

63rd Annual Meeting EAAP  
August 27th – 31th, 2012  
Bratislava, Slovakia

# Effect of dietary vitamin A restriction on growing performance and intramuscular fat content of pigs

*N.Tous<sup>1</sup>, R.Lizardo<sup>1</sup>, B.Vilà<sup>1</sup>, M.Gispert<sup>2</sup>,  
M.Font-i-Furnols<sup>2</sup>, E.Esteve-Garcia<sup>1</sup>*

<sup>1</sup>IRTA – Monogastric Nutrition

<sup>2</sup>IRTA – Carcass Quality

# 1.Introduction

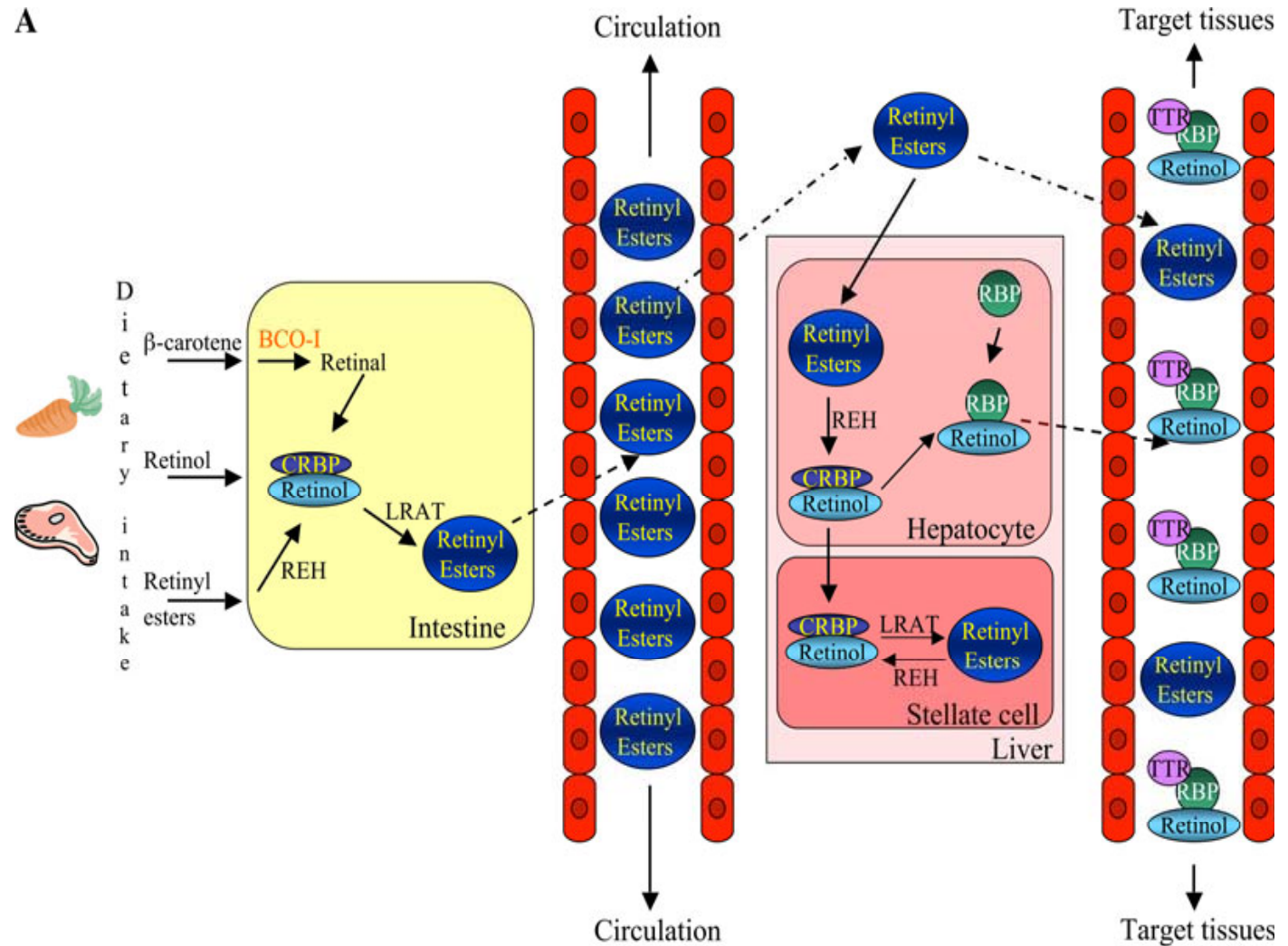
- **In 80's pig selection against pig fatness, decreased IMF of pigmeat** (Wood et al., 2008).
- **IMF content correlated with overall consumer acceptability** (Font-i-Furnols et al. 2012).
- **Nutritional strategies to improve IMF:**  
**Reduction of dietary vitamin A**

# 1.Introduction

**NRC 1998 requirement for fattening pigs:**  
**1,300 IU/kg**

**EFSA (2009) recommended to establish  
new maximum levels for G/F feeds:**  
**6,500 IU/kg**

**Usual Spanish mineral pre-mix:**  
**5,000 IU/kg**

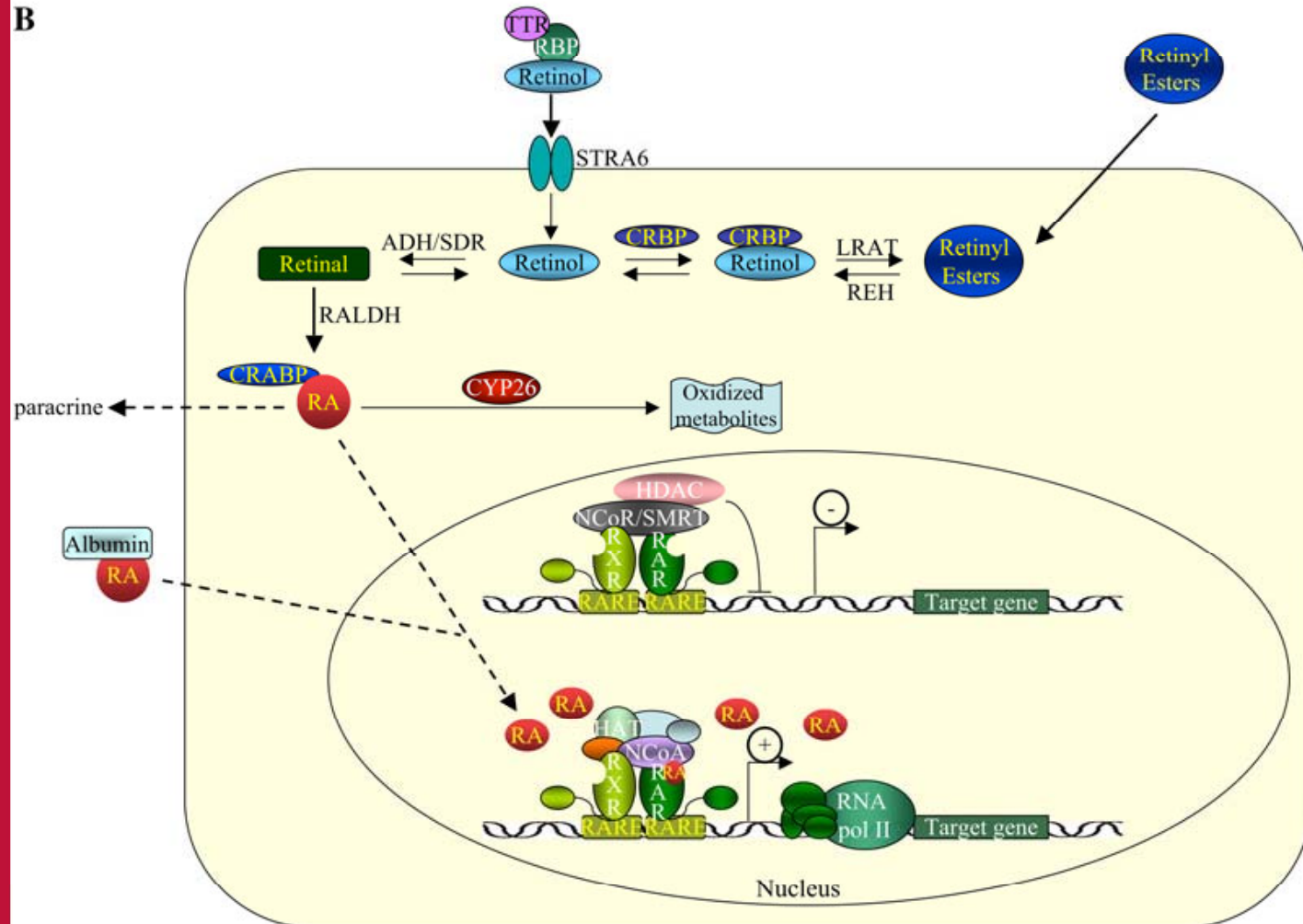


Theodosiou et al. (2010)

**RA may contribute to Glucose and lipid homeostasis:**

- Promote or repress adipogenesis (Krskova-Tybitanclova et al. 2008).
- Smaller fat cells but greater number (Arana et al., 2008).

B



Theodosiou et al. (2010)

## Effect of dietary vit A level in farm animals

### Beef cattle

Without vit A  
supplementation:



**IMF or marbling**

(Siebert et al. 2006)  
(Gorocica-Buenfil et al. 2007a,b,c)  
(Kruk et al. 2008)  
(Arnett et al. 2009)

### Pigs

Reduction dietary vit A:

**IMF**



(D'Souza et al. 2003)  
(Olivares et al. 2011)

Increase dietary vit A:

**No effect IMF**

(Olivares et al. 2009a,b)

## 2. Objective

**To evaluate the effect of dietary vitamin A level on**

- **Pig productive parameters**
- **Backfat thickness**
- **Intramuscular fat (IMF) content**
- **Liver retinol content**

### 3. Material and methods

- ✓ **3 experimental diets ( $\neq$  vitamin A level) :**
  - **Without vit. A supplementation (0 IU/kg)**
  - **Required vitamin A (1,300 IU/kg; NRC 1998)**
  - **Commercial vit A level (5,000 IU/kg)**
- ✓ **48 barrows LD x DU; 35kg BW**
- ✓ **16 blocks of BW; housed individually**
- ✓ **Slaughtered at  $117 \pm 5.6$  kg**
- ✓ **Carcass & meat quality measurements**
- ✓ **IMF in LD muscle (Folch et al. 1957)**
- ✓ **Liver retinol determination**



### 3. Material and methods

#### Experimental diets

<i>Ingredients</i>	Grower	Intermediate	Finisher
Sorghum	31.6	36.8	36.8
Manioc	25.0	25.0	25.0
Wheat	20.0	20.0	20.0
SBM 44%	19.8	14.4	15.0
<i>Nutrients</i>			
Energy, Kcal/kg	3129	3124	3127
Protein, %	14.9	13.0	13.0
Dig. LYS, g/kg	10.0	8.4	7.4

### 3. Material and methods

#### Dietary vit A content, IU/kg

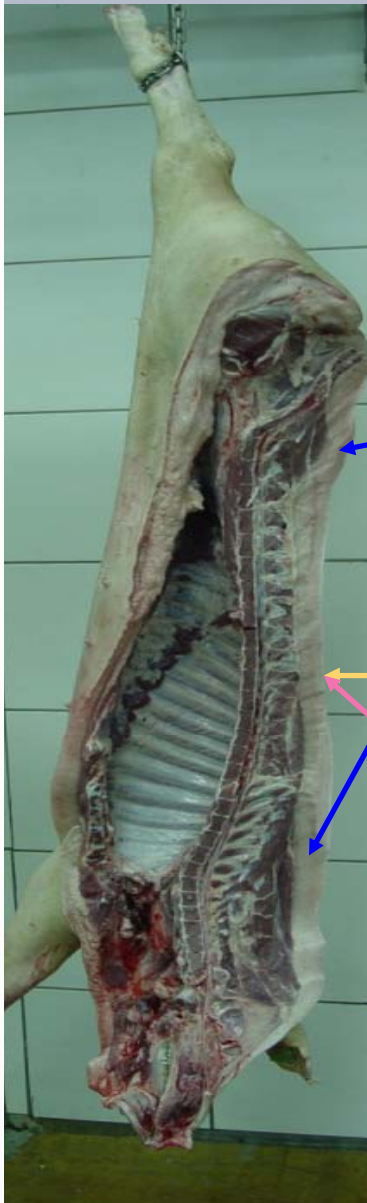
	Vit A 0 IU	Vit A 1300 IU	Vit A 5000 IU
<b>Vitamin A</b>	654±41	2078±145	6991±242

## 3. Results

### Productive parameters

<b>Item</b>	<b>Vit A 0 IU</b>	<b>Vit A 1300 IU</b>	<b>Vit A 5000 IU</b>	<b>RMSE</b>	<b><i>P</i></b>
<b>Initial weight, kg</b>	<b>35.7</b>	<b>34.9</b>	<b>35.2</b>	<b>2.85</b>	<b>0.77</b>
<b>Final weight, kg</b>	<b>118.6</b>	<b>114.3</b>	<b>117.0</b>	<b>5.81</b>	<b>0.75</b>
<b>ADFI, kg/d</b>	<b>2.93</b>	<b>2.82</b>	<b>2.94</b>	<b>0.23</b>	<b>0.65</b>
<b>ADWG, kg/d</b>	<b>1.05</b>	<b>1.00</b>	<b>1.03</b>	<b>0.08</b>	<b>0.85</b>
<b>FGR</b>	<b>2.81</b>	<b>2.82</b>	<b>2.86</b>	<b>0.22</b>	<b>0.54</b>

### 3. Results



### Backfat thickness (mm) and lean meat (%)

Item	Vit A 0 IU	Vit A 1300 IU	Vit A 5000 IU	RMSE	<i>P</i>
<b>minFAT</b>	<b>29.1</b>	<b>28.7</b>	<b>29.1</b>	<b>4.48</b>	<b>0.95</b>
<b>maxFAT</b>	<b>45.3</b>	<b>44.1</b>	<b>44.7</b>	<b>5.16</b>	<b>0.56</b>
<b>Fat34lr</b>	<b>29.6</b>	<b>29.2</b>	<b>30.2</b>	<b>4.64</b>	<b>0.64</b>
<b>Muscle34lr</b>	<b>51.2</b>	<b>47.9</b>	<b>49.0</b>	<b>5.00</b>	<b>0.37</b>
<b>Lean, %</b>	<b>43.6</b>	<b>43.4</b>	<b>42.7</b>	<b>4.15</b>	<b>0.53</b>

$$\text{Lean meat, \%} = 61.56 - 0.878\text{Fat34} + 0.157\text{Mus34}$$

### 3. Results

#### IMF of LD muscle and liver retinol content

Item	Vit A 0 IU	Vit A 1300 IU	Vit A 5000 IU	RMSE	<i>P</i>
IMF (NIT), %	2.29	2.70	2.62	1.05	NS
IMF (Folch), %	2.50	3.12	2.94	1.07	0.39
Liver retinol, µg retinol / g	63.7	123.6	361.6	38.1	<0.001

## 4. Conclusion

- **Pig performance parameters as well as carcass quality and overall fatness were not affected, even with vitamin A depletion**
- **IMF either remain unaffected or can be reduced when vitamin A was omitted in the diet**
- **Retinol content in the liver increased as a function of the dietary level of vit A.**

# Acknowledgements

**MICINN project: AGL 2007-6589-C02-02**

**INIA: predoctoral grant for Núria Tous**

**THANK YOU VERY  
MUCH FOR YOUR  
ATTENTION!!!!**