Methadone Detections in Blood Samples from Apprehended Drugged Drivers

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Keywords
Methadone, drugged driving, multidrug use

Abstract
Norwegian patients in methadone assisted treatment programs (MATP) are allowed to drive after at least 6 months on an unchanged daily dose. The number of patients in MATP has increased more than ten fold since 1997. By using the nationwide database of the National Institute of Forensic Toxicology on blood concentrations measured in suspected drugged drivers during 1997-2001, all methadone positive cases were identified. These cases had been subject to blood alcohol and drug screening with confirmation and quantification of methadone and other drugs present. These results were used in the present study.

The number of suspected drugged driving cases was approximately 3000-4000 per year for the study period, while methadone positive cases increased steadily from 3 in 1997 to 69 in 2001. In most cases from 2000-2002 the blood methadone concentrations measured were compatible with daily dosing up to 150 mg, i.e. within the therapeutic range. In 97% of the cases additional drugs were detected. Flunitrazepam was present in 72% of the samples, often in high concentrations and other benzodiazepines were also abundant, as were tetrahydrocannabinol and amphetamine. Recent heroin use could be stated (6-monoacetylmorphine positive) in 17%, and was suspected in additional 18% of the cases. As a mean between 2 and 3 additional drugs were found in methadone positive samples.

Drivers on methadone, suspected of drugged driving, have a more frequently use of additional drugs than has been reported from MATP with urine drug control. This might suggest that those on methadone who also use additional drugs, more likely become impaired and consequently drive in a manner calling attention from the police.

Introduction
Methadone intake can lead to impaired performance in various psychomotor tests under controlled conditions (1,2). Some dose-effect relation has been demonstrated (1). On the other hand it has been found that these acute effects of methadone will be less pronounced when patients have been using the same daily dose for weeks or months (1,2). As a consequence of these findings, Norwegian patients in methadone assisted treatment programs (MATP) are allowed to drive after approximately 6 months on a stable daily dosage. Until 1997 approximately only 100 patients were enrolled in MATP. This figure has since then increased to 1074 (in 2000) and 1503 in 2001. The sales of methadone in Norway parallels this increase very closely. We wanted to test whether this increasing enrollment into MATP over the later
years was reflected in more frequent methadone detections among people suspected of drugged driving by the police, and if that was the case, to find if the suspected subjects represented cases with higher blood methadone concentrations among those given methadone in MATP.

This could be done since the Norwegian police for years has demonstrated a rather high detection rate of correctly suspected drugged driving based on close observation of signs and symptoms of impairment followed by forensic toxicological analysis of the suspects blood sample. Most of the cases which have caught the attention of the police have done so because of accidents, reckless and dangerous driving or other deviating driving patterns.

Our hypothesis was that increased enrollment of patients into MATP, in spite of careful precautions of permitting driving until stable dosing was achieved, would be reflected in increased numbers of methadone cases among drugged drivers because real traffic could be more demanding than simple laboratory tests, and further that high methadone concentrations would be overrepresented in this material, because of limited tolerance to high doses of methadone.

**Methods**

All blood samples from drivers suspected by the Norwegian police for drugged driving are routinely sent to the National Institute of Forensic Toxicology (NIFT) for analysis and interpretation. These samples are subject to alcohol and drug screening with confirmation and quantification of methadone and other drugs by chromatographic methods, for most drugs with mass spectrometric detection (GC/MS, LC/MS). The samples are accompanied by a drug history of the subject and the results of a 23 item clinical test of drunkenness (CTD), routinely performed by a police physician, at the time of blood sampling. The analytical results are interpreted individually for each suspected driver taking this background information into account. The results are stored in a database at NIFT. By using this nationwide database all methadone positive cases were identified and the results were used for the purpose of the present study.

**Results**

The number of blood samples from suspected drugged drivers in which one or more non-alcohol drugs of any type was detected, increased from 2927 in 1997 to 4029 in 2001 (table 1). In the same period samples containing methadone increased from 3 in 1997 to 22 in 2000 and 69 in 2001.

**Table 1: Blood samples from suspected drugged drivers**

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number positive for one or more non-alcohol drugs</td>
<td>2927</td>
<td>3314</td>
<td>3456</td>
<td>3535</td>
<td>4029</td>
</tr>
<tr>
<td>Number positive for methadone</td>
<td>3</td>
<td>7</td>
<td>17</td>
<td>22</td>
<td>69</td>
</tr>
</tbody>
</table>

From 2000 and onwards we analysed our samples routinely for approximately 25 non-alcohol drugs, including all major illegal drugs and medicinal drugs of particular importance to traffic safety. 104 blood samples collected from 2000 to March 1 2002, containing methadone were subject to further study.
We found that in 3 out of 104 cases, methadone was found as the only drug, in the other 101 cases one or more drugs were found in addition to methadone. From table 2 it can be seen that most samples contained 2 or 3 drugs in addition to methadone. The table also demonstrates that there were no significant differences between methadone levels in drivers depending on the number of additional drugs that were found. The methadone levels measured were of the order of magnitude as expected to be found in patients participating in MATP (0.3-2.8 micromol/L).

### Table 2: Methadone positive samples from suspected drugged drivers

<table>
<thead>
<tr>
<th>Number of additional drugs taken:</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of samples</td>
<td>3</td>
<td>16</td>
<td>35</td>
<td>30</td>
<td>15</td>
<td>4</td>
<td>1</td>
<td>104</td>
</tr>
<tr>
<td>Methadone conc. (micromol/L)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>1.1</td>
<td>1.0</td>
<td>1.0</td>
<td>0.9</td>
<td>1.0</td>
<td>1.1</td>
<td>0.7</td>
<td>1.0</td>
</tr>
<tr>
<td>Range</td>
<td>0.9-1.4</td>
<td>0.4-1.8</td>
<td>0.3-2.8</td>
<td>0.3-2.2</td>
<td>0.5-2.1</td>
<td>0.3-1.6</td>
<td>0.3-2.8</td>
<td></td>
</tr>
</tbody>
</table>

Several drugs were found in the 101 blood samples that contained other drugs than methadone. Drugs of abuse were represented by morphine (n=36, median conc. 0.26, range 0.03-1.0 micromol/L). In 18 samples with morphine detection, where urine was available for analysis, 6-monoacetylmorphine (6-MAM) was found, unequivocally demonstrating the intake of heroin. Other drugs of abuse were tetrahydrocannabinol (THC) (n=32, median conc. 0.003, range 0.001-0.018 micromol/L), amphetamine (n=26, median conc. 0.9, range 0.3-5.0 micromol/L), methamphetamine (n=4, median conc. 2.1, range 0.5-7.3 micromol/L) and the cocaine metabolite benzoylcegonine (n=2, range 0.9-2.4 micromol/L).

Ethanol was found in 15 samples (median conc. 0.092, range 0.001-0.218 per cent).

Benzodiazepines was the most abundant drug group found together with methadone; flunitrazepam (n=75, median conc. 0.048, range 0.006-0.53 micromol/L) and diazepam (n=31, median conc. 0.8, range 0.2-3.6 micromol/L) being the two most frequent. Other benzodiazepines were found in 31 blood samples.

**Discussion**

We found as expected, that the number of suspected drugged driving cases with methadone involved increased markedly from 1997 to 2001, during a period where the number of patients enrolled in MATP increased more than 10 fold.

We did not find as we had expected, that the subjects driving in a way that would call the suspicion of the police, was a user group with particularly high blood methadone concentrations. In most cases from 2000-2002 (n=104) the blood methadone concentrations measured were compatible with daily doses up to 150 mg, i.e. with doses which has been used in therapeutic settings (3).
In 97 per cent of the cases, however, other drugs were present in the blood samples. Almost all of these drugs could themselves impair driving. This finding strongly indicates that drivers on methadone, who also used additional drugs, were more likely to become impaired and consequently drive in a manner calling the attention from the police. Other studies have also showed that people who combine methadone with other drugs represent a greater risk than those on methadone only (4,5).

In our study this group of suspected drugged drivers mixing methadone with other drugs did so more frequently than has been reported from MATP with urine drug control (3). The Norwegian MATP programs might allow some drug use in combination with methadone, without the institution of strong sanctions, although abstinence from all drugs besides methadone is the principle guideline. When it comes to driving no drugs in addition to methadone is allowed.

Accordingly, 97 per cent of our cases had violated this rule. There are other points which can be seen from our results which indicates that these drivers were from a group difficult to control. First, there was frequent use of illegal drugs, opiates in 35 per cent of the cases, cannabis in 31 per cent, and amphetamine in 25 per cent. Heroin use was probably the reason for the 35 per cent morphine positive samples, and could be proven by 6-MAM detection in urine (when available) in 17 per cent of the total material. Second, the presence of THC and morphine as well as high concentrations of other drugs in blood indicated recent drug use, probably during the last 12 hours before driving. 72 per cent of the suspected drivers had flunitrazepam in their samples. The median flunitrazepam concentration (0.048 micromol/L) indicated use of 4-5 mg or more within the period before driving. The highest recommended dose at bedtime is 2 mg. However, high-dose flunitrazepam use is not uncommon in drug abuse. We also noticed the presence of alcohol in 14 per cent of the samples, with a median concentration of 0.092‰, indicating a substantial intake of ethanol in relation to driving.

The Norwegian material of suspected drugged drivers with methadone detection appeared to represent a group that was not following the advice given during treatment. It is important to stress that mixing other drugs with methadone is not compatible with driving. The presence of only 3 subjects with methadone only among suspected drugged drivers, might be interpreted in several ways, but one possibility, is that most of those following the basic principle of not combining other drugs with methadone, could drive in a way not attracting the attention of the police. Those who did, however, did not have particularly high methadone blood concentrations, demonstrating the potential deteriorating effects of this drug in roadside traffic.

References

