

Investigation on the presence of Dioxins in the Sicilian Sheep's milk

Gianluigi Maria Lo Dico¹, Antonello Cicero¹, Valentina Cumbo¹, Francesca Ornella Assiria¹, Giuseppe Giusto¹, Andrea Macaluso¹, Barbara Randisi¹, Francesco Giuseppe Galluzzo¹, Michele Chetta¹, Gaetano Camilleri¹, Rosaria Collura¹, Stefania Graci¹, Maria Drussilla Buscemi¹, Antonio Vella¹ & Vincenzo Ferrantelli¹

¹Istituto Zooprofilattico Sperimentale della Sicilia "A. Mirri", Via G. Marinuzzi 3, 90129 Palermo, Italy

²Dipartimento SASTAS, Università degli Studi di Messina, Polo dell'Annunziata, Messina, Italy

ABSTRACT

Our studies were conducted in 2016 and several sicilian sheep farms were involved. The goal of this research was to evaluate the possible use of sheep as a "sentinel" body to be used as a biological indicator for environmental biomonitoring of dioxins. For the determination of dioxins in sheep's milk was used a method on high-resolution gas chromatography along with a high resolution mass spectrometry (HRGC/HRMS) in order to evaluate the existence of dioxins with concentrations exceeding the limits imposed by the EC Regulation 1881/2006. A total of 200 samples were analyzed, of which 14 samples exceeded the limits imposed by the EC Regulation 1881/2006: 3.0 pg/g fat sum of dioxins (WHO.PCDD/F-TEQ). It is conceivable that the proximity to high anthropization areas and industrialization, may have a positive influence on the propagation of dioxins in the environment having been detected values exceeding the allowed limit. The samples with low dioxin concentrations were analyzed, with values not exceeding the prescribed limit.

KEY WORDS

Dioxins; milk; PCDD; GC/MS.

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INTRODUCTION

Dioxins are present in the soil as trace impurities coming from herbicides and chlorophenols. They can originate from photochemical and thermal reactions in fly ash and other incineration products. The stability in chemical structure and in the environment of some dioxins coupled with their potential to accumulate in fat is confirmed in their detection into global ecosystem (Eisler, 1986).

MATERIAL AND METHODS

The sheep breeds of the farms under investiga-

tion come from crosses between Cosimana, Maltese, Derivate of Syria, Argentine Etna, Girgentana and Messina Indigenous. They were bred year-round semi-wild state. Their nutrition consists mainly of fodder provided by the adjacent pasture-grazing areas integrated, in the least, with dried fodder (lager hay). The first step in the determination was the extraction of the fat fraction from the milk sample. The analytical technique used is the accelerated extraction with the solvent (ASE Thermo Fisher Scientific). Approximately 10 mL of sample was added 200 µL of internal standard (PCB 155) and diatomaceous earth. The extraction solvent is a mixture of hexane/ether 30:70 (V/V). The second step is to purify the fat extract through the passage

Compound Name	Quant /Qual	Precursor Ion [Da]	Product Ion [Da]	Collision Energy [V]
¹³ C-TCDF	Qual	315.94	251.97	26
¹³ C-TCDF	Quant	317.94	253.97	26
TCDF	Qual	303.89	240.94	26
TCDF	Quant	305.89	242.94	26
¹³ C-TCDD	Qual	331.94	267.97	20
¹³ C-TCDD	Quant	333.93	269.97	20
TCDD	Qual	319.89	256.93	20
TCDD	Quant	321.89	258.93	20
¹³ C-PeCDF	Qual	351.89	287.93	26
¹³ C-PeCDF	Quant	353.89	289.93	26
PeCDF	Qual	339.86	276.89	26
PeCDF	Quant	341.86	278.89	26
¹³ C-PCDD	Qual	367.89	303.93	22
¹³ C-PCDD	Quant	369.89	305.89	22
PeCDD	Qual	355.85	292.89	20
PeCDD	Quant	357.85	294.89	20
¹³ C-HxCDF	Qual	383.86	319.89	26
¹³ C-HxCDF	Quant	385.86	321.89	26
HxCDF	Qual	371.82	308.86	28
HxCDF	Quant	373.82	310.86	28
¹³ C-HxCDD	Qual	399.86	335.89	20
¹³ C-HxCDD	Quant	401.86	337.89	20

Table 1. Mass spectrometry parameters for the detection and confirmation of the analytes.

in the Extraluent cartridge and then into the silica SPE cartridge. The sample was transferred to a HRGC/HRMS 7200B Quadrupole Time-of-Flight GC/MS system (Agilent Technologies) with auto-sampler vial.

RESULTS AND DISCUSSION

In this study small-sized farms were monitored, from 10 to 100 heads. From the results obtained we can observe that on all the samples analyzed only three samples exceed the limit imposed by Regulation EC 1881/2006 which is equal to 3.0 pg/g fat. From the results obtained we can observe that on all samples analyzed only three samples exceed the limit imposed by Regulation EC 1881/2006 which is equal to 3.0 pg/g fat per sum of dioxins. The highest concentration value was 8.47 pg OMS-PCDD/F-TEQ/g fat, 3.75 pg OMS-PCDD/F-TEQ/g fat and

6.73 pg OMS-PCDD/F-TEQ/g fat. The results obtained from the determination of the other samples show very low levels of contamination from 1.36 to 0.0054 µg OMS-PCDD/F-TEQ/g by demonstrating that the milk produced is a safe food for human consumption (see also Schuhmacher et al., 2002; Gullet & Touai, 2003; Croes et al., 2013).

CONCLUSIONS

Positive results were obtained from samples taken from farms that use milk as raw material to be transformed into dairy products and then mixed with other raw materials with a dilution process that makes the product unholy to human health. Samples that show a level of dioxins above the law limit all fall into a wooded area where frequent fires develop which may result in increased concentrations first in the forage then transferring to milk.

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