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PCB decontamination in accidentally exposed heifers

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INTRODUCTION

European Union regulation has defined maximum levels for polychlorinated dibenzo-*p*-dioxins, polychlorinated dibenzofurans (PCDD/Fs) and dioxin-like polychlorinated biphenyls (PCBs) in food from animal origin (Regulation N°1259/2011/EU) and in products intended for animal feed (Regulation N°277/2012/EU). Livestock exposed to contaminated forage or soil may produce meat or milk which are unfit for human consumption. Until recently management of these crises involved euthanasia of animals. The question arising is to know if bovines contaminated by dioxin-like compounds may be decontaminated and further used for their initial purpose. The aim of this experiment was to study the decontamination process of accidentally PCB contaminated Limousine heifers

MATERIALS & METHODS

Animals:

8 growing Limousine heifers were removed from a PCB contaminated rural area. They were fed a non contaminated diet based on hay and grass silage, supplemented by corn and minerals, to allow a daily weight gain of about 1000 g/d

Sampling and treatment:

Every two months the animals were weighed and submitted to pericaudal biopsies. Pericaudal fat samples and experimental feed were analyzed for DL-PCBs and NDL-PCBs (ASE extraction and GC-HRMS equipped with a DB-5MS column using the SIM acquisition mode).

RESULTS AND DISCUSSION

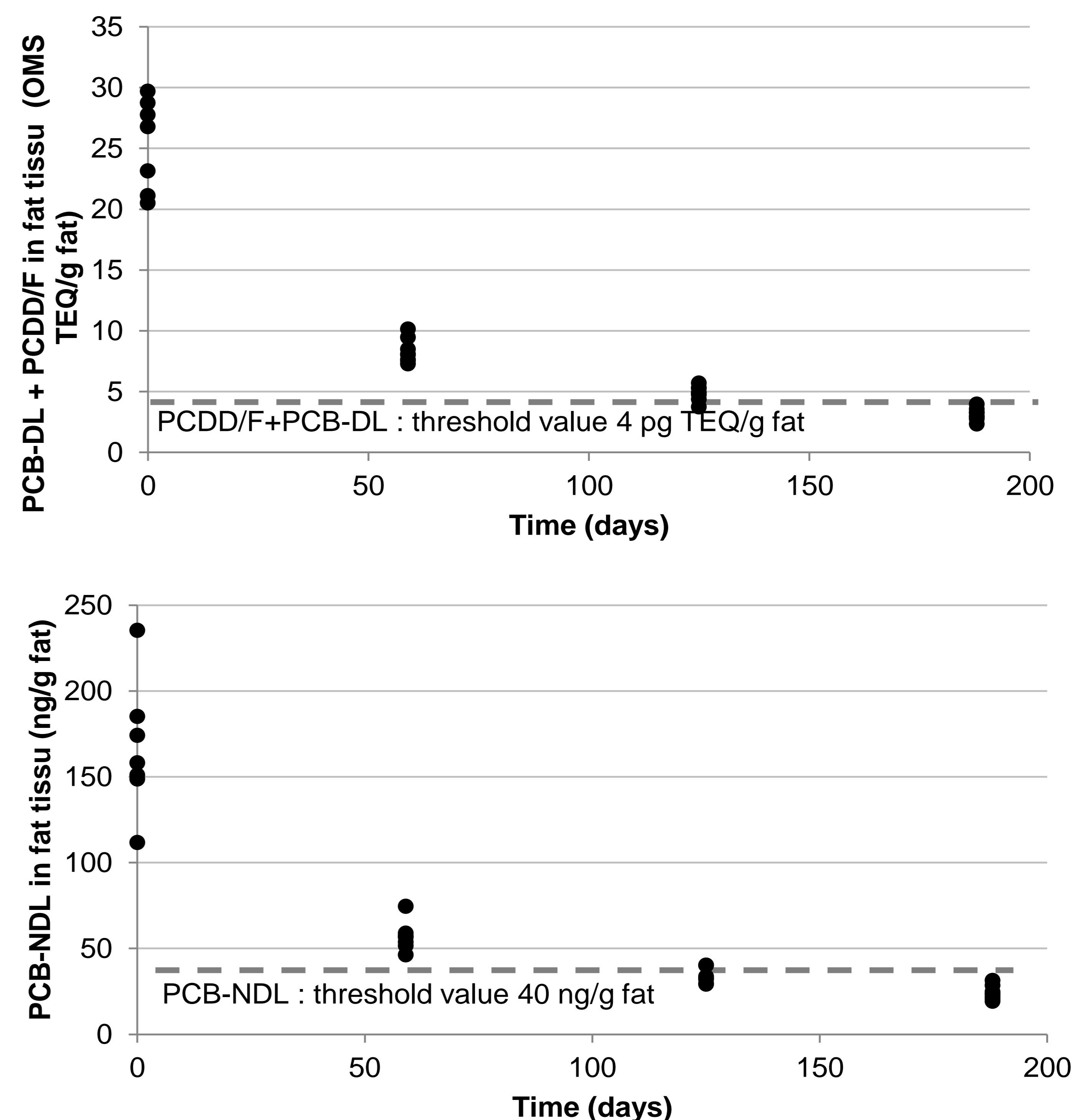
The eight heifers (weighing 337±21 kg) showed a rather high initial PCB concentration in fat tissue (from 25-28 pg/g fat WHO₂₀₀₅-TEQ). During the experimental period the kinetics of DL-PCB and NDL-PCB congeners followed an exponential decrease mainly related to the weight gain of the animals. After 120 d, the NDL-PCB levels were found to be below the threshold value (40 ng/g fat) and after 180 d, the DL-PCB level was also below the threshold value (4 pg WHO₂₀₀₅-TEQ/g fat) for all animals (Figure 1).

During this 6 months experiment the mean weight gain of the animals was 180 kg and at the end of this period all heifers were considered decontaminated. The estimated half-life is about 40 to 50 days for PCBs (Table 1)

Table 1 : Weight gain and contamination levels evolution

N°	OMS-TEQ PCB DL / MG	Weight (kg)	OMS-TEQ PCB DL / MG	Weight (kg)	OMS-TEQ PCB DL / MG	Weight (kg)	OMS-TEQ PCB DL / MG	Weight (kg)
	20/09/2011	20/09/2011 (kg)	18/11/2011	18/11/2011 (kg)	23/01/2012	23/01/2012 (kg)	27/03/2012	28/03/2012 (kg)
9537			10,473	415	5,827	456	3,823	495
9539	21,377	352	8,296	432	5,018	477	4,052	496
9542	31,283	302	7,724	365	4,786	424	2,973	468
9543	29,288	367	7,858	460	4,458	517	2,779	571
9547	30,913	331	9,573	402	5,528	446	3,474	500
9553	27,733	344	8,654	425	5,179	491	2,738	553
9562	22,724	320	7,776	426	3,915	477	2,452	547
9566	24,463	342	8,491	430	5,026	477	3,344	530

Figure 1 : Decontamination kinetics of DL PCB and NDL PCB in growing limousine heifers



CONCLUSION

❖ This study indicates that the decontamination process, mainly via a dilution process, is feasible during a growing period. In this study a decontamination of at least 6 months was considered necessary. In that time period, the mean weight gain of the animals was of 180 kg, i.e. 1 kg average daily gain. Thus, decontamination is possible for young animals or animals with a significant growth potential. This result appears of practicable interest in animals with high genetic potential.

❖ Further research work needs to be carried out to better characterize this decontamination process in connection with parameters related to the nutritional, physiological or f status of the animals.