Northumbria Research Link

Citation: Roussel, Olivier, Coste, Damien, Bouvot, Xavier, Bévalot, Fabien, Gaillard, Yvan and Carlin, Michelle (2014) Road Safety: increase in blood concentrations of cannabinoids between 2010 and 2013 – assessment of confirmation tests. In: TIAFT 2014 - 52nd Annual Meeting of The International Association of Forensic Toxicologists, 9th - 13th November 2014, Buenos Aires, Argentina.

URL: http://www.tiaft2014.com.ar/TIAFT2014_PosterSessio... <http://www.tiaft2014.com.ar/TIAFT2014_PosterSessions.pdf>

This version was downloaded from Northumbria Research Link: https://nrl.northumbria.ac.uk/id/eprint/21631/

Northumbria University has developed Northumbria Research Link (NRL) to enable users to access the University's research output. Copyright © and moral rights for items on NRL are retained by the individual author(s) and/or other copyright owners. Single copies of full items can be reproduced, displayed or performed, and given to third parties in any format or medium for personal research or study, educational, or not-for-profit purposes without prior permission or charge, provided the authors, title and full bibliographic details are given, as well as a hyperlink and/or URL to the original metadata page. The content must not be changed in any way. Full items must not be sold commercially in any format or medium without formal permission of the copyright holder. The full policy is available online: http://nrl.northumbria.ac.uk/policies.html

This document may differ from the final, published version of the research and has been made available online in accordance with publisher policies. To read and/or cite from the published version of the research, please visit the publisher's website (a subscription may be required.)

Northumbria University NEWCASTLE

University Library

Road Safety: Increase in Blood Concentrations of Cannabinoids between 2010 and 2013 – Assessment of Confirmation Tests

O. Roussel[1]; D. Coste[1]; X. Bouvot[1]; S. Sabini[1]; F. Bévalot[2]; Y. Gaillard[2]; M. Carlin[3]

[1] Forensic Toxicology Unit, Forensic Sciences Institute of the French Gendarmerie (FSIFG), Rosny-sous-Bois, France ;
[2] LAT LUMTOX, Lyon/La Voulte sur Rhône, France ; [3] Faculty of Health & Life Sciences, Northumbria University, Newcastle upon Tyne, United Kingdom

ABSTRACT

In 2008, the French government decided to set up oral-fluid drug screening in drivers. This new practice modified the customs of police officers and the number of screenings and confirming tests increased dramatically. Since this change, we have consequently observed an increase in blood concentrations of cannabinoids without any modifications in our lab procedures.

In trying to understand this rise and to confirm this observation, we extended our study to include another lab. Results were reviewed by both LAT LUMTOX lab and FSIFG's forensic toxicology unit and data was obtained between 2010 and 2013 for the following substances: Δ9-tetrahydrocannabinol (THC), 11-nor-9-carboxy-THC (THCCOOH) and 11-hydroxy-THC (11-OHTHC). Results were classified as "non-detected" (ND), "detected" (D) and "quantified" (Q) and if no substance was detected, results were considered negative (NEG).

Parametric statistics were carried out using χ^2 tests and ANOVA-1 performed with GraphPad Prism 5.0® software. Since 2010, the number of NEG has still been stable (ns) when the proportions of D and Q changed significantly. Significant increases in blood concentration of all cannabinoids were also observed (e.g. LAT LUMTOX for THC from μ_{2010}=3.40±0.14 ng/mL to μ_{2013}=5.26±0.10 ng/mL, p<0.001).

The results from LAT LUMTOX confirmed the increase in blood concentrations of cannabinoids in drivers.

INTRODUCTION

→ Since 2008, oral fluid has been used as screening sample by police officers from both forces (Police Nationale and Gendarmerie Nationale) (Roussel, 2014)

→ European toxicologists reported an increase in blood concentrations of cannabinoids in people who were screened positive to cannabis usage during the last decade (Vindenes, 2013; Jones, 2008)

→ Increase in THC content of cannabis resins for 10 years (Jones, 2008)

→ In 2003, we reported the same increase in blood concentrations of cannabinoids among confirmation blood samples tested in our lab from 2010 to 2012 (Coste, 2013)

AIMS

Confirm our past observations by :
→ The analysis of our results from 2013
→ The analysis of the results from another lab : LAT LUMTOX

Try to understand the rise of blood concentrations of cannabinoids

MATERIALS AND METHODS

Data analysis:

• Retrospective analysis of GC/MS confirmation analysis results for cannabinoids (THC, THCCOOH and 11-OHTHC) obtained by FSIFG and LAT LUMTOX after urinary or oral fluid screening:

Lab \ Year	2010	2011	2012	2013
FSIFG	n=781	n=890	n=870	n=504
LAT-LUMTOX	n=1,162	n=1,223	n=2,668	n=3,898

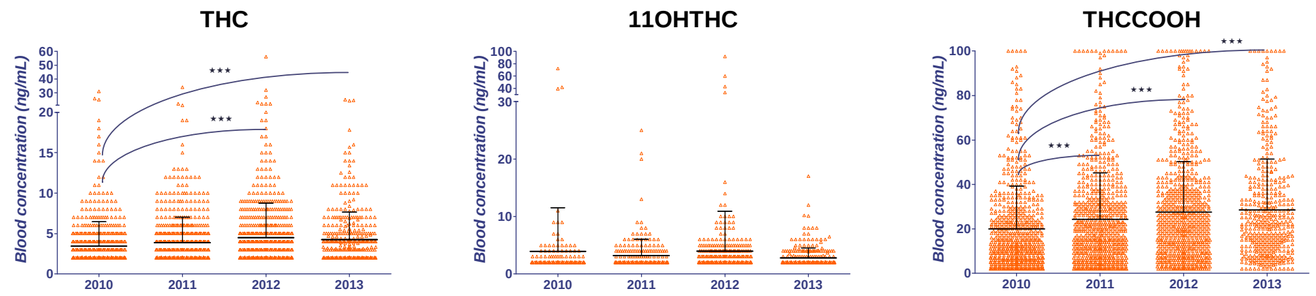
• Distribution of the results in 3 categories:
- "not detected" (ND) when not identified by comparison of retention time and spectrum (LLD at 0,1 or 1*ng/mL),
- "detected" (D) when identified but under the LLQ. The mean of LLD and LLQ was allocated to those results for the parametric statistics, and,
- "quantified" (Q) when upper to LLQ (0,5 or 3*ng/mL). When all the 3 cannabinoids were not detected, results is categorized "negative" (NEG).

• χ^2 tests and 1 way ANOVA with Bonferroni's post-tests were performed with GraphPad Prism 5.0® software.

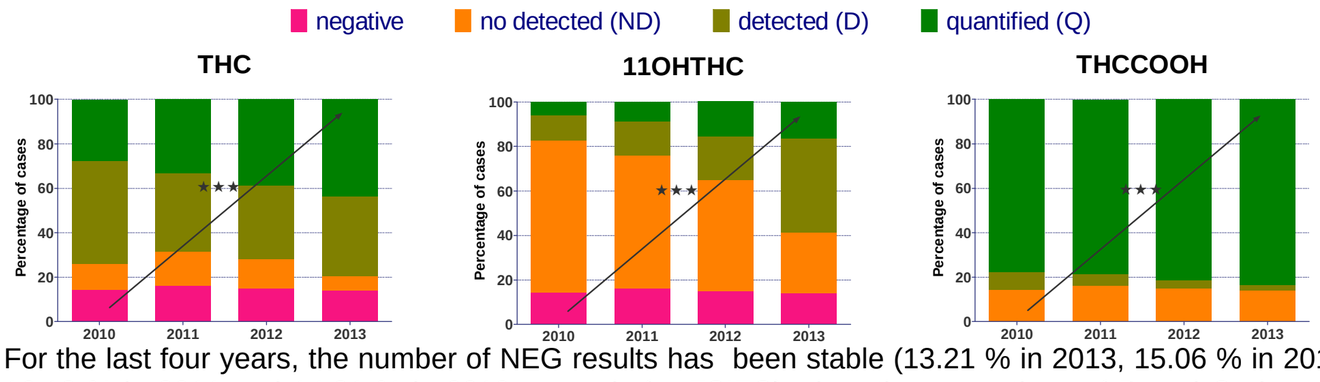
** Because the LLD and LLQ for cannabinoids was 1 and 3 ng/mL in 2010, those thresholds were kept for all the calculations of FSIFG's results (there are currently 0,5 ng/mL).*

RESULTS

FSIFG's results:

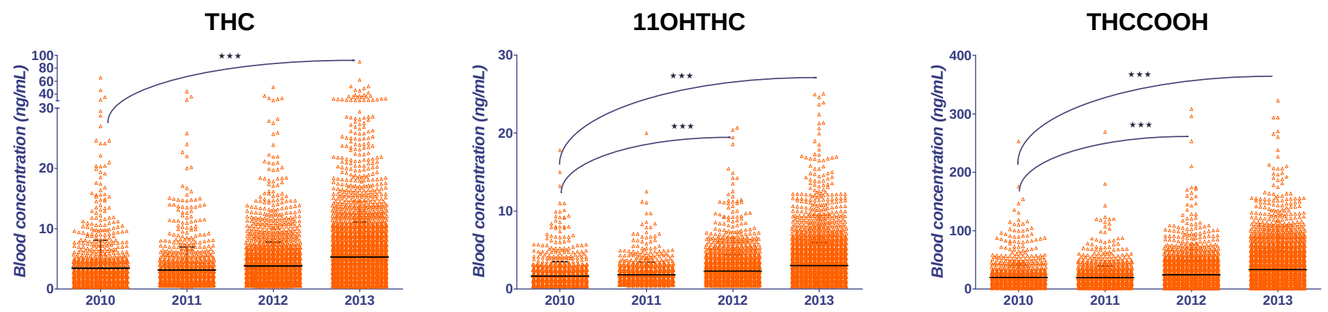


Significant increases in blood concentration were observed: for THC from μ_{2010}=3.44±0.13 ng/mL to μ_{2013}=4.23±0.17 ng/mL, p < 0.001, for THCCOOH from μ_{2010}=19.96±0.74 ng/mL to μ_{2013}=28.57±1.10 ng/mL, p < 0.001.

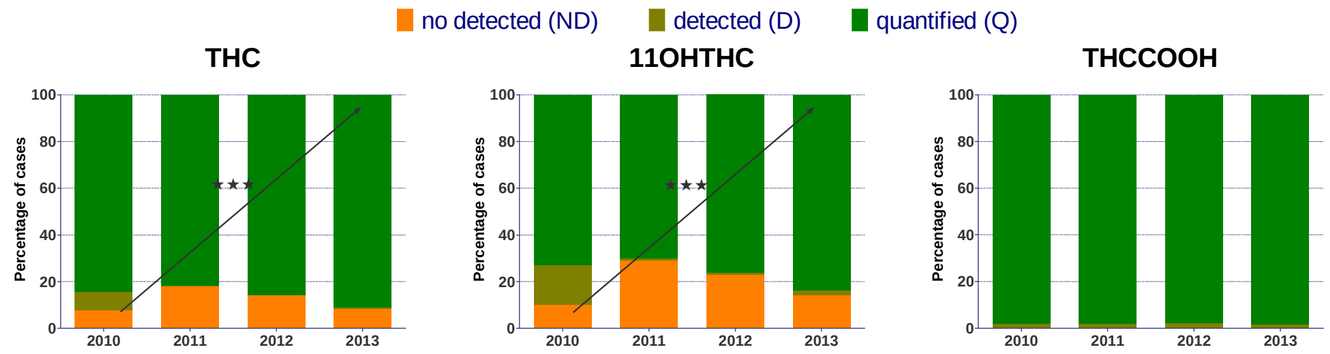


For the last four years, the number of NEG results has been stable (13.21 % in 2013, 15.06 % in 2012, 16.18 % in 2011 and 14.21 % in 2010, ns, only for FSIFG) when the proportions of D and Q changed between 2010 and 2013, THC: proportion of Q rise from 27.78% to 46.26%, p < 0.001; 11-OHTHC: from 5.89% to 18.45%, p < 0.001; THCCOOH: from 77.85% to 85.19%, p = 0.002.

LAT LUMTOX's results:



Significant increases in blood concentration were observed: for THC from μ_{2010}=3.40±0.14 ng/mL to μ_{2013}=5.26±0.10 ng/mL, p < 0.001, for THCCOOH from μ_{2010}=19.67±0.64 ng/mL to μ_{2013}=33.15±0.51 ng/mL, p < 0.001, for 11-OHTHC from μ_{2010}=1.66±0.06 ng/mL to μ_{2013}=3.01±0.05 ng/mL, p < 0.001.



The proportions of D and Q changed between 2010 and 2013, THC: from 84.25% to 90.72%, p < 0.001, 11OHTHC: from 73.15% to 82.93%, p < 0.001. *THCCOOH calculations were impossible because we didn't distinguish the confirmation requests with and without positive screening test.*

DISCUSSION - CONCLUSIONS

- Even though the results obtained by the LAT LUMTOX were slightly different (absence of negative results) and obtained with another analytical method than FSIG's, they confirmed our past observations of an increase in blood concentrations of cannabinoids in drivers.
- Several hypotheses could explain this observation:
  - an evolution of the practices of police officers. They now work closer to the drivers and participate more in the intervention. Consequently, they might reduce the wait between screening and sampling. Since the introduction of oral fluid screening tests, the only step requiring an health practitioner has been for blood sampling when positive,
  - the change of oral fluid screening test during the last four years (from Rapidstat® to Drugwipe®),
  - the increase in THC content of consumed products, especially cannabis resins (INPS, 2013; OFDT, 2013).
- This final observation was established when the lab environments were stable (methods, equipment, team and customers) which ruled out laboratory influence, therefore must be because of an external reason. Our observations are also reinforced by the similar results of a Norwegian study (Vindenes, 2013).
- A field study of police-officer's practises could confirm or refute our first hypothesis; the others will be more difficult to investigate.

With the financial support of the French Society of Analytical Toxicology

Bibliography: ► COSTE, D, and coll. "2010 – 2012 : Évolution des concentrations sanguines en cannabinoïdes mesurées lors des analyses de confirmation d'usage de stupéfiants au volant", 5èmes Journées Internationales de Toxicologie (2013), Liège ► INPS *(Institut National de Police Scientifique/National Forensic Science Institute)*, "Stupéfiants 2012: Bilan S.T.U.P.S.©", not published (2013) ► JONES, AW, and coll. "Driving under the influence of cannabis: a 10-year study of age and gender differences in the concentrations of tetrahydrocannabinol in blood", Addiction (2008), 103(3): 452-461 ► OFDT *(Observation Français des Drogues et Toxicomanies/French Monitoring Center for drugs and Drug Addictions)* , "Drogues, chiffres clés", 5th edition (2013) ► ROUSSEL, O, and coll. "The French experience of establishing an oral fluid roadside drug test", Analytical, Clinical and Forensic Toxicology International Meeting, Joint workshop of SFTA & TIAFT young scientists (2014), Bordeaux ► VINDENES, V, and coll. "Has the intake of THC by cannabis users changed over the last decade? Evidence of increased exposure by analysis of blood THC concentrations in impaired drivers ", Forensic Sci Int (2013) 226 (1-3): 197-201