



## Feeding Fats Safety

### WP 2

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## Objective WP 2

To assess the risk related to the use of recycled fat  
in the feed industry and in animal production



Broiler chicken & Rabbit production



**4 trials: December 2005 – October 2006**

- Trial 1, *Trans* Fatty Acids (T)
- Trial 2, Dioxins and PCBs (C)
- Trial 3, PAHs (P)
- Trial 4, Lipid Oxidation (O)

## 4 experiments

Basal diet supplemented with **6 % (BROILERS) or 3% (RABBITS)** of **recycled fat**, differing in type and level of alteration

### Trans Fatty Acids

**HIGH** 12.40%  
**LOW** 0.65%

### Lipid Oxidation

**HIGH** 6.61% Polymers  
67.43 p-anisidine  
**LOW** 0.35% Polymers  
2.74 p-anisidine

### Dioxins and PCBs

**HIGH** 28.80 pg/g oil  
**LOW** 9.64 pg/g oil  
WHO-TEQ PCDD/Fs + DL-PCBs

### PAHs

**HIGH** 5290 ng PAHs/g oil  
**LOW** <18 ng PAHs/g oil  
PBDEs < 2 ng/g oil



**UAB**  
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## WP2- Procedures



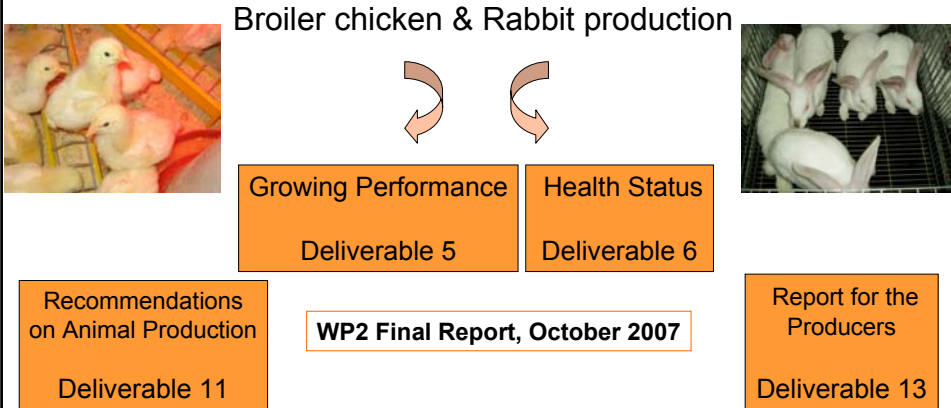
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- Growing performance:
  - Feed intake and body weight gain
  - Digestibility trials
- Carcass:
  - Final body weight
  - Carcass yield
  - Abdominal fat content

- Health status:
    - Daily incidences
    - Post-mortem inspection
    - Determination of different parameters:
      - Biochemical
      - Microbiological
      - Histological
- Samples:* blood (serum); jejunum sections; caecal content and excreta.



To assess the risk related to the use of recycled fats  
in the feed industry and in animal production



**Trans Fatty Acids**

↩

**HIGH 12.40%**  
**LOW 0.65%**

BROILERS Experimental feed:  
HT: 677,7 mg/100g *Trans FA*  
LT: 50,3 mg/100g *Trans FA*

RABBITS Experimental feed:  
HT: 331,9 mg/100g *Trans FA*  
LT: 25,5 mg/100g *Trans FA*

**The inclusion of a fat with a HIGH content of TFA  
LED to a:**

- Smaller growth and worse feed efficiency
- Lower ether extract and energy digestibility coefficients
- Some impairment of microbial activity in rabbits: lower caecal TSCFA concentration
- Higher haemolysis rate after a week in broilers

**NO EFFECTS:**

- Organic lesions: inspection post-mortem
- broilers: ecological composition of microbiota  
microbiota activity: TSCFA and lactic production  
gut morphology
- rabbits: hepatic and renal function test

## PAHs

**HIGH** 5290 ng PAHs/g oil  
**LOW** <18 ng PAHs/g oil  
PBDEs < 2 ng/g oil

BROILERS Experimental feed:

HP: 274ng/g PAHs

LP: 13 ng/g PAHs

RABBITS Experimental feed:

HP: 153 ng/g PAHs

LP: 32 ng/g PAHs

The inclusion of a fat with a **HIGH** content of PAHs  
LED to a:

Some impairment of microbial activity in rabbits: higher caecal NH<sub>3</sub> concentration

### NO EFFECTS:

Growth performance

Organic lesions: inspection post-mortem

broilers: ecological composition of microbiota

microbiota activity: TSCFA and lactic production

gut morphology

rabbits: hepatic and renal function test

In general: Low ether extract and energy digestibility coefficients



- *Trans* FA Trial:

Hydrogenated Palm FA distillate

Palm FA distillate

%	HT	LT
SFA	85	54
MUFA	15	37
PUFA	0	9

- *PAH* Trial:

Olive-pomace acid oil

Olive acid oil

Acid Value	HT	LT
mgKOH/g	100,4	108,3

**TRANS AND/OR SATURATED FATTY ACIDS ?**

**PAHs AND/OR ACID OILS ?**



Fat supplementation is a normal practice in feed formulation

Added fats represent a high concentrated energy source

**IN BOTH TRIALS:** impairment of fat digestibility  
having an impact on energy digestibility  
and then: **energy value of feed**

### Implications:

it seems advisable to **measure the energy value of the fatty materials**, or alternatively to correct it by knowing the fat digestibility

**Dioxins and PCBs**

**HIGH** 28.80 pg/g oil  
**LOW** 9.64 pg/g oil  
WHO-TEQ PCDD/Fs + DL-PCBs

**Level of contaminated experimental feed:  
PCDD/Fs + DL-PCBs**  
Broilers: **117%** Rabbits: **57%**  
than allowed

Exceeding MAX values 24 pg TEQ PCDD/Fs+DL-PCBs/g oil  
(2006/13/CE)

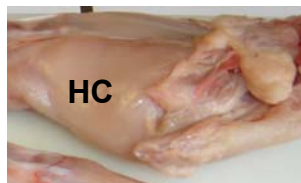
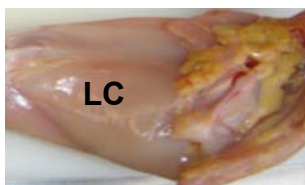
The inclusion of a fat with a **HIGH** content of DIOXINS and PCBs:  
LED to a:  
NO NEGATIVE effects on growth performance and health in both species

but

## RABBITS

GROWTH PERFORMANCE WAS POORER  
WITH FEED **LOW** IN DIOXINS AND PCBs

MOREOVER, CARCASS FROM FEED **LOW** IN DIOXINS AND PCBs  
WERE NOT ACCEPTABLE COMMERCIALY

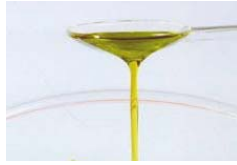


FEED **LOW** IN DIOXINS AND PCBs  
IMPARED HEPATIC FUNCTION

## DIOXINS AND PCBs

Quality and safety of fish oils for animal feeding !!!

	LC Fish oil	HC Fish oil
Dioxins/PCBs (pg WHO-TEQ/g)	9.64	28.80
Elements (mg/kg)		
Ca	61	4.15
P	494.5	<4
As	8.2	<4
Fe	41.5	<4
Mg	27.5	<4
Zn	4.1	<4
p-anisidine value	58.8	8.2
Polymer content (%)	2.65	0.21
TBA value (µg MDA/kg)	2819	65



## FISH OIL > Dioxins and PCBs content

### Implications:

Limitation of FISH OIL in feed formulation  
Quality control of these kind of oils: oxidative status – chemical composition, ..

#### Lipid Oxidation



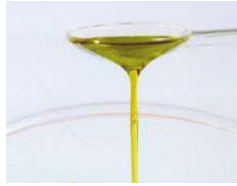
**HIGH** 6.61% Polymers  
67.43 p-anisidine  
**LOW** 0.35% Polymers  
2.74 p-anisidine

BROILERS Experimental feed:  
HO: 14.75 p-anisidine value  
LO: 3.73 p-anisidine value  
RABBITS Experimental feed:  
HO: not available  
LO: not available

The administration of a feed with a **HIGHLY** oxidized fat

LED to a:

NO NEGATIVE effects on growth performance and health in **both species**



The actual level of oxidation of the added fat  
**is less important than**  
the susceptibility to oxidation

### **Implications:**

Low impact of the use of oxidised fats in feed formulation  
In our experimental conditions: No limits to inclusion



## **Conclusion**

The inclusion in broiler chicken or rabbit feed of different fatty recycled materials differing in levels of *trans* fatty acids, dioxins and PCBs, PAHs or lipid oxidation **HAD NOT MAJOR EFFECT** on animal performance and health



## TO NOTE:

- ✓ The level of alterations / contaminations studied were **not extreme** in any case
- ✓ It was not always possible to use the same fat **the different composition of added fat could also affect the results**



## Feeding Fats Safety

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