

Highlights of Analytical Chemistry in Switzerland

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Detection and Significance of Cocaine Traces on Swiss and Euro Banknotes

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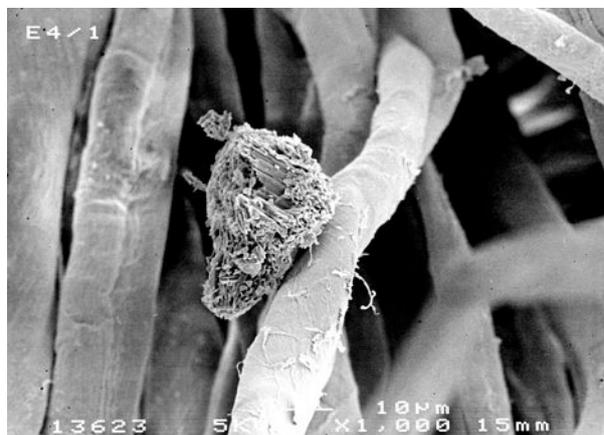
In the fight against illicit drug trafficking, police investigations cannot solely rely on the seizure of illicit drugs to determine the involvement of people in such activities. More often than not, investigators have to collate information from different sources (testimonies, intelligence database, observations, *etc.*) in order to gather intelligence that could serve to reveal the structure of



Cocaine seizures on Swiss banknotes.

a network. Among other means, the detection of traces of illicit drugs on banknotes was proposed in the middle of the 90s to be used as an indicator of money related to trafficking. Banknotes coming in contact or being close to illicit drugs may become contaminated by such substances. Many studies showed that cocaine may be commonly detected on banknotes, but there is a lack of knowledge concerning the value of such a detection: does it really reveal an involvement in illicit drug trafficking or is it just background noise?

The study of significance of cocaine traces on banknotes encompasses sampling issues, analytical developments, and data treatments. Two distinct populations were considered: one composed of banknotes in circulation (Swiss francs and Euros), put at our disposal by financial institutions ($n_{\text{CHF}} = 900$; $n_{\text{EUR}} = 992$), the other one by banknotes originating from police seizures linked to illicit drug trafficking ($n_{\text{CHF}} = 640$; $n_{\text{EUR}} = 462$). New Swiss banknotes were also studied as control. Detection of cocaine traces was undertaken by Ion Mobility Spectrometry after



Cocaine grain adhering to the paper fibres of a banknote (viewed by scanning electron microscopy).

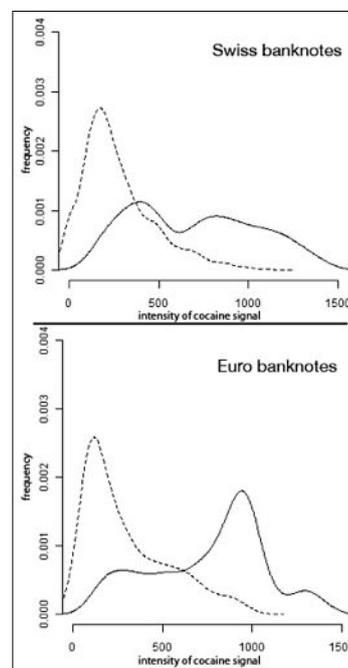
swabbing on the banknotes' surfaces. For both Swiss and Euros banknotes, the results indicate that the detection of cocaine traces cannot be used to discriminate between the two populations as more than 90% of all specimens are contaminated with cocaine. However, significant differences are observed considering the intensity of cocaine signals between banknotes in circulation and banknotes seized by the police. Distribution curves of the intensity of cocaine signals in these populations were computed both for Swiss francs and Euros. A model was then constructed taking into account the measured distributions that could be used to discriminate between the two populations (ROC – receiver operating characteristic – curve area: 0.86). This model can serve as a support for the decision to assess the significance of cocaine detection intensities on a specific batch of banknotes in comparison to the two considered populations.

The model raised from these findings has a decisive potential for the detection of banknote batches related to cocaine trafficking.

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References

F. Anglada, O. Delémont, O. Guéniat, P. Esseiva, *Revue internationale de criminologie et de police technique et scientifique* **2011**, *LXIV*(2), 213 and 231.



Distributions of cocaine signal intensities for the two populations (dotted line: banknotes in circulation; plain line: banknotes seized in cases of illicit drug trafficking).

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