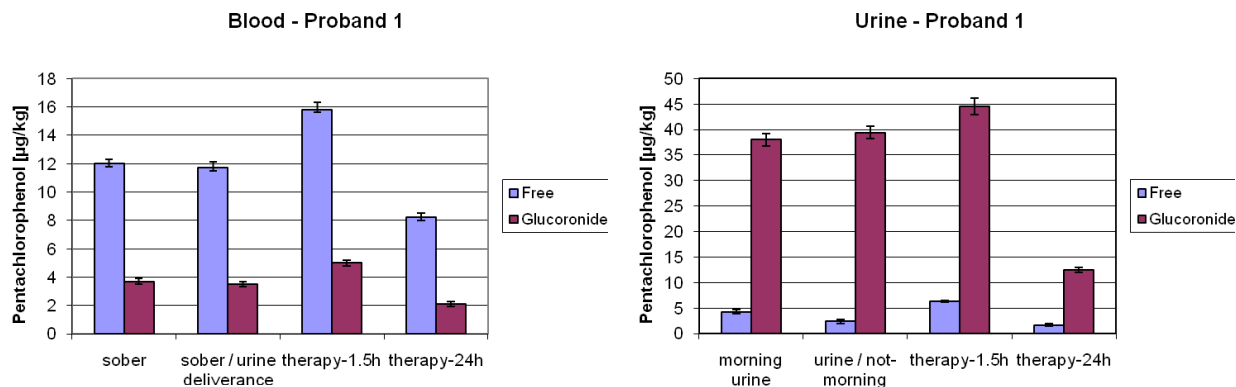
**Proban-No.: 10**

|                           | Blood (empty stomach) |             | Morning urine |             |
|---------------------------|-----------------------|-------------|---------------|-------------|
|                           | Free                  | Glucuronide | Free          | Glucuronide |
| 2,4,6-Trichlorophenol     | 1,2 ± 0,1             | 0,6 ± 0,2   | 0,9 ± 0,3     | 1,2 ± 0,2   |
| 2,4,5-Trichlorophenol     | 7,0 ± 0,4             | 3,2 ± 0,4   | 3,2 ± 0,4     | 5,0 ± 0,6   |
| 2,3,4-Trichlorophenol     | 0,0 ± 0,0             | 0,0 ± 0,0   | 0,0 ± 0,0     | 0,0 ± 0,0   |
| 2,3,4,6-Tetrachlorophenol | 0,0 ± 0,0             | 0,0 ± 0,0   | 0,0 ± 0,0     | 0,0 ± 0,0   |
| Pentachlorophenol         | 16,2 ± 1,2            | 4,5 ± 0,5   | 6,0 ± 0,4     | 40,2 ± 1,6  |

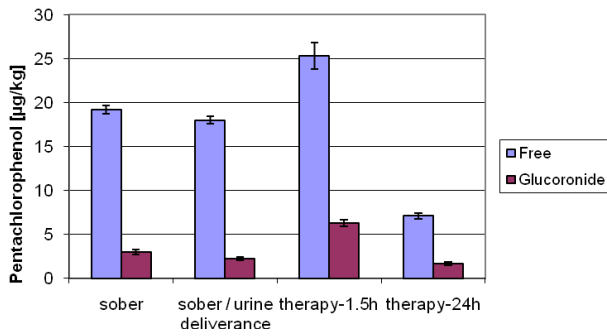
|                           | Blood (empty stomach);<br>Time of urine deliverance |             | First urine sample<br>after morning urine |             |
|---------------------------|---|-------------|---|-------------|
|                           | Free  | Glucuronide | Free                                      | Glucuronide |
| 2,4,6-Trichlorophenol     | 1,1 ± 0,1   | 0,4 ± 0,2   | 0,4 ± 0,1                                 | 1,4 ± 0,2   |
| 2,4,5-Trichlorophenol     | 6,5 ± 0,5   | 2,8 ± 0,4   | 1,5 ± 0,3                                 | 6,5 ± 0,7   |
| 2,3,4-Trichlorophenol     | 0,0 ± 0,0   | 0,0 ± 0,0   | 0,0 ± 0,0                                 | 0,0 ± 0,0   |
| 2,3,4,6-Tetrachlorophenol | 0,0 ± 0,0   | 0,0 ± 0,0   | 0,0 ± 0,0                                 | 0,0 ± 0,0   |
| Pentachlorophenol         | 12,4 ± 0,8  | 4,0 ± 0,4   | 2,6 ± 0,6                                 | 40,0 ± 1,8  |

|                           | Blood after therapy; 1,5 h |             | Urine after therapy; 1,5 h |             |
|---------------------------|----------------------------|-------------|----------------------------|-------------|
|                           | Free                       | Glucuronide | Free                       | Glucuronide |
| 2,4,6-Trichlorophenol     | 2,2 ± 0,4                  | 1,0 ± 0,2   | 0,8 ± 0,2                  | 1,6 ± 0,4   |
| 2,4,5-Trichlorophenol     | 7,4 ± 0,8                  | 4,0 ± 0,6   | 2,0 ± 0,4                  | 8,0 ± 1,0   |
| 2,3,4-Trichlorophenol     | 8,0 ± 0,6                  | 1,0 ± 0,2   | 1,2 ± 0,2                  | 1,4 ± 0,2   |
| 2,3,4,6-Tetrachlorophenol | 3,0 ± 0,5                  | 3,0 ± 0,6   | 1,4 ± 0,4                  | 1,4 ± 0,2   |
| Pentachlorophenol         | 16,0 ± 0,8                 | 5,4 ± 0,4   | 6,5 ± 0,5                  | 48,0 ± 2,0  |

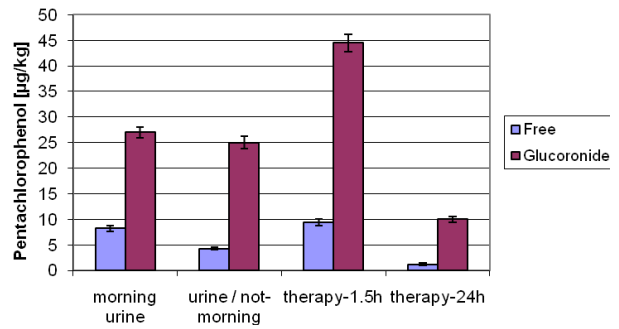
|                           | Blood after therapy; 24 h |             | Urine after therapy; 24 h |             |
|---------------------------|---------------------------|-------------|---------------------------|-------------|
|                           | Free                      | Glucuronide | Free                      | Glucuronide |
| 2,4,6-Trichlorophenol     | 0,0 ± 0,0                 | 0,0 ± 0,0   | 0,0 ± 0,0                 | 0,0 ± 0,0   |
| 2,4,5-Trichlorophenol     | 3,0 ± 0,4                 | 1,5 ± 0,3   | 1,0 ± 0,1                 | 1,8 ± 0,4   |
| 2,3,4-Trichlorophenol     | 2,0 ± 0,6                 | 0,0 ± 0,0   | 1,0 ± 0,1                 | 0,0 ± 0,0   |
| 2,3,4,6-Tetrachlorophenol | 0,2 ± 0,1                 | 0,0 ± 0,0   | 0,0 ± 0,0                 | 0,0 ± 0,0   |
| Pentachlorophenol         | 7,4 ± 0,6                 | 2,0 ± 0,4   | 2,0 ± 0,4                 | 14,5 ± 0,0  |

**FIGURE 1 - Pentachlorophenol concentrations in blood and urine samples according to proband.**

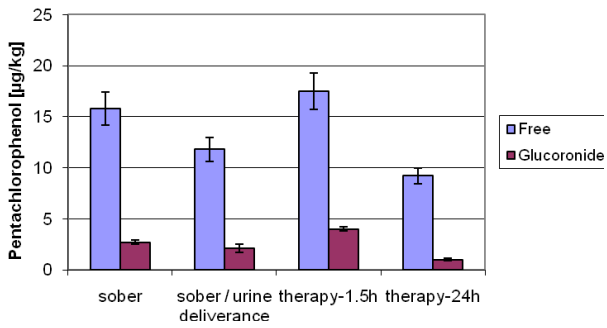
Blood - Proband 2



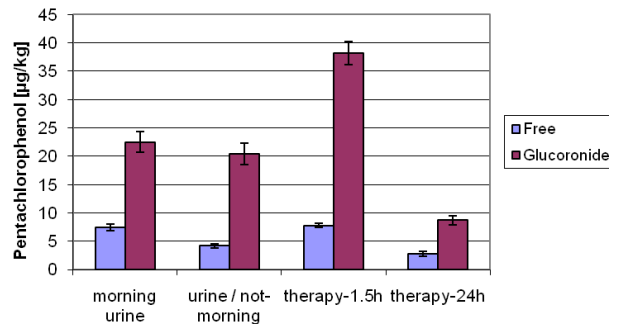
Urine - Proband 2



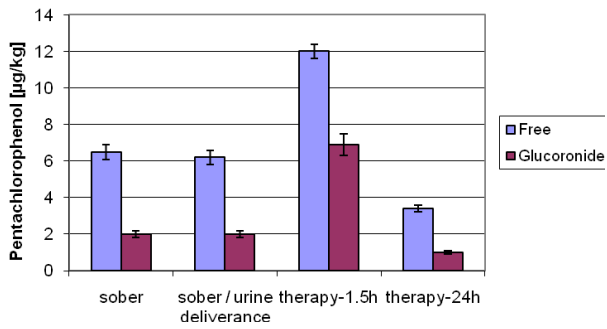
Blood - Proband 3



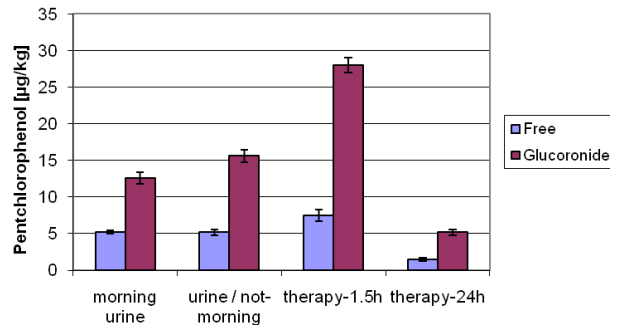
Urine - Proband 3



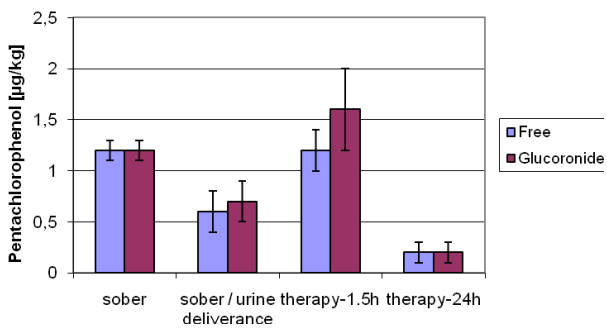
Blood - Proband 4



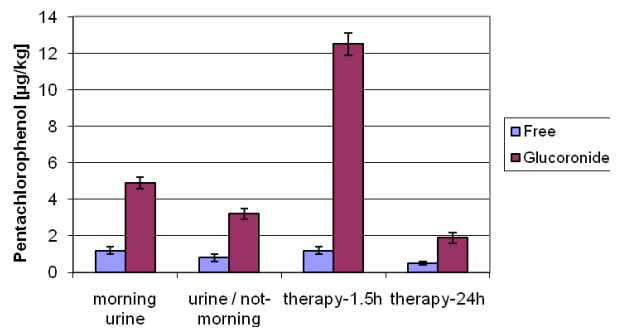
Urine - Proband 4



Blood - Proband 5

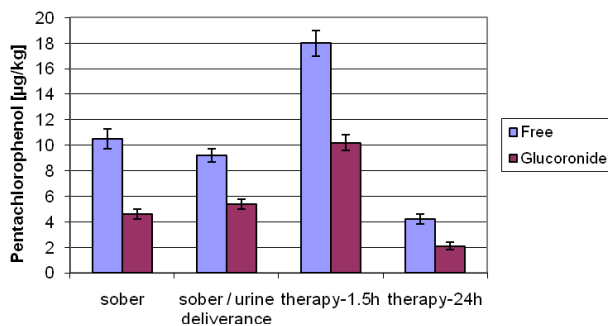


Urine - Proband 5

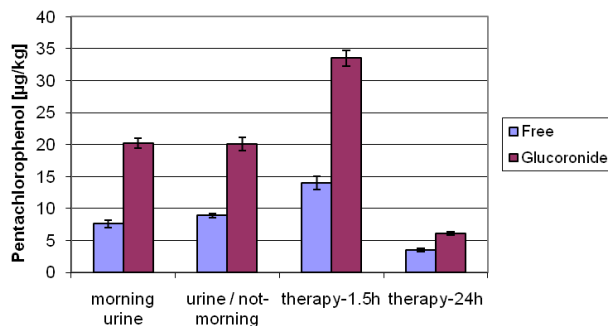




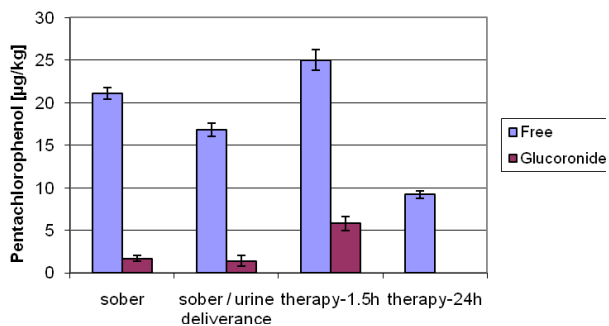
Blood - Proband 6



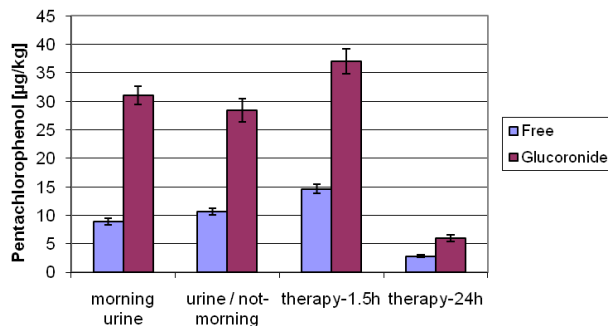
Urine - Proband 6



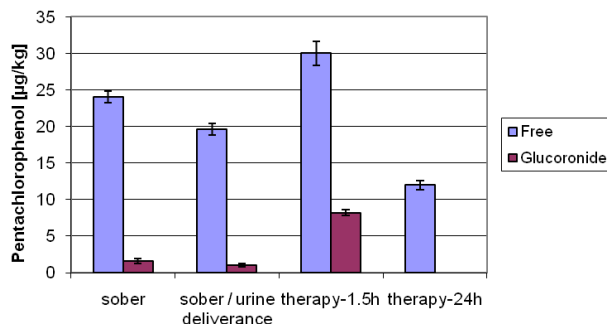
Blood - Proband 7



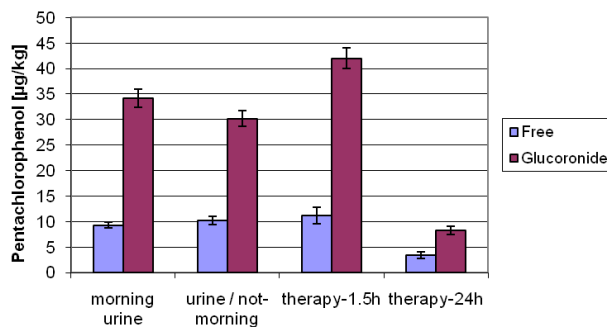
Urine - Proband 7



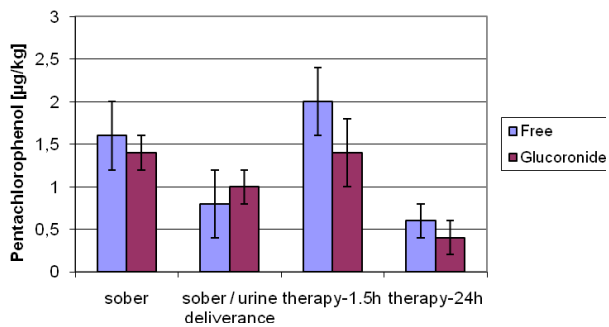
Blood - Proband 8



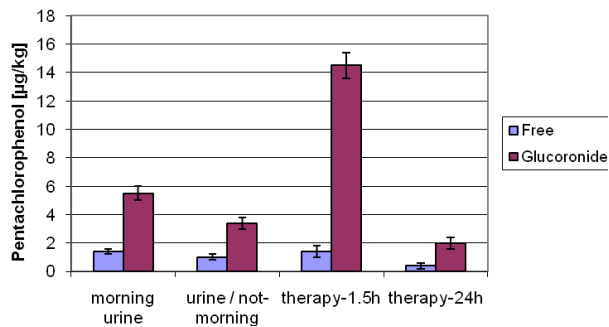
Urine - Proband 8



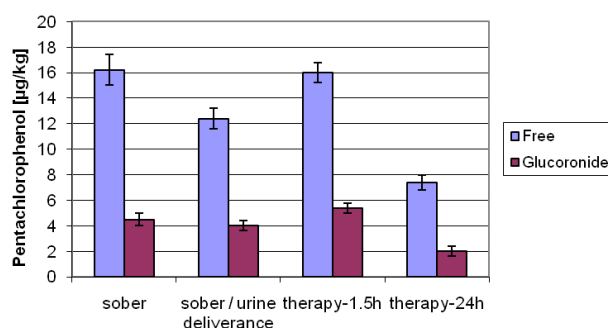
Blood - Proband 9



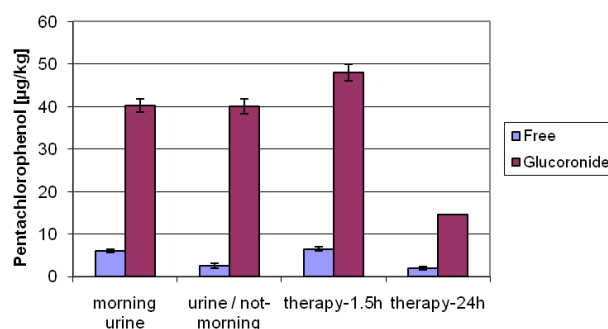
Urine - Proband 9



Blood - Proband 10



Urine - Proband 10



to the metabolite pentachlorophenolglucuronide. Similar values were also found in the urine delivery. After the therapy of 1.5 h, the total pentachlorophenol content in blood increased significantly and reached ca. 20.5 µg/kg. For this, the ratio of pentachlorophenol to pentachlorophenolglucuronide is 3.55. This tendency is also confirmed for the period of 24 h. The ratio here is ca. 4.0, with a total phenol concentration of ca. 10 µg/kg. This means at first that the concentration of pentachlorophenol decreased after the therapy, and secondly that higher amounts of pentachlorophenolglucuronide were eliminated from blood. The corresponding urine values of proband No. 1 show that the pentachlorophenolglucuronide concentrations increased after 1.5 h of therapy (from 16 to 45.0 µg/kg), which means that a treatment with PowerTube accelerated the excretion of pentachlorophenolglucuronide from urine. After 24 h of treatment, the proband excreted ca. 15 µg/kg of the total pentachlorophenol content, which corresponds to 37.5% of the initial concentration. Therefore, the elimination of pentachlorophenol in proband No. 1 occurred at first rapidly, and reached only one third of the initial value at the end of the treatment.

As has been demonstrated on the example of proband No. 1, the same in tendency can also be ascertained for the other probands. The results clearly indicate that after a PowerTube therapy of 1.5 h, the chlorophenol concentrations in blood and urine of all probands start at first to increase significantly. Concentrations, however, of both the chlorophenols and glucuronide in blood and urine decrease significantly when the therapy continuous over 24 h. It is remarkable to observe that the glucuronide concentrations increase significantly after 1.5 h of therapy, which indicates in turn that metabolism takes place increasingly in all probands. After 24 h of therapy, these substances are excreted through the urinary bladder, which means that a detoxification of the human body from this environmental chemical takes place.

The disadvantage of this study, however, is that only two measurements were performed, one after 1.5 h and the other one after 24 h, which leads to the question as to how exactly the decrease over time occurred. This can only be answered by additional measurements in between this

period, but it is assumed that a linear decrease takes place. Moreover, additional measurements should be performed after 24 h in order to ascertain whether the values after 2 or 3 days remain either constant, or start to increase. It is assumed without speculation that the values reach their initial level after a certain time. This however would mean that the duration of the therapy should be prolonged (7 to 30 days) in order to irreversibly eliminate or excrete these substances from the human body, presuming that no additional contamination of the proband with chlorophenols would occur.

In conclusion, the therapeutic devise PowerTube QuickZap clearly stimulates the metabolism process in the body, leading to detoxification as we demonstrated earlier with alcohol and coffee treatments of probands(10) If applied regularly, the probability is high that the chlorophenols are entirely eliminated from the human body.

*The authors have declared no conflict of interest.*

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