On the effects of sampling, analysis and interpretation strategies for complex forensic DNA research with focus on sexual assault cases
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Chapter 2

Revision and implementation of the SAFE kit used in The Netherlands

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Titia Sijen

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Abstract

In this study, we revised and effectively implemented the sexual assault forensic examination (SAFE) kit used in The Netherlands to improve the forensic investigation of sexual offences. The former version was developed over a decade ago, and since then new and advanced methods have been introduced in forensic research that warrant revision of the SAFE kit. We briefly describe the steps that were undertaken, the products that were chosen and/or developed and the benefit(s) regarding the former version of the SAFE kit. Collaboration and dialogue between the parties involved were of great importance during both the revision and the implementation process.
Chapter 2

Introduction

In this study, we describe the steps undertaken to revise the sexual assault forensic examination (SAFE) kit used in The Netherlands. Motives for revision encompass: (1) the introduction of microscopic laser microdissection to forensic research which is a technique that benefits from the presence of intact cells [1]; (2) the increasing sensitivity of DNA profiling which necessitates absolutely DNA-free sampling material; (3) the view of forensic practitioners that the examination can be more efficient; (4) reduce discomfort for victims or suspects of sexual assault.

Results

To optimise the SAFE kit, we took a stepwise approach: (1) we critically examined the contents and procedures of the SAFE kit, (2) assessed if optimisation was needed, (3) searched for alternative materials and/or revised the procedures, (4) assayed the performance of a (specific) potential component in a pilot study, (5) developed the final SAFE kit and (6) introduced this new SAFE kit to the users. The results of steps one to five are summarized in Table 1 that describes the content of the former and revised SAFE kit including a brief explanation for the revisions.

The evidence sampling materials that underwent replacement in the SAFE kit involve the fingernail sampling devices and the body sampling swab. The plastic toothpicks that were previously used for nail sampling invoked discomfort for the sampled person and the nail scrapings were sometimes hard to recover from the hollow core. We tested various alternative sampling methods and found that cotton minipoint swabs (wooden shaft) moistened with sterile water were the most effective collection tools; good rates of buccal cell material were recovered while a limited amount of finger epithelia was included. Importantly, both the medical examiners, the volunteers and the DNA laboratory personnel described this sampling method as user-friendly. To minimise the risk of contamination and to allow the moistened minipoint swabs to dry, swabs were ethylene oxide (EO) sterilised and inserted in tubes containing a self-drying agent. In the former SAFE kit a cotton swab was present for the internal body samplings. A previous study [1] had shown that nylon flocked swabs have improved performance compared to the cotton swabs. Like the minipoint swabs for nail sampling, these swabs were EO-treated and inserted in a tube that contains desiccant. The shaft of the nylon flocked swab is made of polystyrene and therefore more flexible than the wooden shaft of the cotton swab. Consequently, medical examiners may experience differences when using these swabs. In order to test the suitability of the nylon flocked swabs for sexual examinations, we initiated a pilot study. During a five-months period, 70 victims of sexual assault were sampled with two additional nylon flocked swabs (140 swabs in
total) after the standard examination had been completed and only when the victim
gave full consent. The responses from the medical examiners were positive.

For assistance, users of the kit have access to a website containing guidelines and
information, and they can send questions or remarks to an email-box. This assistance
service met with appreciation of the users of the SAFE kit.

Discussion and conclusion

In this study we revised our SAFE kit with products and guidelines to optimise
the sampling, collection and preservation of the evidence in sexual assault cases. We
assayed the performance of several aspects of the kit for which an open dialogue with
all parties (medical examiners, police investigators, volunteers, laboratory personnel,
manufacturer and distributor of the SAFE kit) was of great importance. Since the
methods of forensic DNA research are continuously updated, we will continue to
monitor the functionalities of the SAFE kit components and introduce adjustments
if necessary and possible. The revised SAFE kit is implemented for sexual assault
casework in The Netherlands and contributes to effective forensic investigation of
sexual offences.

Acknowledgements

We are grateful to several Dutch parties who had an active role in the revision
and/or implementation of the SAFE kit. Special thanks go to Jan Stoof, Jody Klaasman,
Simone van Soest and Mirjam de Pagter.

Reference

1. C.C. Benschop, D.C. Wiebosch, A.D. Kloosterman and T. Sijen, Post-coital vaginal sampling with
Table 1. Content of the former and revised sexual assault forensic examination (SAFE) kit used in the Netherlands.

<table>
<thead>
<tr>
<th>Former SAFE kit</th>
<th>Revised SAFE kit</th>
<th>Reason revision</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General materials</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Simple box      | Double-layered box:  
  Short stepwise instruction inside lid.  
  Transparent storage pocket on outside of the box (for journal). | Double layer to separate general material and sampling materials.  
Short guideline to assist examiners.  
Access to offence journal without opening the box with evidential samples. |
| Ground drape sheet | Ground drape sheet | - |
| Mob cap         | Mob cap         | - |
| Mouth mask      | Mouth mask with ear-loop | User-friendly. |
| Offence journal (to document findings) | Revised offence journal with trace evidence labels attached. | Total revision: modern anatomical diagrams, ring binder, more concise wording, simplified completion due to the use of flow charts and multiple choice questions, less chance to miss information. Labels stay with the kit. Journal in exterior storage pocket attached to the box, so that the labels remain available for police forms after evidence collection and kit sealing. |
| Security seals | Security seals | - |
| Shipping bag    | Transparent secure shipping bag | Contents of the bag can be seen. One can see if the bag has been opened. |
| **Nail sampling materials** | | |
| -               | Plastic bag containing all nail sampling items.  
Drape sheet | User-friendly (separated components for nail/hair/body sampling).  
- |
| Plastic tooth picks | DNA-free cotton minipoint swabs in tubes with desiccant. Tubes are pre-labelled to easily mark the left/right hand and sampled finger. | Higher yield of cell material of the perpetrator and better ratio perpetrator to sampled person. Easier to handle for examiner, less chance of contamination, less discomfort for sampled person.  
- |
| Plastic bags    | Sterile water and petri dish.  
Pair of semi-open nail clippers and jars with lids (and labels) to collect the nail clippings. | To moisten minipoint swabs.  
In case nail clippings are preferred. Easier than regular pair of scissors (which were not included in former SAFE kit). Semi-open collection keg helps to reduce the chance that nails shoot off.  
- |
## Revision and implementation of the SAFE kit

### Chapter 2

<table>
<thead>
<tr>
<th>Former SAFE kit</th>
<th>Revised SAFE kit</th>
<th>Reason revision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hair collection materials</td>
<td>Plastic bags containing all hair sampling materials.</td>
<td>User-friendly, no need to cut the tubes.</td>
</tr>
<tr>
<td>Body sampling materials</td>
<td>Pre-hydropolysed labels on envelopes to easily mark</td>
<td>Easier to handle for medical examiner and laboratory personnel.</td>
</tr>
<tr>
<td></td>
<td>Combs</td>
<td>Plastic bags became sticky and hairs were not sticking.</td>
</tr>
<tr>
<td></td>
<td>Cotton swabs</td>
<td>Swabs dry within tissues and are less damaged.</td>
</tr>
<tr>
<td></td>
<td>Disposable underpants</td>
<td>Slides-oriented from the kit as these will be prepared in a forensic laboratory.</td>
</tr>
<tr>
<td>Induction/assistance</td>
<td>Internet guidelines accessible for users and email address for questions/reminders.</td>
<td>Revised SAFE kit</td>
</tr>
</tbody>
</table>

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