Screening for Drivers under the Influence of Drugs
The new Drugwipe® for Sweat and Saliva Testing

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Abstract
Drugwipe® is a pen-size detector for invisible traces of drugs on surfaces and was initially
developed for Customs applications. Since 1998 Drugwipe® is in use by German Traffic
Police Forces to identify Drivers under the Influence of Drugs. In the following paper the
experiences of the German traffic police and data from controlled studies with Drugwipe®
are summarized. Also an improved product generation of DrugWipe is presented. The 2nd
generation Drugwipe is specifically developed for traffic control applications taking into
consideration the comments and experiences of the traffic police in Germany and other
European Countries.

Introduction
Securetec was founded in 1995 to develop, manufacture and market devices for the rapid
onsite detection and identification of illegal narcotics. Drugwipe® was initially developed
for Customs and Law Enforcement Officers to detect smuggling and dealing with illegal
narcotics. The main advantages of Drugwipe® are lying in its small size, fast response time
and low false alarm rate.

In 1997 and 1998 the German State Baden-Württemberg evaluated Drugwipe® as a sweat
test for roadside applications [1]. In 1998 the German Traffic Law was extended to make
Driving under the Influence of Drugs (DUID) a crime. As the new law was implemented
executives of the traffic police were trained in the recognition and detection of DUID. In
parallel, several German states started to work with Drugwipe® as a roadside screening
device. To date Drugwipe® is in use in Baden-Württemberg, Saxonia, Berlin, Thuringia and
Lower Saxonia – always based on sweat as test specimen.

In 1999 the European Union asked a consortium of 9 Institutes and 3 companies to test and
evaluate urine, saliva and sweat test devices and to develop recommendations for the
application of roadside screening devices for DUID. The project was named ROSITA
("Roadside-Testing-Assessment") and Drugwipe® participated as a sweat and saliva test [2, 3].

This presentation will provide an overview on the experiences and results of the traffic police in Germany with the Drugwipe® device. The new Drugwipe® generation will be introduced and the main features will be discussed.

The Drugwipe® System

Drugwipe® is a pen-size rapid test for the detection of invisible traces of drugs on surfaces, on the skin (sweat) or in saliva. Sample collection and transfer is performed with a wiping fleece located on a special wiping element. The sample is analysed with a lateral flow immunoassay housed in a plastic protection (detection element).

Figure 1: Construction of the Drugwipe® drug detector

Sampling is based on wiping over a surface of suspicion. This may be a personal item (suitcase, passport) but can also be the skin of a person. A body location is chosen where external contamination is of less concern and drug residues deposited on the skin by perspiration can be detected. Alternatively samples can be collected from inside the mouth or from the tongue (saliva).

Experiences with the 1st Generation Drugwipe®

In Germany roadside screening is performed when there is an initial suspicion of Driving under the Influence of Drugs. Drivers showing a positive screening result have to supply a blood sample for confirmatory analysis in the laboratory. Punishment is based on the laboratory results in blood and additionally documented observations of the police officer.
The following diagrams are providing the field test results of the traffic police in Baden-Württemberg with Drugwipe®. Drugwipe® was used as a sweat test and either the armpit or the forehead were used as a sampling location. Blood is the reference specimen.

![Figure 2: Correlation of the Drugwipe® results under field conditions with the blood status of suspicious driver](image)

Table 1: Concentration of MDMA and HMMA in plasma and Drugwipe® result in dependence of time after administration of 100 mg MDMA [4]

<table>
<thead>
<tr>
<th>Time (hours)</th>
<th>Sweat</th>
<th>Drugwipe® result</th>
<th>Plasma [ng/ml]</th>
<th>Drugwipe® result</th>
<th>Reference method</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>MDMA</td>
<td>HMMA</td>
<td>MDMA</td>
<td>HMMA</td>
</tr>
<tr>
<td>0</td>
<td>-</td>
<td>0.0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>2</td>
<td>+</td>
<td>88.1</td>
<td>151.7</td>
<td>2</td>
<td>160.7</td>
</tr>
<tr>
<td>4</td>
<td>N.A.</td>
<td>164.4</td>
<td>160.4</td>
<td>4</td>
<td>N.A.</td>
</tr>
<tr>
<td>6</td>
<td>+</td>
<td>152.8</td>
<td>147.4</td>
<td>6</td>
<td>+</td>
</tr>
<tr>
<td>8</td>
<td>+</td>
<td>119.7</td>
<td>108.1</td>
<td>8</td>
<td>+</td>
</tr>
<tr>
<td>12</td>
<td>+</td>
<td>77.9</td>
<td>74.2</td>
<td>12</td>
<td>+</td>
</tr>
<tr>
<td>24</td>
<td>-</td>
<td>26.5</td>
<td>45.2</td>
<td>24</td>
<td>-</td>
</tr>
<tr>
<td>36</td>
<td>-</td>
<td>N.A.</td>
<td>N.A.</td>
<td>36</td>
<td>-</td>
</tr>
<tr>
<td>48</td>
<td>-</td>
<td>N.A.</td>
<td>N.A.</td>
<td>48</td>
<td>-</td>
</tr>
</tbody>
</table>

N.A.: not available
MDMA: M ethylenedioxymethamphetamine
HMMA: 2-Hydroxy-3-methoxymethamphetamine
Besides these field studies the Drugwipe® Amphetamines was also evaluated in controlled studies with ecstasy [4]. MDMA was administered to volunteers and the detectability of MDMA with Drugwipe® and DrugRead was tested.

Table 1 shows the MDMA concentration in plasma of 2 volunteers after administration of a single 100 mg dose. In parallel the Drugwipe® was applied in the armpit to measure the excretion of MDMA in the sweat. It was possible to detect the consumption of MDMA in a time window between 2 hours and 12 hours after drug administration. This covers most of the time, which is of importance for roadside testing.

For saliva testing a combination of the Drugwipe® Amphetamines and an optical reader (Drugread) was used. MDMA concentrations have been measured quantitatively in saliva after calibrating the system. Figure 2 is providing the MDMA concentrations in saliva measured with GC/MS and simultaneously measured with Drugwipe®/DrugRead in dependence of time after administration of a single 100 mg dose. DrugRead is an absorption photometer measuring the coloration in the Drugwipe® readout window in arbitrary digits. The number of digits is directly proportional to the Drugwipe® signal.

![Graph showing MDMA concentrations in saliva](image)

**Figure 3:** Concentration of MDMA in saliva measured with GC/MS and with the Drugwipe®/DrugRead system [5]

Legislation in Germany defines, that drivers having detectable amounts of MDMA in their blood are in violation of the Law. Therefore the time window which is of interest for traffic police is approximately 10 to 12 hours after consumption. With setting the internal cutoff of the DrugRead/Drugwipe® system at the right level it is possible to detect MDMA residues in saliva in this time window.
The 2nd Generation Drugwipe®

Considering the needs and requirements of the Traffic Police forces in Europe as well as the test results from different studies (German Traffic Police, Rosita), Securetec has started a development program to improve the Drugwipe® for traffic control applications.

The major goals of this program are to introduce the following improvements:

- Multi-testing capabilities in sweat and saliva for Cannabis, Opiates, Cocaine and Amphetamine/Methamphetamine/Ecstasy
- Signal output in form of a test line (which appears in case of a positive result) and a control/reference line demonstrating the correct usage of the device
- Electronic read out for error free evaluation under “bad” environmental conditions
- Ease-of-use, testing speed and handling similar to the 1st generation Drugwipe®

![Drugwipe® Twin with multi-parameter-testing capabilities](image)

In the first step the test readout was changed to a line format. A control line provides higher user safety and must be present to make a test valid. The test line is indicating a positive test result and appears only in positive cases. Multi-testing capability is possible with a panel test format combining different Drugwipe® assays in one device.

The following table provides an overview on the sensitivities of the first generation Drugwipe® in relation to the new product generation. The sensitivity of the new Drugwipe® Cannabis is approximately 100 fold higher than the sensitivity of the first generation Drugwipe®. For the Drugwipe® Opiates the increase is about 10 fold.

<table>
<thead>
<tr>
<th>Drugwipe® Type</th>
<th>Sensitivity in ng/cm²</th>
<th>Target Analyte</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1st Generation</td>
<td>2nd Generation</td>
</tr>
<tr>
<td>Cannabis</td>
<td>200</td>
<td>2,5</td>
</tr>
<tr>
<td>Amphetamines</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>25</td>
</tr>
<tr>
<td>Opiates</td>
<td>25</td>
<td>2,5</td>
</tr>
<tr>
<td>Cocaine</td>
<td>10</td>
<td>5</td>
</tr>
</tbody>
</table>
Summary and Outlook

The Drugwipe® product is widely used in Germany as a roadside screening device for the identification of drivers under the influence of drugs. Traffic police in Germany and other European countries mainly appreciate the ease-of-use, the capability to examine sweat or saliva and the short response times of the Drugwipe®. This paper is providing analytical results from various studies to demonstrate sensitivity and applicability of the Drugwipe® device for sweat and saliva testing.

The first generation Drugwipe® was developed for applications in the Customs and Law Enforcement area. Recently Securetec has launched a second generation Drugwipe® specifically for the application in the Traffic Police area. Comments of different user groups within the traffic police as well as the analytical results from various studies have been taken into account to fulfil the needs and requirements of the traffic police.

Sensitivities of the different Drugwipe® types have been increased up to 100 fold to reach an acceptable level of reliability for roadside applications. By combining different test strips in one housing several drugs can be measured simultaneously. A line test format with a test and a control line was realized to allow better signal evaluation.

The new Drugwipe® II device is currently in the introduction process in Germany and several German states have equipped their traffic police forces with the new product generation. Initial results from evaluation campaigns will be published soon.

References


[5] Pichini, S., de la Torre, R. et al., On-site testing of MDMA ("Ecstasy") in saliva with Drugwipe® and Drugread: a controlled study in recreational users, Oral Presentation at the 1st Workshop on oral fluid testing, Ghent, April 2001