Influence of hair straightening on ethyl glucuronide content in hair

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Abstract

Aims: The aim of the study was to analyse ETG in hair samples treated by a hair straightener.

Methods: Positive EtG hair samples were treated with hair straightener during 1 min at 200°C. Treated and non treated hair were analysed for EtG by GC/MS-NICI after solid phase extraction and heptafluorobutyric anhydride derivatization .

Results: In 11 samples an average decrease was found 24% and in 5 cases an average increase was found 14,2%.

Conclusion: This preliminary study indicates that a heat source may influence EtG content in hair. This has to be considered for a correct interpretation of EtG results in hair.

1. Introduction

Hair analysis of ethyl glucuronide (EtG), a direct ethanol metabolite ethanol, has become a valuable procedure for the determination of social and chronic excessive alcohol consumption [1]. It is known that cosmetic treatment has to be taken into consideration for the correct interpretation of hair results [2-7]. Beside coloration, bleaching and perming is hair straightening a very common cosmetic treatment, esp. for women, often done on daily basis. To our knowledge no studies about the effect of hair straightening on EtG content in hair exist so far.

2. Material and Methods

Sample preparation: 16 hair samples were split into two strands and labelled with “n” for not treated and “t” for straightened hair. The samples labelled with “t” were subjected to direct heat from the straightening iron at 200°C for 60 seconds. Both hair strands were then cleaned and analysed using the method described below.

Method: The method used for extraction of the hair samples has been described previously [4,7]. After cleaning the hair with water and acetone, pulverization, incubation during 2 h in an ultrasonic bath, a solid phase extraction was performed with OASIS Max Columns (Waters). After derivatization with heptafluorobutyric anhydride the analysis was performed by GC/MS in negative chemical ionization mode. The observed precursor ions were: *m/z* 596, 397 for EtG and *m/z* 601 for EtG-D5. The actual limit of detection (LOD) was at 0.5 pg/mg and the lowest limit of quantification (LLOQ) was at 1.5 pg/mg.

3. Results and Discussion

In 11 of 16 samples a decrease was found ranging from 0.8% to 70.3% (average 24%) whereas in 5 cases an increase was found ranging from 7.5% to 29.5 (average 14%) (Tab. 1). The variation of the results seems to be depending on hair type. The decrease may be explained by the thermal destruction of EtG following hair treatment. One hypothesis to explain the

increase may be a better extraction of EtG from the damaged hair matrix (caused by heat treatment) during the incubation in the ultrasonic bath, which can also be seen as the extract of the hair is coloured after incubation.

Tab. 1. Results of the analysed hair samples.

EtG in hair (pg/mg)		
Non treated	**Treated**	**Difference (%)**
130.9	102.4	-21.8
126.2	108.7	-13.9
115.3	99.8	-13.4
115.3	95.7	-17.0
91.1	116.8	28.2
61.7	47.3	-23.3
52.1	49.2	-5.7
48.0	49.8	3.7
41.9	34.6	-17.6
37.7	40.2	6.6
28.6	8.5	-70.3
12.6	5.9	-53.2
10.0	12.0	19.5
9.4	9.4	-0.7
7.4	5.5	-25.7
7.0	7.9	13.2

4. Conclusions

This preliminary study indicates that a heat source may influence EtG in hair depending on the hair type. This has to be considered for a correct interpretation of EtG results in hair.

5. References

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