Z Rechtsmed (1988) 101:197–204

Zeitschrift für
Rechtsmedizin

Kasuistiken / Casuistics

Fatal Intoxications in Denmark Following Intake of Morphine from Opium Poppies

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Summary. In Denmark it is legal to grow opium poppies for the production of poppy seeds and until 1986 for decoration purposes, too. Danish poppy capsules contain 0.3–5 mg morphine per capsule and the content of morphine in opium exuded from the capsules may amount to 24%. This has resulted in misuse as both fresh and dried poppy capsules have been used for the production of "opium tea". During the period 1982–1985, seven casualties occurred among drug addicts in Denmark which were solely or partly caused by these opium poppies.

Key words: Opium poppies – Poppy capsules – "Opium tea" – Drug addicts – Deaths from opium poppies

Zusammenfassung. Der Anbau von Mohn zur Produktion von Mohnsamen (für Brötchen) ist in Dänemark erlaubt; bis 1986 war er auch zu dekorativen Zwecken zugelassen. Dänische Mohnkapseln enthalten 0,3–5 mg Morphin per Kapsel. Der Inhalt von Morphin im Opium, das aus den Kapseln gewonnen wird, kann bis zu 24% ausmachen. Dieses hat zum Mißbrauch von sowohl frischen als auch getrockneten Mohnkapseln zur Produktion von „Opiumtee" geführt. In der Zeit von 1982–1985 erfolgten sieben Todesfälle von Drogensüchtigen in Dänemark, verursacht ausschließlich oder teilweise durch diese Mohnkapseln.

Schlüsselwörter: Mohnblumen – Mohnkapseln – „Opiumtee" – Drogenabhängige – Tod durch Mohnblumen

Introduction

During recent years in Denmark a discussion has taken place in the daily press and the Danish parliament concerning the legal growing of opium poppies and the sale of dried Danish poppy capsules.

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In Denmark it is legal to grow opium poppies for seed production without any restrictions, whereas in many other European countries it is either totally prohibited or growing is allowed only after special permission, for instance for scientific or pharmaceutical purposes. This gives the Danish farmers good possibilities for export of the popular blue poppy seeds, but unfortunately it implies that drug addicts often steal poppy capsules from the fields in the period from ceasing to flower until harvest to get free narcotics. Obviously, it is very difficult for the farmers to control their fields and avoid these thefts. Furthermore, the dried Danish poppy capsules, which until March 1986 were legally sold on the Danish market, most often for decoration purposes, were bought by drug addicts in considerable amounts. By making tea of these dried capsules it was possible for the drug addicts to meet their demand for narcotics in a much cheaper and easier way than by buying illicit narcotics. Because of the misuse the law was strengthened and from March 1986 onward growing of opium poppies for decoration purposes has been allowed only after special permission from the National Board of Health.

In Denmark all deaths in connection with abuse of narcotics are subjected to medicolegal autopsy and forensic chemical investigation by law. In the light of this all casualties, where opium poppies has been involved, should be submitted to forensic chemical investigation.

To obtain an impression of the magnitude of the problem it was found relevant to investigate how many deaths were caused solely or partly by this uncontrolled misuse in Denmark.

The study also involved a determination of the content of morphine in Danish grown poppy capsules, poppy seeds and in "opium" exuded from the capsules.

Materials and Methods

Materials

This investigation includes seven fatal intoxications in Denmark, where morphine from poppy capsules grown and/or sold in Denmark, fresh or dried, in the period 1982–1985 most likely has been the cause of death or significantly contributed to death.

Included are also poppy capsules seized or collected and poppy seeds bought under the name Tawana.

Methods

Determination of the Content of Morphine in Poppy Capsules or Seeds. Three poppy capsules were finely sliced and boiled in 100 ml of water for 10 min, after which an excess of sodium hydrogen carbonate together with a threefold volume of chloroform/isopropanol 3 + 1 was added (pH 8.4–9.0). After shaking, the organic layer was filtered through sodium sulfate, and the extraction was repeated twice. The combined extracts were evaporated and the residue dissolved in 2.0 ml of methanol. Part of the methanol solution was evaporated and 100 µl of BSA/acetone 1 + 1 added for analysis by GC, using a 3% SE-30 column combined with a flame ionization detector. The result was verified by TLC and UV-spectrophotometry.

The content of morphine in poppy seeds was determined in a similar way, using 10 g of seeds. Morphine in opium exuded from poppy capsules was determined by dissolving the opium powder in methanol, which was used for GC (BSA-derivative), TLC and UV-spectrophotometry as described above.

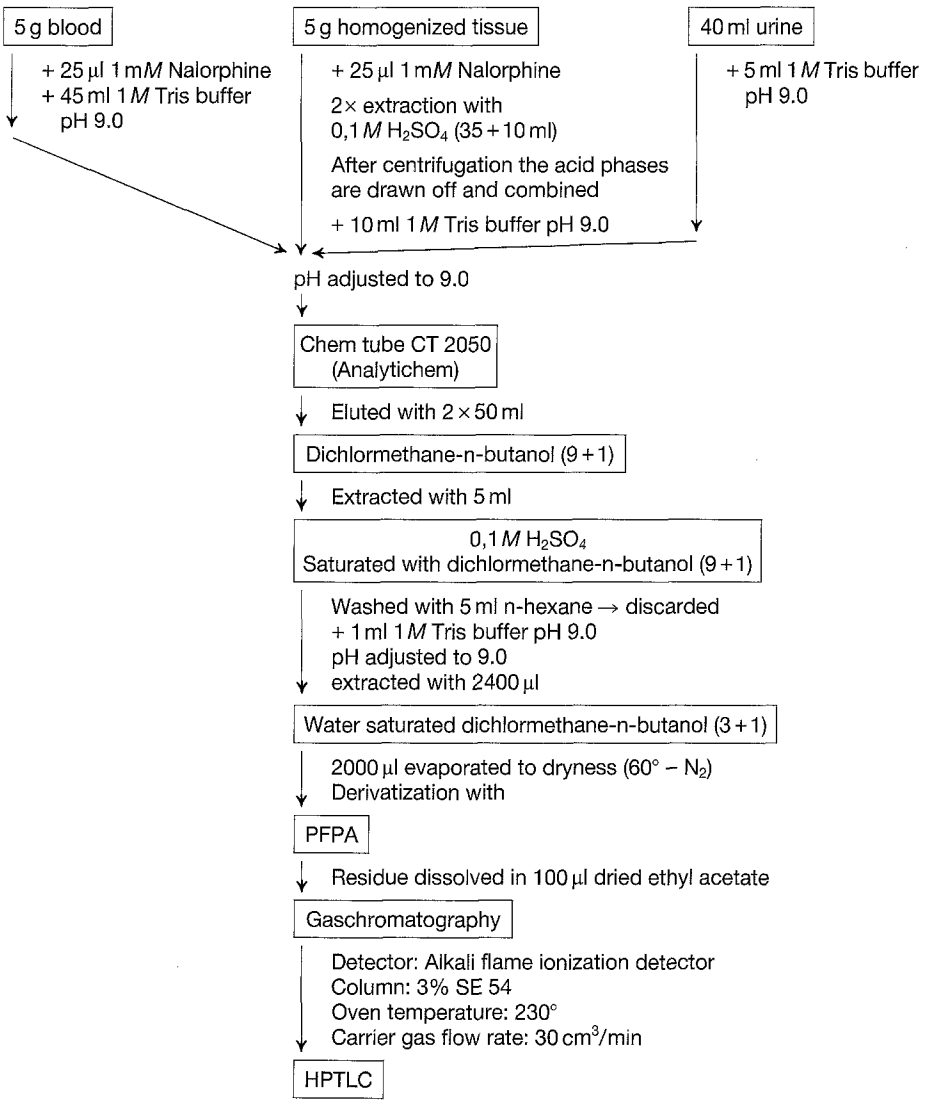

Fig. 1. Method for the determination of morphine, codeine, and 6-monoacetylmorphine in blood, tissue, and urine

Determination of Morphine in Autopsy Material. In one of the cases (no. 3) the drugs were analyzed as described by Kaempe [4], while the methods used for the other six cases were as follows:

The method for determination of morphine in autopsy material was based on column extraction, using Chem Tube columns [7]. The method is outlined in Fig. 1.

The quantitative determination was performed by gas chromatography after derivatization with PFPA, and the confirmation of the results by thin layer chromatography.

Other Forensic Chemical Investigations in Autopsy Material. For basic drugs a liquid-liquid extraction was performed followed by a quantification by gas chromatography with confirmation by thin layer chromatography [9].

Ketobemidone was analyzed by the same method as morphine, but diethylether was used instead of dichlormethane-n-butanol (1 + 9).

A radioreceptorassay [6] was used as screening method for the benzodiazepines, while the quantitative determination was performed by gas or high pressure liquid chromatography [8].

Results and Discussion

Content of Morphine in Opium, Poppy Capsules, Poppy Seeds, and Extracts ("Tea") Made from Poppies

The content of morphine in opium exuded from Danish poppies may amount to 24%, which is similar to opium from poppies grown in a warmer climate. Opium powder is normally used for eating or injection. Thus a concentration of 70 mg morphine and 5 mg codeine per milliliter has been found in a syringe intended for injection .

A normal procedure for "tea" preparation is boiling of 25–30 poppy capsules in 2–3 l water, corresponding to a concentration of 2–75 mg morphine per liter of decoction.

The laboratory extraction of morphine from poppy capsules was prepared in a similar way by boiling with water. It made no difference whether the capsules were boiled with water or with 0.05 *M* sulfuric acid. The recovery was approximately 90% by both methods.

The content of morphine in Danish poppy capsules examined varied from 0.3 to 5 mg per capsule. Depending on size and dryness of the capsule this corresponded to 0.1–2 mg/g capsule, the weight of the biggest capsule being 24 g and of a small dry capsule less than 1 g.

Even poppies grown ornamentally in private gardens may contain considerable amounts of morphine, a maximum of 5 mg per capsule being found in a "garden poppy".

Poppy seeds (blue) from two capsules with high contents of morphine contained 2–4 µg morphine/g seed while poppy seeds (white) bought in a Danish food-shop contained 30 µg morphine/g (trade name: Tawana). This is in accordance with the results of a Swedish [1] and a German study [2].

Seven Cases of Fatal Intoxications Caused by Morphine from Opium Poppies

Table 1 shows information of seven fatal intoxications, where Danish grown and/or sold poppy capsules were assumed to have caused death or to have contributed significantly to the death. The seven cases involved six men and one woman.

Twenty per cent of the total number of deaths amongst narcotic addicts investigated at the Institute of Forensic Chemistry in Copenhagen in 1982 and 1983 were women and the average age 29 years for men and 27 years for women [5]. The corresponding number for the female addicts examined at the Institute in Aarhus were 27%, and the average age was 28 and 26 years for men and women, respectively [3].

Table 1. Fatal intoxication in Denmark 1982–1985 after the intake of morphine from opium poppies

Case	Year of death	Sex	Age in years	The duration of narcotic abuse	Geographic place for the death	Month of death
1	1982	Male	26	Not stated	Rural district	August
2	1982	Male	19	Few weeks	Rural district	August
3	1982	Male	28	10–15 years, but not for the last 10 months before death	Rural district	July
4	1983	Male	18	Several years	Small town	September
5	1984	Male	34	Not stated	Small town	March
6	1984	Female	33	About 20 years	Small town	September
7	1984	Male	25	Not stated	Copenhagen	November

The average age for the seven cases in our material was 26 years, the youngest being 18 years and the oldest 34 years. In five of the cases the persons were unemployed, in two cases employment was not stated.

In six of the cases it was evident from the police report that the deceased was a drug addict. Case 2 was a young man, who obviously had begun abuse of narcotics lately. Cases 1 and 6 involved an additional abuse of alcohol. In three of the cases the duration of the abuse of narcotics was not stated. In cases 3, 4, and 6 the abuse lasted for several years.

Most often death among drug addicts in Denmark takes place in Copenhagen and its suburbs. In 1982, according to own accounts, for example 67% of the total number of deaths among drug addicts took place in Copenhagen and its surroundings.

As shown in Table 1 only one of the seven deaths caused by opium poppies took place in Copenhagen, while three took place in a small town and three in a rural district. In the case from Copenhagen (case 7) the month of death was November, where no fresh capsules were available and dried poppy capsules were used presumably. Also in case 5, where the death took place in March, dried poppy capsules must have been used.

The other five deaths took place in the period from July to September, which is a period, where it is possible to get fresh poppy capsules from the field.

The unusual geographic distribution for deaths among this group of drug addicts could possibly be explained by the easier access to opium poppy fields, in combination with the fact, that it is more difficult to get the illicit narcotics living outside the metropolitan area.

Case Reports

Case 1

The deceased (male, 26 years) was found dead in his bed about 36 h after his arrival to a re-establishment center. A bag with dried poppy capsules was found beside his bed. It was told that he was under the influence of opium from the poppy capsules during his stay.

Case 2

The deceased (male, 19 years) was found dead in his home. For the last 3 weeks he had injected amphetamine and consumed large quantities of diazepam. Two days before his death he stole poppy capsules from a field and during the last 2 days he drank large quantities of tea from these capsules with an obvious euphoric effect.

Case 3

About 1 week before death the deceased (male, 28 years) had stolen about 20 kg poppy capsules from a field. The day before his death he drank large quantities of tea from these capsules with an obvious euphoric effect. The next morning he was found dead. According to his wife he had not injected or consumed other drugs or narcotics the day before his death.

Case 4

The deceased (man, 18 years) was found dead a short time after his arrival to some friends. He was under the influence of narcotics when he arrived. Among his belongings a pot with boiled poppy capsules and a used syringe were found.

Case 5

The deceased (male, 34 years) had lately taken considerable amounts of narcotics. In his flat a pot with boiled poppy capsules was found. Three days before death the deceased received 25 methadone tablets of 5 mg and 200 ml codeine syrup.

Case 6

Boiled poppy capsules were found in the flat of the deceased (female, 33 years), and a friend stated that she had drunk tea of poppy capsules. Furthermore, were found clobazam, clomipramine, and levomepromazine tablets, all prescribed 4 days before her death.

Case 7

Boiled poppy capsules together with used syringes were found in the flat of the deceased (male, 25 years). The deceased was not seen during the last 5 days before he was found.

Toxicologic Findings

Table 2 shows the concentrations of morphine and other drugs found in the seven cases.

In all cases morphine was detected in the concentration range normally seen at our institutes in cases of deaths among drug addicts following the intake of morphine or heroin.

In six of the cases it was evident from the police report that the morphine derived from opium tea from poppy capsules, whereas it was less certain in case 1 whether the morphine originated from opium tea or from opium made from poppies.

In case 5 the cause of death was fatal intoxication with morphine, codeine, and methadone; and case 7 was a combined fatal poisoning with morphine and ketobemidone (Ketogan).

In cases 2, 3, and 5 diazepam in therapeutic concentrations was detected. In case 6 therapeutic concentrations of clobazam, levomepromazine, and orfen-

Table 2. Toxicologic findings in seven fatal intoxications in Denmark in 1982–1985 after the intake of morphine from opium poppies

Case	Morphine μmol/kg		Other drugs μmol/kg		Ethanol in blood mg/g
	Blood/Muscle	Liver			
1	B: 4.8	2.6	–		0.41
2	B: 0.3	0.7	B: Diazepam:	0.9	0
3	B: 0.2		S: Diazepam:	0.4	0
4	B: 6.7	2.5	–		0
5	B: 0.6	0.3	B: Methadone:	2.6	0
			Codeine:	2.7	
			Diazepam:	0.5	
6	B: 3.3	6.6	B: Clobazam:	0.4	0
			Clomipramine:	0.8	
			Levomepromazine:	0.2	
			Orfenadrine:	0.3	
7	M: 0.7	4.1	M: Ketobemidone:	0.8	No blood available

B: Blood; M: Muscle; S: Stomach contents

adrine were found in addition and a high therapeutic or low toxic concentration of clomipramine.

Conclusion

Considering an annual number of about 140 deaths among drug addicts in Denmark these seven deaths caused by the opium poppies may seem to be a minor problem. In fact, however, the free access to the opium poppies causes a great problem in the treatment of drug addicts, and may also be a temptation for young non-addicts.

In 1986, however, the growing of opium poppies was substantially reduced, mostly because of downward tendencies of the prices for poppy seeds on the export market. The area for growing opium poppies was reduced from about 3000 hectares in 1984 to about 200 hectares in 1986, and in accordance with this no deaths caused by opium poppies were seen in 1985 and in 1986 either.

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Received November 2, 1987