The Swiss toxicologist Hans Brandenberger explains which chemical clues point to [Uwe Barschel's] murder at the hand of professionals

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Chemical analysis of body fluids and organs of poisoned persons can reveal surprising informations. The causative agents can be detected and quantified. The comparison of their concentrations in the stomach, blood and urine, as well as the simultaneous detection of their possible modified and degraded products (metabolites) permits conclusions as to the time course of the events. It is not unusual that the analytical data also provide insight into the background of the poisoning; for example, it is possible to infer whether accident, suicide or murder is the most likely scenario, and there may even be clues as to the identity of the perpetrators.

The professional requirements for the analyst are demanding. He must master the techniques of analysis of biological matter, have a good knowledge of analytical instrumentation, know the pathways of drug modification and degradation in the body (metabolism), and he must not be influenced by the external circumstances or appearances of the case.

On the immediate cause of death

As a Swiss citizen with American family background I am mostly oriented to the West and know little about German politics. The first time I heard about Uwe Barschel was on October 11th, when the Swiss radio broadcast the news that he had been found dead in a Geneva hotel. I was then attending a meeting of a commission of the Senate of the German Research Council (DFG) in Munich. Several of my colleagues immediately expressed their view that this was clearly a suicide. My question as to how they could be sure of it without detailed information was left unanswered. As I was chairing the meeting, I did not think about the news for long; I only remembered that Dr. Barschel had been a leading politician and the premier of a German province. I did not even know his party affiliation.

The next time I became involved with this affair was on December 20th 1987. A Swiss journalist, whom I had previously supplied with answers to his toxicological questions, contacted me. He told me that he and a colleague of his were staying in Geneva to collect information on Barschel's death. They had managed to get hold of the report of the chemical-analytical service of the court at Geneva that at the time was still under locks (how they had managed it, he would't say). He read the summary to me, containing the concentrations of four drugs in

the stomach fluid, the blood, and the urine. My comment: The deadly dosage of the hypnotic agent cyclobarbital had entered the body later than the other sedative and/or hypnotic agents, which earlier had also been applied high dosages.

With these comments, I had stirred a hornets' nest. The following afternoon, the two gentlemen arrived with a TV crew in tow and asked me to repeat my statement for the public. I requested one hour's time to read the report of the Geneva forensic chemist, Dr. Staub, and then answered their questions. I called the report solid, the conclusion—deadly dosage of the hypnotic cyclobarbital, augmented by the likewise toxic dosages of the drugs pyrithyldione, diphenhydramine und perazine—reasonable. I further stated that the deadly dosage of cyclobarbital very likely had been ingested only after the others, since [at the time of death] it had only been in the process of uptake (high content in the stomach, higher concentration in the blood than in the urine), whereas the others had already been in the process of excretion (concentration lower in the blood than in the urine).

The conclusions would be strictly provable through the detection of the drugs' degradation products (metabolites). The question whether Dr. Barschel had still been capable to act himself when cyclobarbital was applied, after the other three hypnotic and sedative drugs had already been applied earlier, I answered as follows: "It is unlikely that he knew what he did or what happened to him."

Considering the reactions of my colleagues at the DFG meeting I was not too astonished that, after this interview was broadcast, quite a few newspapers attacked me. In contrast, I fail to understand that the forensic chemist with the Geneva judiciary, Dr. Staub, was angry about my suggestion to look for metabolites. To me, the simultaneous detection of metabolites is an integral part of every toxicological analysis, as some compounds can only be detected as metabolites. To my later question as to why he had not looked for metabolites, he answered that this had not beend demanded of him. But who would be able to make such a demand? Certainly not the examining magistrate or judge, who as a jurist is not versed in these matters. Or did the chemist possibly think of his colleague, the court pathologist Professor Fryc?

The Hamburg "cocktail" hypothesis

Following the examination at Geneva, several of Uwe Barschel's organs were also examined in Hamburg in 1987. These examiners confirmed the main conclusions from Geneva and additionally showed that the deceased had also ingested a quite large dosage of the drug Tavor [lorazepam]. The Hamburg forensic expert told the media that the deadly drugs had been ingested as a cocktail. I wonder how he could have reached this conclusion, since the people in Hamburg had not had access to stomach fluid or urine for their examination, and no glass or other container for the supposed cocktail either.

Dr. Staub had not made such a conclusion in his report, but later he adopted the statement of the Hamburg forensic expert. At the "Analytical Forum 88", a public symposium on instrumental analytical chemistry at Egerkingen / Switzerland in February 1988, he gave a presentation on his examinations in the Barschel case. When asked whether the drugs had been ingested simultaneously or successively, he answered with "simultaneously, as a cocktail". When asked why the urine content of cyclobarbital was so low, he stated that this drug is rapidly metabolized in the body and occurs in the urine as a metabolite. Why, then, did he

not measure the metabolite?

The search for metabolites

Subsequently, the family of the deceased engaged the forensic and legal experts in a struggle of several years in order to have analyses for drug metabolites performed. As I had told them, this was possible in several ways:

- by re-analyzing the existing extracts of urine or kidney tissue,
- by re-extracting these materials and analyzing those new extracts,
- by reviewing the already existing raw data from Geneva (computer printouts).

When the examining magistrate, after three years, finally requested the Geneva institute to hand over the urine and stomach contents of the deceased to Dr. Eike Barschel (the brother of the deceased) and myself, we were in for a rude surprise. Dr. Staub showed us, in his institute, a plastic tube labeled with wax crayon, containing 10 milliliters of urine, and he offered us half of that amount. He said that no more was available, and only a tiny amount of kidney tissue. Professor Fryc maintained that more than 0.5 liters of urine that had not yet been examined, as well as the stomach content—which had not even been quantified before—had been discarded.

Of course I did not believe this. Discarding sample material is tantamount to the destruction of evidence and is punishable by law. According to Dr. Staub, the extracts, too, had all been discarded. I went away without having achieved anything and assumed that the examining magistrate would look into the matter. That however was not the case.

Today I do no longer think it impossible that Professor Fryc discarded most of the stomach content and urine, but I know that there still was enough kidney material, which can serve as a substitute for urine, since 67 grams of it were sent to Munich in February 1995.

After the Geneva court's forensic service had succeeded to forestall additional analyses of their extracts, as well as the repeated extraction of the organ materials, Dr. Eike Barschel demanded to see the data of the [previous] analyses. Dr. Staub would only accede to it when ordered by the court, since according to him the data were strictly secret. This attitude is incomprehensible to me. As the apppointed court chemist at Zurich, I have always shared the analytical evidence when requested by the victims or accused in the case. They were always allowed to review the data with their legal counsels. If one makes a statement that has [legal] consequences, one must not hesitate to offer up the evidence.

On November 4th 1991, the examining magistrate Carol Barbey summoned Professor Fryc, Dr. Staub and myself. She demanded to know what metabolites were and what kind of information one could derive from their measurements. I explained that a total lack, or the presence of only trace amounts of metabolites of cyclobarbital would prove the sequential uptake of the drugs, such that cyclobarbital had been taken up only after the other drugs; this would be further corroborated by the detection of significant amounts of metabolites of these other drugs. On the other had, the detection of significant amounts of cyclobarbital metabolites in the urine would be evidence against a sequential application. The colleagues from Geneva appeared to agree with this statement.

I now expected to soon be granted permission to review the analysis data. However, only after a prolonged tug of war did the magistrate, on February 10_{th} 1993, request the experts Fryc and Staub and myself to review the existing data and possibly also to perform minor additional analyses, with the purpose to learn more about the time course of drug application, as well as the question whether or not Uwe Barschel had still been master of himself when the cyclobarbital had been applied. When several experts are jointly given a task, they are commonly expected to submit a joint report. I therefore asked the magistrate what should happen in case we couldn't agree. Her reply: In that case, everyone should submit his own report.

My review of Dr. Staub's data occurred on March 4^{th} 1993. During the last half hour of this session, Professor Fryc was also present, and we scheduled an additional analysis of 5 milliliters of urine for March 31^{st} 1993 in order to clear up the discrepancy between the data from Geneva and those from Hamburg. I took it on to draft the report on the review and evaluation of the data in German, asked colleague Staub for a report on the additional analysis and hoped that Professor Fryc would translate my text. Here a short summary of the new results:

- There were no cyclobarbital metabolites at all in the urine; the body therefore had had no time at all to degrade this substance.
- There was a number of diphenhydramine metabolites in the urine, indicating that the body had been able to degrade diphenhydramine.
- In the urine, but strangely not in the stomach and the blood, I was able to detect small amounts of another strong hypnotic, namely methyprylon, the active ingredient of the [the commercial drug] Noludar.
- The additional analysis of the urine (to search for benzodiazepines) proved the ingestion of lorazepam (the active ingredient of the commercial drugs Tavor and Temesta) or lormetazepam (the active ingredient of Noctamid and Loramet), at a dosage at the high end of the therapeutic range, but hardly important for the events.

My statement from December 1987 that the deadly cyclobarbital had been taken later than the other drugs was therefore confirmed by the search for metabolites, based alone on the review of the data from Geneva. I was very astonished by the detection of Noludar (methyprylon) in the urine, since this hypnotic drug is rapidly modified in the body, and usually only its oxidative metabolites are exreted. It used to be commercially available as an aqueous solution, but it oxidizes in solution even upon contact with oxygen. Its initial oxidation product is even more strongly hypnotic than Noludar itself. This is the reason for the exceptionally strong and rapid effect of the so-called "k.o.-drops", which were first used in the Hamburg red light district and later also in Switzerland to stun johns.

My report

I shared my part of the report with the colleagues from Geneva, but I didn't hear back from them. When I contacted Dr. Staub in this matter in May 1994, he stated that the translation

was almost ready, but Professor Fryc and he had decided to remove the metabolite analyses from the report, as well as my detection of Noludar, in order not ot complicate the matter. He said that they also wanted to write up the conclusions separately from me.

To suppress important information is tantamount to the fabrication of facts. I therefore informed justice Barbey on May 14th 1994 that I had to make use of the option offered by her to submit a separate report, and I submitted my report on May 27th 1994, as follows: My expert opinion (21 pages) with three appendices (seven pages with structural proofs and literature citations for the chemical experts).

Examinations from Munich

At the end of September 1994 the Geneva judiciary forwarded my report to the chief public prosecutor at Lübeck, Mr. Wille, who in turn forwarded it to the department of forensic medicine at the University of Munich, requesting a short expertise on its plausibility. Professors von Meyer and Eisenmenger transmitted their statement to Lübeck by fax on October 5th. They stated that the urine of the deceased might have been acidic, which would have inhibited the excretion of the acidic compound cyclobarbital.

This idea, however, had not originated in their own kitchen. It had already been suggested in a previous letter of the US-American toxicologist Basselt to the magazine "Stern", to which I had replied as follows: Pyrithyldione, the active ingredient of [the commercial drug] Persedon, that surely was undergoing excretion [at the time of death], is also a weak acid and not basic or neutral, as Basselt had assumed. An acidic urine should have inhibited its excretion also. In addition, the autopsy had not provided any indication of a disease that would result in an acidic urine.

Nevertheless, the "plausibility expertise" from Munich was given to the press, whereas my explanations were not. Later on, some more theories were advanced to explain what causes might have inhibited the excretion of cyclobarbital. None of these had any solid foundation. I will relate just one of these: At the symposium at Egerkingen, Dr. Staub rightly stated that cyclobarbital is swiftly degraded, and he also correctly named the main metabolite, for the presence of which he nevertheless had not looked in his analysis. After I had failed to find it [in my review of his data], he changed his mind and on February 21st submitted the following statement to justice Barbey: "It is common knowledge that cyclobarbital is only slowly metabolized".

On February 20th 1995, Dr. Staub handed over the following materials collected from Uwe Barschel's autopsy that were still available at Geneva, as follows: 12 grams of stomach content (which had not been shared with the experts at Hamburg), 25 milliliters of blood and 115 grams of liver tissue, 28 grams of bile, 5 milliliters of urine and 67 grams of kidney tissue (which had been concealed from us in 1992). These were sent to the forensic department in Munich for a re-analysis, which yielded surprising results:

1. In the blood and urine, Professor von Meyer found traces of volatile compounds and inferred the ingestion of alcohol. His opinion: "The results are compatible with the ingestion of whisky and/or red wine at an amount that corresponds to the [number of] bottles that were found or had been ordered."

2. In the blood, bile and urine he detected the presence of Noludar (methyprylon) and wrote that this was present in the enol form. In addition, he reported the detection and quantification of methyprylon by UV spectrophotometry. In this, he reported unbelievably high concentrations, namely 2 milligrams/liter in the blood (only 0.19 mg/l by gas chromatography, that is ten times less), 35.9 mg/l in the urine and 158 mg/l in the bile.

3. In the urine, he detected three metabolites of diphenhydramine, as well as: "Indications of the presence of an oxo compound of cyclobarbital, the spectrum of which however is not identical to the one given by Pfleger/Maurer/Weber".

As to the first result: When such small samples of biological material are left to age, there is always a small degree of putrescence. This produces traces of the volatile compounds that Professor von Meyer had reported. At the so-called round-table at Lübeck on June 5th 1997, Professor Schmoldt asked his colleague von Meyer whether his volatile compounds might not have arisen by putrescence. His reply: "That is possible". This is not noted in the report to the judiciary.

As to the second result: Around 1965 at Zurich, we had to examine a large number of Noludar intoxications. I am familiar with the metabolism of this substance, and I learned much about it from Dr. Schnyder, the chemist with Roche who synthesized Noludar, as well as from physician and chemist Professor Pribilla ([universities] Kiel and Lübeck), whose habilitation covers the metabolism of Noludar. I have also published on this subject myself.

I had already been puzzled by the results of the analysis in Geneva, which had detected un-metabolized Noludar in the urine but not the stomach or the blood. My impression was that this substance might have been applied rectally, shortly before death had occurred. The expertise from Munich, however, is incompatible with this. Professor von Meyer writes that methylprylone was present in the enol form and had been measured by UV spectrophotometry. However, it is not possible to distinguish the enol from the keto form by mass spectrometry. In addition, the absorbance of Noludar in the UV range is so small that it is barely detectable, and certainly not quantifiable, in an extract from a biological sample. I have stated my concerns in writing on October 10th 1995 to the public prosecutor's office at Lübeck (Mr. Wille), with copies to the judiciary at Geneva (chief prosecutor Bertossa and examining magistrate Barbey). I hinted that a clarification of these issues might be important for the investigation but did not receive a reply.

Upon my request, the public prosecutor Sela at Lübeck on May 6th 1996 sent me some documents concerning the Noludar analyses that had been provided from Munich after long delay. The identification by mass spectrometry in the urine and the bile appears correct. In contrast, the measurements by UV spectrophotometry do not. Noludar has an absorbance maximum at 295 nanometers. The people in Munich detected a compound with a maximum at 306 nm, probably Persedon (pyrithyldione), whose UV absorbance is about 100 times greater. I advised Mr. Sela to consult with Professor Pribilla at Lübeck. He refused.

As to the third result: It supports the conclusion that cyclobarbital had been ingested later than diphenhydramine. But von Meyer again brings up Basselt's theory. He presumably has not read my reply to the latter. He also criticized that my search for metabolites did not also include pyrithyldione and perazine, although he knows that the former is very stable in the body and does not yield detectable metabolites, and that we lacked the material required for a

renewed extraction for perazine metabolites.

How did the Noludar enter the body?

Having studied some more analysis reports from Munich that had been forwarded to me via Mr. Sela's office, on July 27th 1996 I once again explained to him my findings, and in particular my criticisms of the Munich statements and data on Noludar, as I had done before on the occasion of my summons to Lübeck on May 14th. In a post scriptum to this letter, I argued: "The methyprylon (active ingredient of Noludar) certainly has played a role in the events. If it had been applied orally hours before death occurred, or even earlier, its metabolites would have to be detectable. If they are not, one should consider the possibility of a rectal application shortly before death."

Discussions at Lübeck

My previously mentioned summons on May 14th was attended by chief prosecutor Wille only during the greeting and the leave-taking. The proceedings were attended by prosecutor Sela, by a criminal officer as well as a chemist from Lübeck, Dr. Reiter. The policeman listened carefully. Prosecutor Sela kept photocopying my documents, notwithstanding my telling him that everything was already in his file. Dr. Reiter contributed several strange comments, for example: Possibly, the spectrophotometer at Munich was misaligned. A little later I received a summary of my explanations written by Dr. Reiter in which crucial points were missing.

On June 5th 1997 I was at the "round table" at Lübeck. This was chaired by Dr. Reiter. In the morning, the data from Geneva, Hamburg and Munich were averaged. I did not understand why, since the sample materials [from which the data being averaged had been obtained] were certainly not identical [and therefore should not be expected to contain the same concentrations]. The afternoon was devoted to speculations as to what might have prevented the excretion and metabolism of cyclobarbital. I contributed little. In forensics, one should adhere to facts and not use unmotivated speculations.

It was interesting to note that some participants kept harping on the possibility of assisted suicide. This implies that they, too, consider a separate ingestion of the drugs plausible. However, the detection of Noludar, and the time line do not fit the assumption of assisted suicide.

Deficiencies of the investigation

In the beginning, it was noted that the professional requirements for chemical toxicologists are stringent. Have these requirement been met in the Barschel case? The chemist at Geneva has solidly determined the immediate cause of death, but without explicit orders refused to shed more light on the underlying circumstances. However, in cases such as this one, no one can issue such explicit orders, since the higher echelons do not know about the possibilities of chemical analysis. The circumstance that important sample materials were simply discarded by the pathologist has certainly hampered the investigation and is incomprehensible.

The Hamburg expertise was vigorously criticized by the expert from Berlin, Dr. Katzung. The expertise from Munich would likely have fared worse. The forensic laboratories are certainly well equipped, but there are gaps in the technical and analytical know how. For example, a chemist should be able to evaluate spectra by deduction and without the help of a computer library, since some entries may be missing from these (such as the diphenhydramine metabolites were, 25 years ago) or may be faulty (as the one for Noludar was at the time).

However, the probably greatest mistake was committed when the repeated analyses were requested from experts that had already made up their minds about the events. That certainly is the case for Munich. But also remember that the statement by the Hamburg forensic expert on the combined ingestion of drugs as a "cocktail" was not based on the results from his institute.

Clues as to the perpetrators

I knew neither the political circumstances nor the preceding history and hardly ever read the German newspapers, even after I had become involved in the investigation. I wanted to remain free of external influences as far as possible. After the investigation had been discontinued, and as I had some time to spare in retirement, I reviewed the books concerned with the case and also came across the report by Victor Ostrovsky: "The other side of the deception (Harper Collins, 1994), which a Geneva journalist had previously tried to bring to my attention. This book details a scenario of murder of Uwe Barschel at the hands of a group of Mossad people.

In contrast to other declarations of confessions or speculations, Ostrovsky's details on the application of the drugs are quite well compatible with the analytical-chemical data: The initial anesthetization using wine with [drug] additives, then—an hour later or more—application of a deadly dosage of hypnotics using a gastric tube, followed by the rectal application of a suppository containing a strong sedative.

However, there also are discrepancies: Ostrovsky writes that pills had been applied through the gastric tube. But the Geneva report does not mention any remainders of pills in the stomach; it doesn't state either that they were absent, however. Noludar, which according to the analyses had been rectally applied, was not commercially available as a suppository. This difficulty can easily be overcome by soaking a porous material (cotton) with k.o.-droplets. Notwithstanding these discrepancies, Ostrovsky describes a scenario that fits the analysis data remarkably well. The chemical findings indicate murder. In particular,

1. it is certain that the deadly dosage of cyclobarbital was applied later than other strongly sedative drugs, most likely at a stage of lost capability to act,

2. it is virtually certain that the strong hypnotic Noludar was applied rectally, briefly before death occurred, which is incompatible with the assumption of assisted ("humane") suicide,

3. because of the complexity of the murderous event it has to be assumed that this was the work of a team of professionals, as opposed to a single person.