'천하제일, 새로운 50년'

대한민국, 천하제일
Above & Beyond

# 최신 양돈 영양 이슈와 사료 효율 개선 방안

**2016. 5. 18**

**홍익대학교 국제연수원**

**양돈 R&D**
**박진성, Ph. D.**

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# 양돈산업

단백질
(아미노산)

아미노산

단백질생산
(돈육)

지방축적

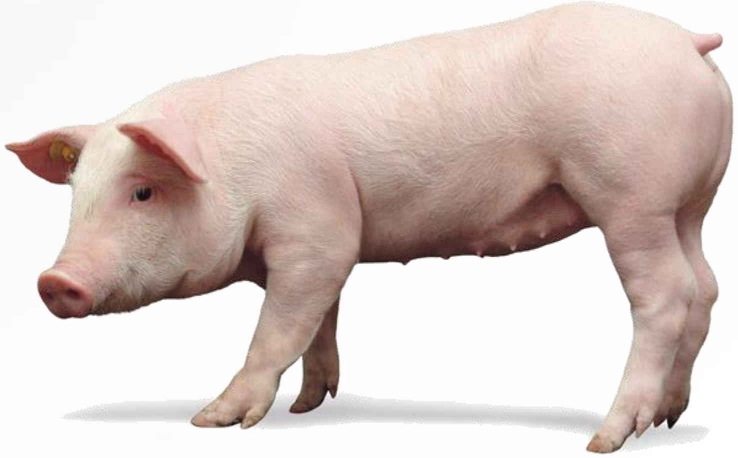
에너지

탄수화물

지방

# 경제성/효율성: Cost Effective 양돈

Input



영양소 소화율

체내 이용율

Output

ADG

ADFI

FCR

# 국제 양돈 사료효율 세미나 (2015.10)

## International Conference on Feed Efficiency in Swine, Omaha, NE

✓ 500명-19 개국
✓ FCR 개선 프로젝트 (5년/500 만불)

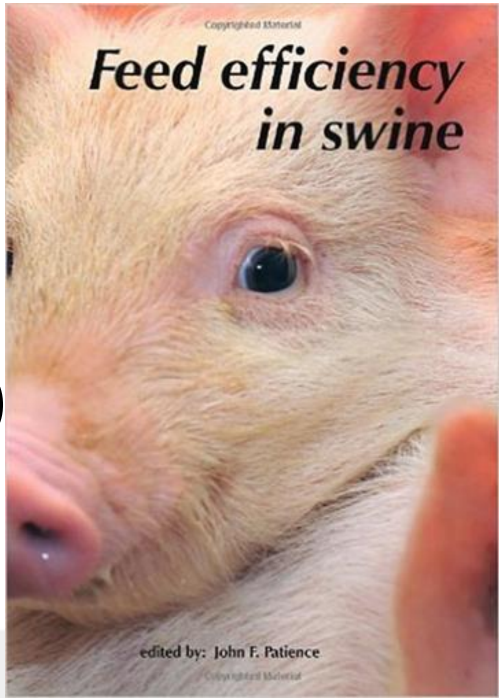
# FCR에 관한 세계적인 관심 증가

❖ 양돈산업의 궁극적인 목표: 수익성 확보 by

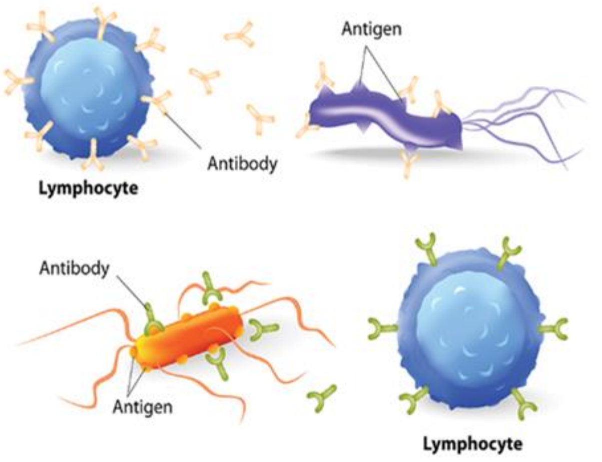
1. 생산성 향상
2. 생산비 절감 (사료비 절감, FCR)
3. 자연 친화적인 양돈 (분뇨 발생 최소화)

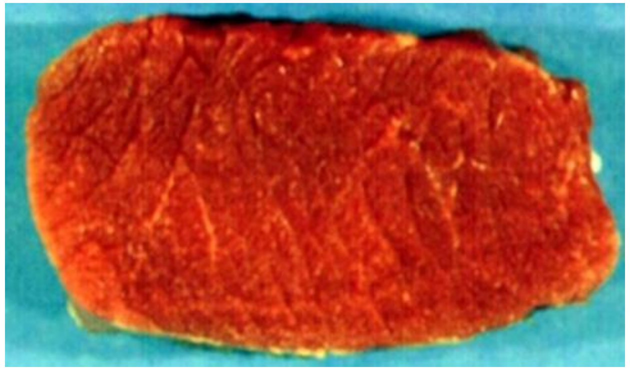

## FCR 개선을 위한 연구

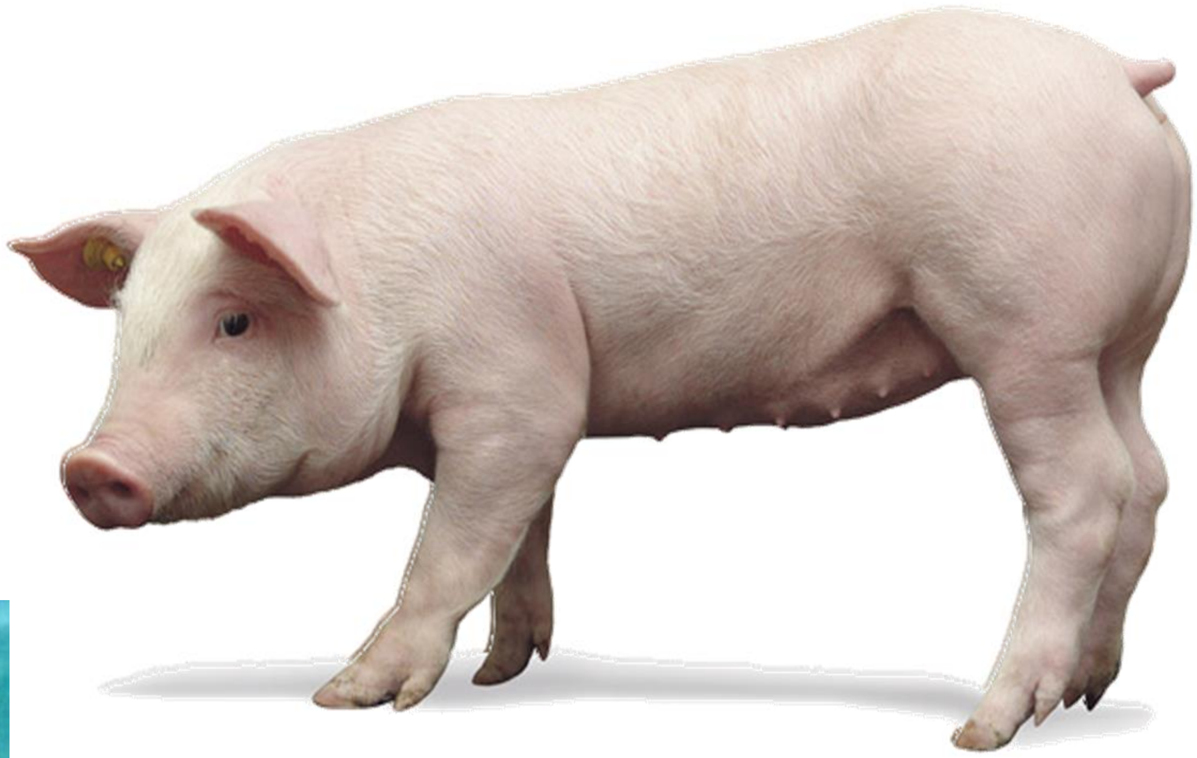
- ❖ Pig health and feed efficiency (질병)
- ❖ Nutrition and feed efficiency (영양)
- ❖ Physiology and feed efficiency (생리학)
- ❖ Genetics and feed efficiency (유전)
- ❖ Pork quality, animal health and feed efficiency (육질/돼지 건강)
- ❖ Feed processing and feed efficiency (사료가공)
- ❖ The sow herd and feed efficiency (모돈)

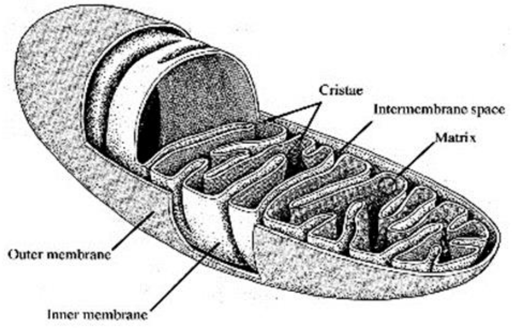


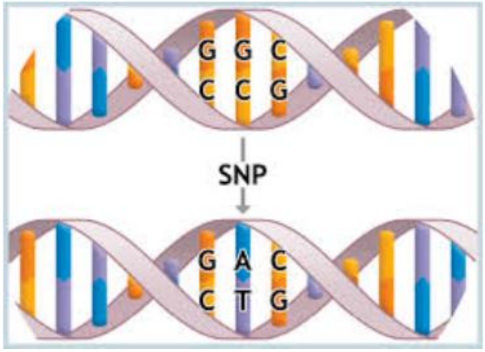
# FCR 개선을 위한 연구 분야







# 질병발생이 성장성에 미치는 영향

'천하제일, 새로운 50년'

| Parameter | Control[1] | PRRS[2] | PED[2] | PRRS + PED[2] | SEM | *P*-value Overall | *P*-value PRRS[3] | *P*-value PED[4] | *P*-value Infection[5] |
|---|---|---|---|---|---|---|---|---|---|
| *0-14 d Performance* | | | | | | | | | |
| **ADG, kg** | 0.62$^{a}$ | 0.35$^{b}$ | 0.61$^{a}$ | 0.41$^{b}$ | 0.03 | <0.001 | <0.001 | 0.506 | 0.003 |
| **ADFI, kg** | 0.95$^{a}$ | 0.67$^{b}$ | 0.94$^{a}$ | 0.76$^{b}$ | 0.05 | 0.001 | <0.001 | 0.441 | 0.032 |
| **G:F** | 0.65$^{a}$ | 0.53$^{b}$ | 0.65$^{a}$ | 0.55$^{ab}$ | 0.03 | 0.020 | 0.003 | 0.861 | 0.095 |
| *15-21 d Performance* | | | | | | | | | |
| **ADG, kg** | 0.66$^{a}$ | 0.63$^{a}$ | 0.35$^{b}$ | 0.20$^{b}$ | 0.04 | <0.001 | 0.083 | <0.001 | 0.001 |
| **ADFI, kg** | 1.22$^{a}$ | 1.02$^{a}$ | 0.88$^{ab}$ | 0.67$^{b}$ | 0.07 | 0.003 | 0.026 | <0.001 | 0.005 |
| **G:F** | 0.54$^{ab}$ | 0.62$^{a}$ | 0.39$^{bc}$ | 0.31$^{c}$ | 0.05 | 0.001 | 1.000 | <0.001 | 0.189 |
| ***0-21 d Performance*** | | | | | | | | | |
| **ADG, kg** | **0.63$^{a}$** | **0.44$^{b}$** | **0.51$^{ab}$** | **0.34$^{c}$** | 0.04 | <0.001 | <0.001 | 0.001 | <0.001 |
| **ADFI, kg** | **1.04** | **0.78** | **0.92** | **0.73** | 0.04 | 0.002 | <0.001 | 0.076 | 0.002 |
| **G:F** | **0.61$^{a}$** | **0.56$^{a}$** | **0.56$^{a}$** | **0.47$^{b}$** | 0.02 | 0.005 | 0.006 | 0.008 | 0.019 |

[1]n=3 pens per treatment; healthy, virus naïve (Control)
[2]n=6 pens per treatment; PRRSV infected (PRRS),PEDV infected (PED), co-infected (PRP)
[3]Orthogonal contrast for PRRSV naïve vs PRRSV infected
[4]Orthogonal contrast for PEDV naïve vs PEDV infected
[5]Orthogonal contrast of virus naïve vs virus challenged
[a,b,c]*P* < 0.05 represents treatment differences

- ➢ **ADG : 20-50% 감소**
- ➢ **ADFI : 10-30% 감소**
- ➢ **GF: 10-20% 감소**

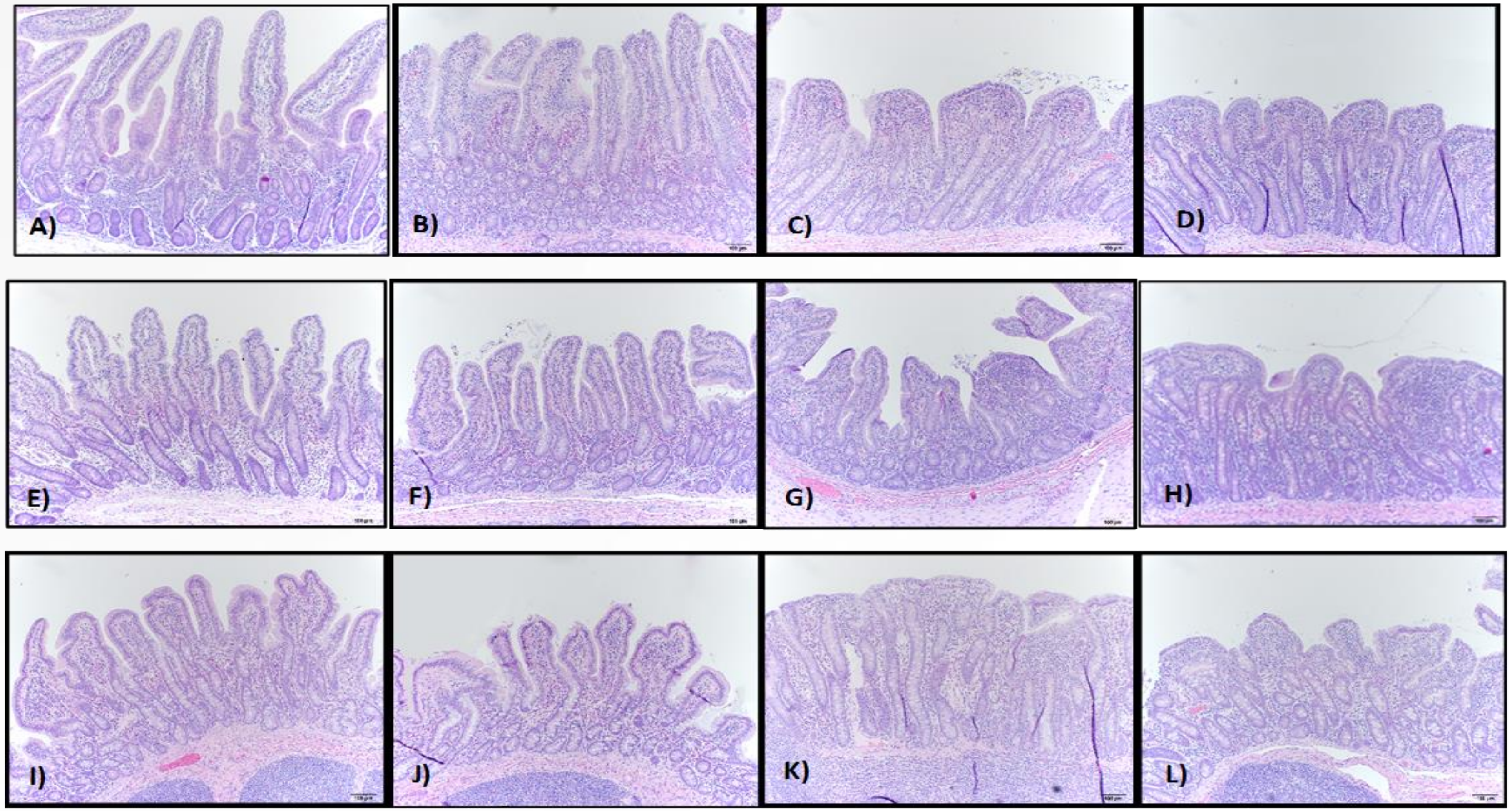
# 조직학적인 변화 (Total Histological Disease Activity Scores)



십이지장 (Duodenum)

공장 (Jejunum)

회장 (Ileum)




CONTROL | PRRSV challenged | PEDV challenged | PRRSV + PEDV challenged

Lesion Score = 0
No morphological changes

Lesion Score=0.1
No morphological changes

Lesion Score = 2.6
Mild villus atrophy and fusion, Some inflammatory infiltrates

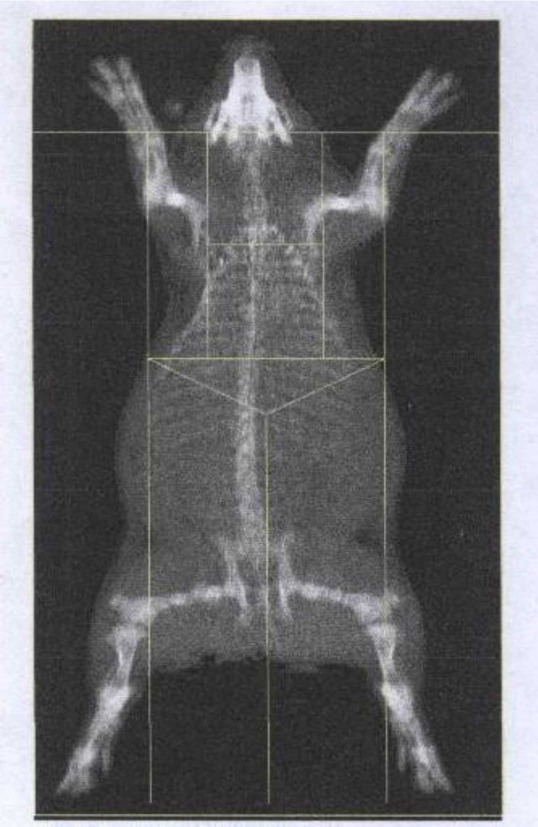
Lesion Score = 4.42
Moderate villus atrophy a nd fusion, mild inflammatory infiltrates

# 체단백질 축적량 변화

- ✓ PRRS: 성장율을 15%~20% 감소
- ✓ 출하체중 감소
- ✓ PRRS 감염으로 두당 $5-20 손실 발생

| Parameter* | Control | PRRSV+ | SE | P-value |
|---|---|---|---|---|
| Lean, g/d | 657 | 568 | 13.9 | <0.001 |
| Protein, g/d | 131 | 112 | 2.89 | <0.001 |
| Fat, g/d | 230 | 184 | 9.22 | <0.001 |

n=30 gilts/trt
*Predicted based on calibration curves



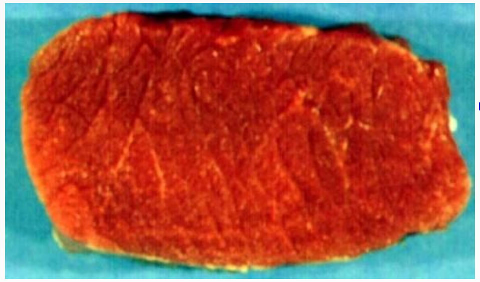
# 면역과 성장

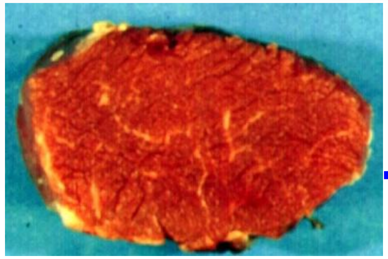
## 아미노산 대사의 이해

성장

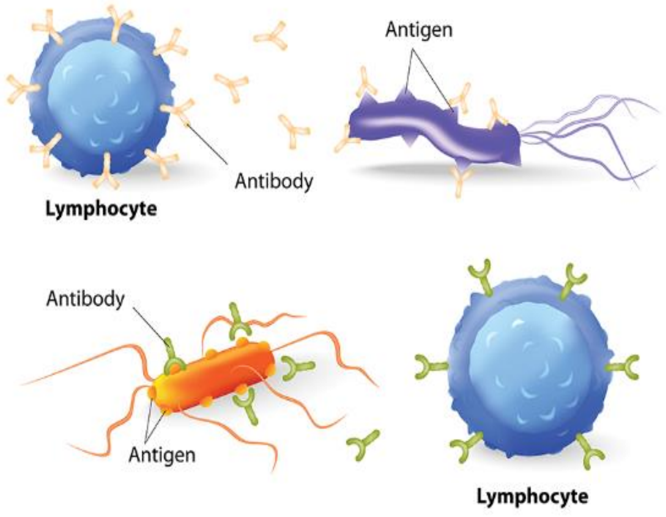
면역

면역 반응을 위한 lysine 요구율이
성장보다 높음
Klasing and Calvert (2000)





FCR




Threonine의 역할

# 질병에 대한 대책



- 질병에 감염된 돼지에 대한 특효약(사료)은 없다
  (No silver bullets in feeding health challenged pigs)

- 질병 감염에 따른 대사 요구량에 대한 더 많은 이해가 필요

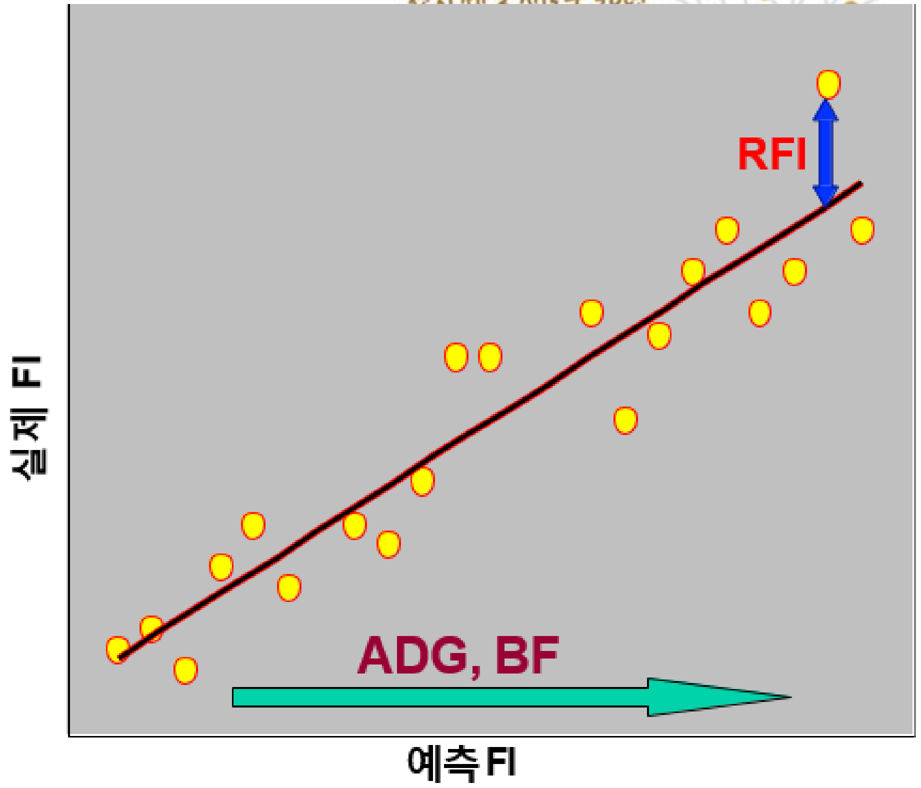
- 질병에 노출된 돼지를 위한 최선책
  - ✓ Biosecurity (철저한 방역)
  - ✓ Amino acid and protein formulation (아미노산과 단백질 조절)
  - ✓ Water delivery of nutrients and antioxidants (음수:영양소/항산화제)
  - ✓ Improve appetite (기호성 개선)
  - ✓ Genetic selection for robustness (품종개량)

# Residual Feed Intake (RFI)

❖ 보다 효율적인 품종 선발

❖ Residual Feed Intake : 섭취량과 FCR의 상관관계

- 내성적 섭취량에 따른 품종 선발
- 예상 값 보다 높은/낮은 섭취량 (RFI+, RFI-)




❖ 낮은 섭취량 돼지 (RFI -) vs 높은 섭취량 돼지 (RFI +)

1. 성장성, 사료효율 개선 (Gilbert et al., 2007)
2. 근섬유 차이(Larger fast-twitch glycolytic fibers): glycogen 함량 높음 (Lefaucheur et al., 2011)
3. 해당(glycolytic) 과 산화(oxidative) 관련 효소량 낮음 (Le Naou et al., 2012; Faure et al., 2013)
4. 근육 내 영양소의 이용율 높음

❖ 축우: RFI – 가 사료효율이 높은 결과를 보임 (Richardson and Herd, 2004).

# FCR과 RFI 변이에 대한 생리학적 접근



- 복합적인 요인 또는 시스템
- 이온 펌프 (예: $Na^{+}/K^{+}$ ATPase)
- 영양소의 소화 및 축적효율
- 체조성과 세포전환 (tissue turnover)
- 미토콘드리아의 기능과 산화스트레스
- 면역작용/강건성
- Etc...

# RFI- 돼지의 생리학적 특성

↓Activity

유지요구량

- ↓ Heat Production
- ↓ Ion Pump Activity
- ↓ 생리작용

- ↓ 소화기 무게
- ↑ 스트레스/면역 강건성 ?

성장에너지

↓섭취량

↑영양소 소화율

체 조성

↑ 정육 축적

↓ 지방 축적

↑ 골격 축적

↑ 단백질 합성

↓ 단백질 분해
↓ 산화 스트레스

↓ 단백질 tunrover

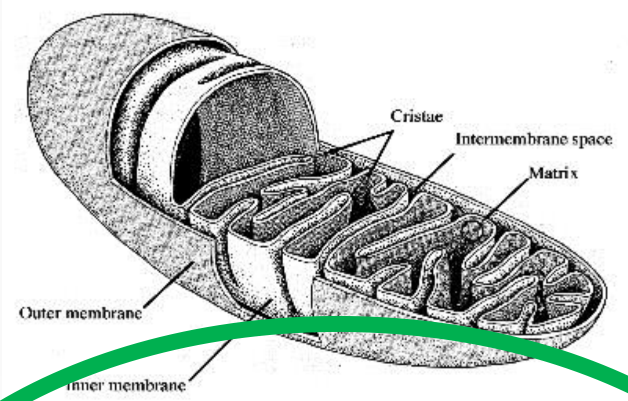
# 미토콘드리아: Energy 발전소

탄수화물

지방산

아미노산

기타




Mitochondria

NADH → ETC → ATP

ETC → 열 (Heat)

단백질
(28%)

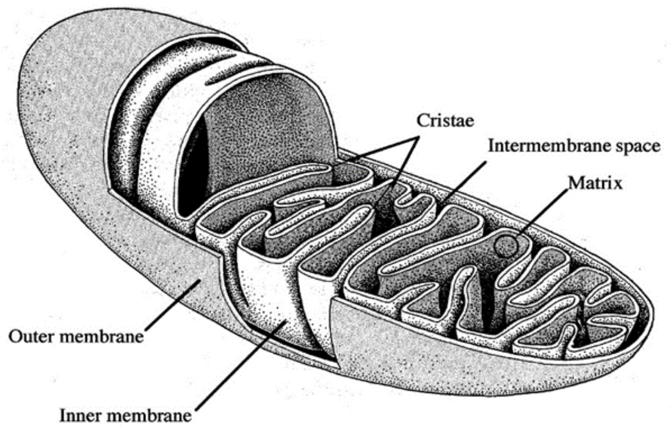
$Na^+/K^+$ ATPase
(19-28%)

근육 수축

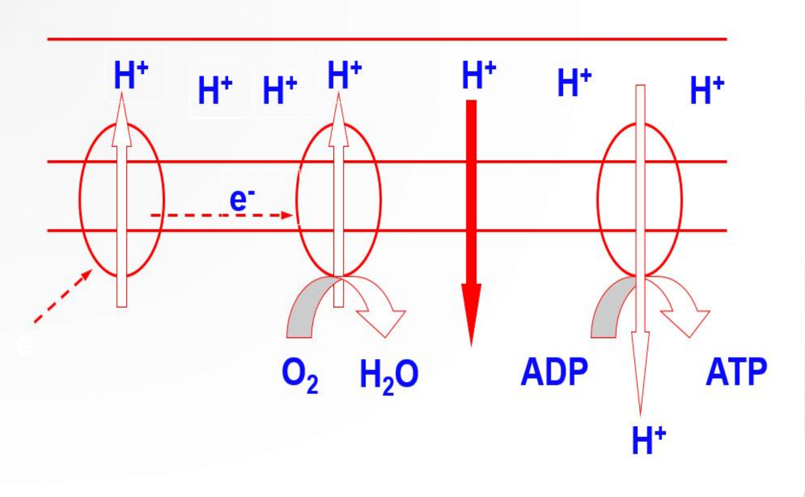
기타 ATPases
(6-16%)

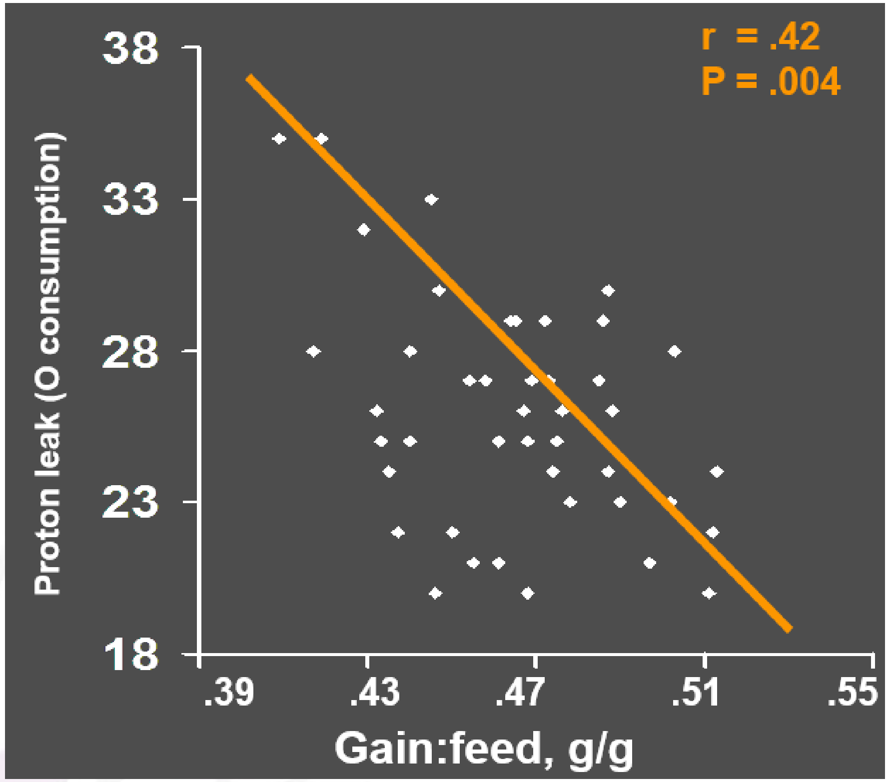
# Proton leak와 FCR 관계

Mitochondria 의 에너지 효율




Proton leak



# 사료효율 개선을 위해 고에너지 사료를 먹고 선발된 돼지가 저에너지 사료에서도 좋은 성적을 내는가?

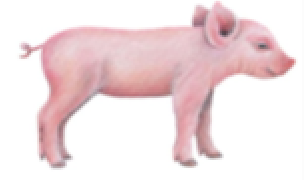


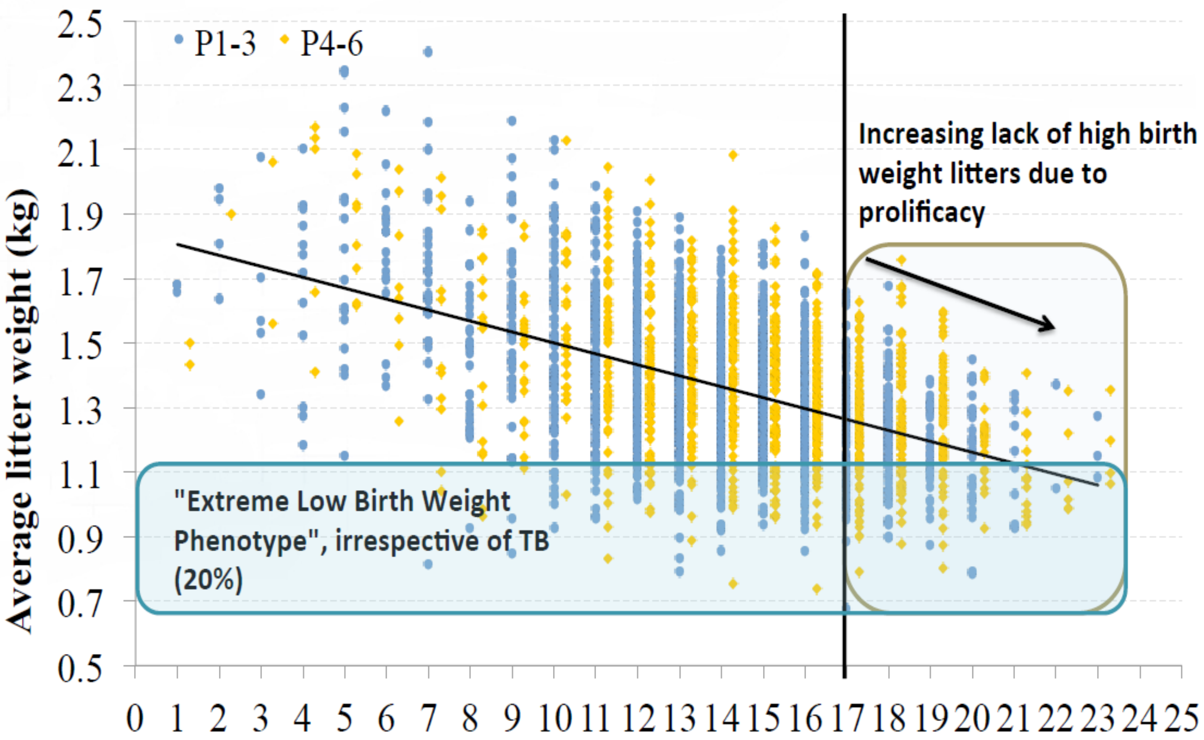
- 고 섬유-저에너지 사료급여 시
  - 사료 섭취량 증가
  - 증체량/사료효율/등지방 감소
  - 유사한 등심단면적

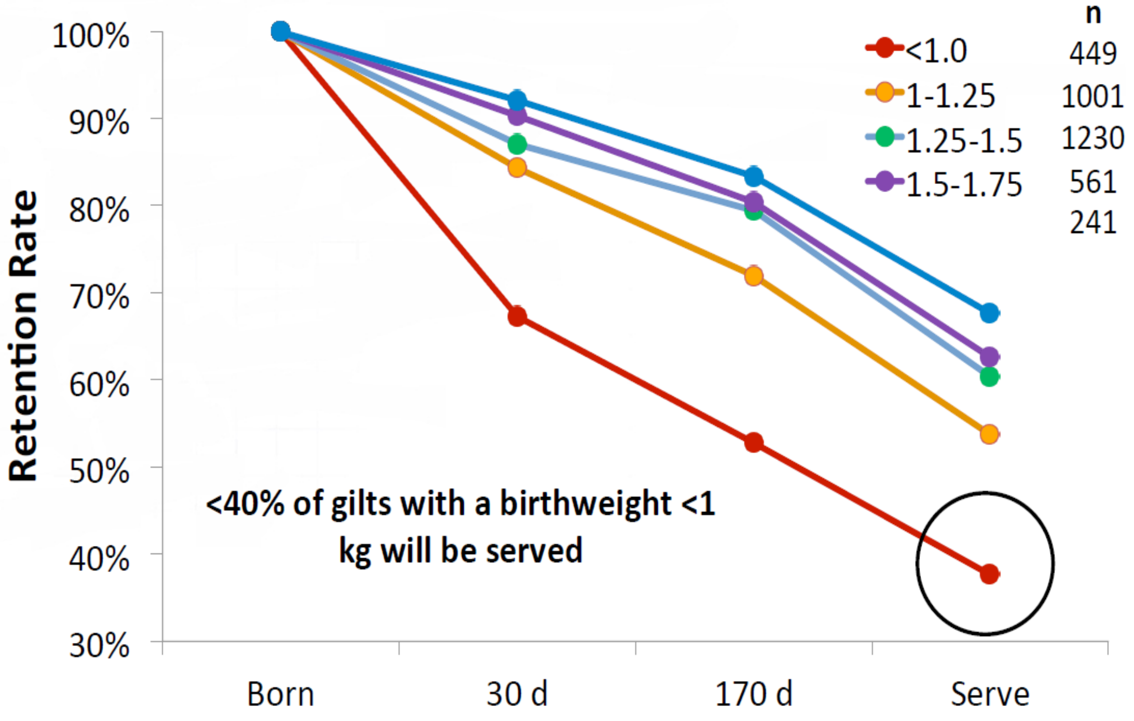
- 고 에너지 사료로 선발된 돼지에게 저에너지 사료 급여 시 FCR 개선 효과가 나타나지 않았음

# Low Birth Weight Phenotype ('Litter of Origin')

'천하제일, 새로운 50년'





# 생시 체중/이유체중이 FCR에 미치는 영향

- Myogenesis (~임신 30일)
- 근섬유 감소→ 단백질 축적 감소→ ADG 저하→ FCR 증가
- 낮은 생시 체중→ 이유 후 낮은 성장성
- 생시체중 (저) vs 고 : 섭취량(저), 성장성(저), FCR (=)

| | 생시체중 | | 이유체중 | |
|---|---|---|---|---|
| | Heavy | Light | Heavy | Light |
| 생시체중 | **1.75** | **1.31** | 1.53 | 1.53 |
| 이유체중 | 7.56 | 6.71 | **7.41** | **6.87** |
| 출하체중 | 125.4 | 124.1 | 124.8 | 124.8 |
| ADG | 0.877 | 0.844 | 0.859 | 0.862 |
| ADFI | 2.08 | 2.04 | 2.06 | 2.06 |
| **FCR** | **2.37** | **2.42** | **2.40** | **2.39** |

# FCR의 이해와 사료효율 개선 방안

# FCR이란?



**종합적인 농장관리 수준 지표**

$$\text{FCR} = \frac{\text{사료량}}{\text{증체량}}$$

3.5

3.0

2.8

2.6

효율성

경제성

Kg당 생산비

# FCR Inside



배합비, 사료,
돼지의 단계
위생, 스트레스

체중, 암수, 품종,
위생, 돈사, 온도...
급여수준

$$FCR = \frac{[\text{ Energy }]_{\text{사료}} \times FI - \text{유지 요구량}}{[\text{ Energy }]_{\text{성장}} \times FI}$$

등지방, 일령, 암수, 품종
영양소 균형 (AA/NE)

급여제한, 일령, 암수, 품종
온도, 물, 돈사, 위생, 배합비

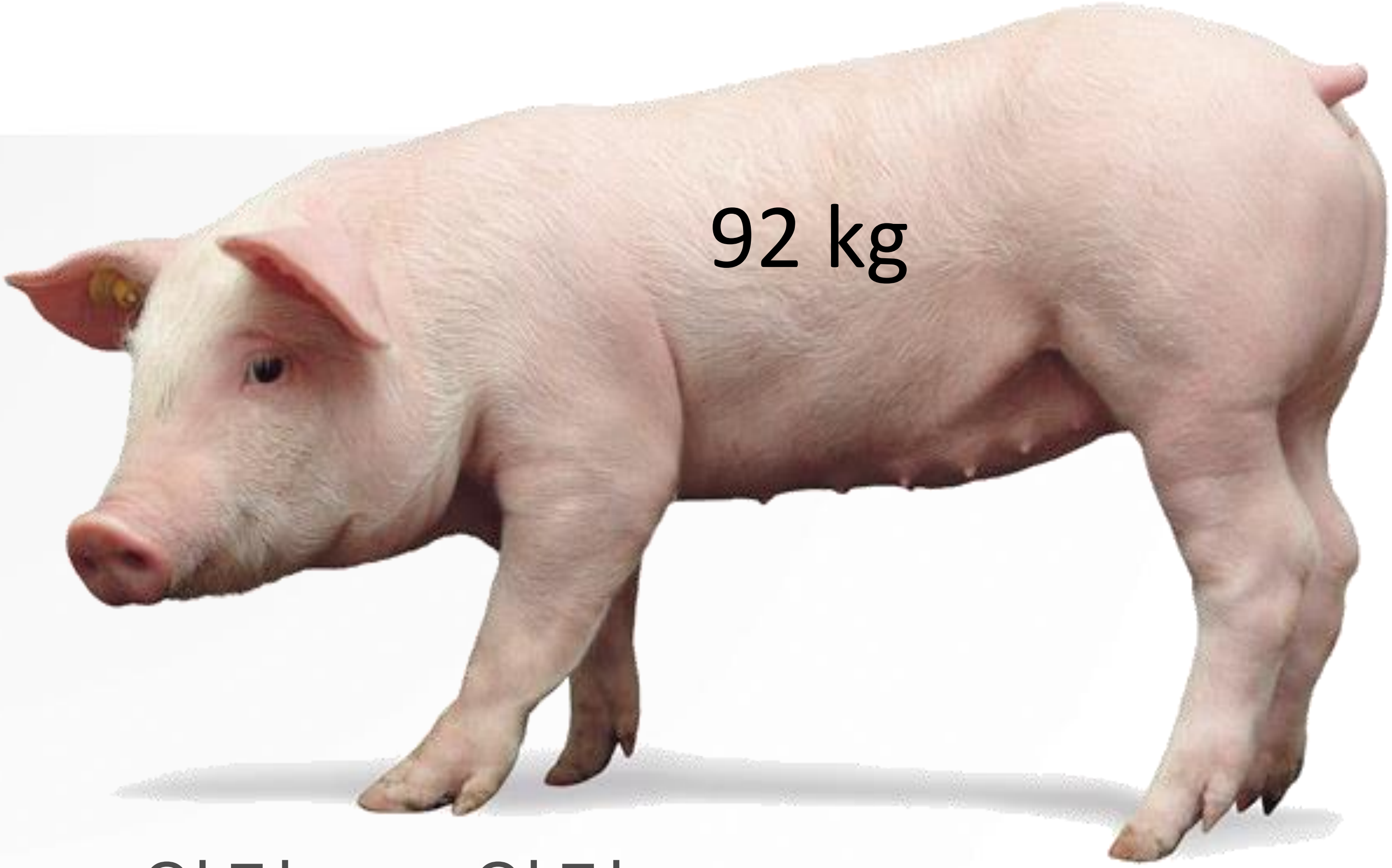
# FCR 측정 방식의 다양성



섬유소의 함량이 높아지는 경우, 도체중에 영향

- 도체중 FCR은 의미있는 분석

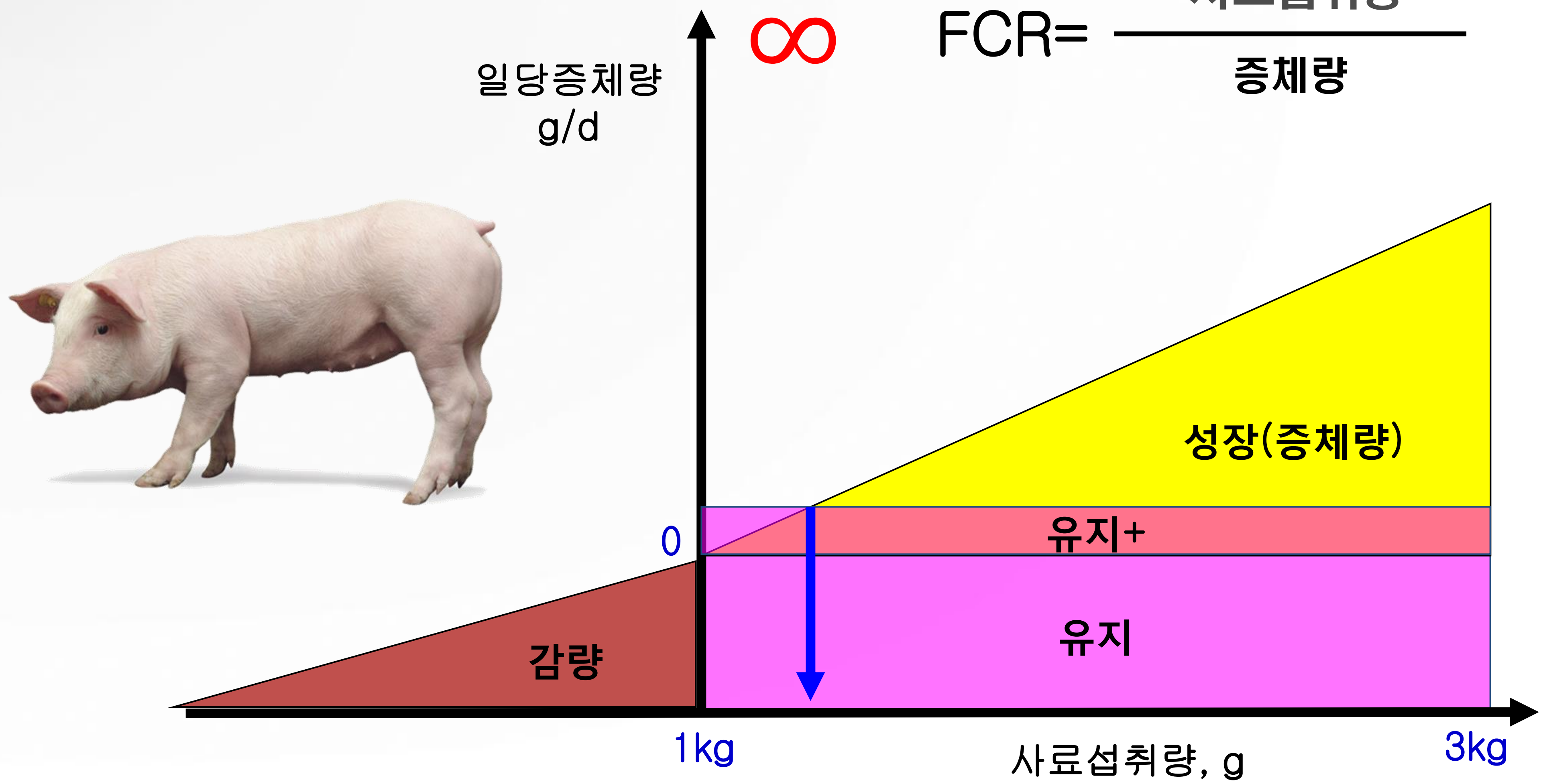
| | DDGS, % | | |
|---|---|---|---|
| | **0** | **15** | **30** |
| **개시체중** | 5.86 | 5.86 | 5.81 |
| **종료체중** | 123.6 | 123.7 | 124.2 |
| **도체육** | 94.1 | 93.5 | 93 |
| **G:F** | 0.378 | 0.373 | 0.37 |
| **FCR** | **2.64** | **2.68** | **2.70** |
| **도체중 G:F** | 0.291 | 0.285 | 0.28 |
| **도체중 FCR** | **3.44** | **3.51** | **3.57** |




- 일령: 140일령
- 사료섭취량:1.05kg/일
- 예상 출하일령은?
- 175일령 예상 체중?

# 사료섭취량과 FCR

$$FCR = \frac{사료섭취량}{증체량}$$



# 종돈 개량에 따른 FCR 개선

**1972**

**266 kg**

**30-100kg**

**FCR: 3.80**

**1.48**

**-104kg**

**2010**

**162 kg**

**FCR: 2.32**

# Genetic Potential

FIRE Feeder를 이용한 30~100kg까지의 개체별 사료요구율과 일당증체량 성적

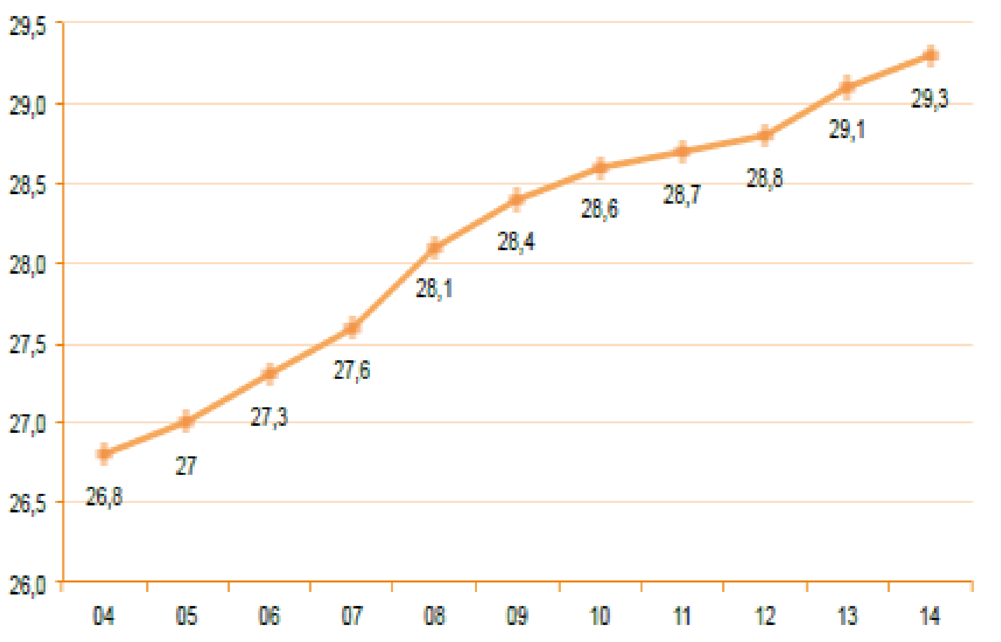
| | | FCR* | | ADG*(kg) | |
|---|---|---|---|---|---|
| Line | N | Average | Top 10% | Average | Top 10% |
| L15 | 2,783 | 2.06 | 1.71 | 0.970 | 1.179 |
| L27 | 3,765 | 1.93 | 1.58 | 0.957 | 1.152 |
| L65 | 3,598 | 1.89 | 1.57 | 1.007 | 1.207 |

PIC 웅돈의 생산성적 *2012년 10월 ~ 2013년 9월*

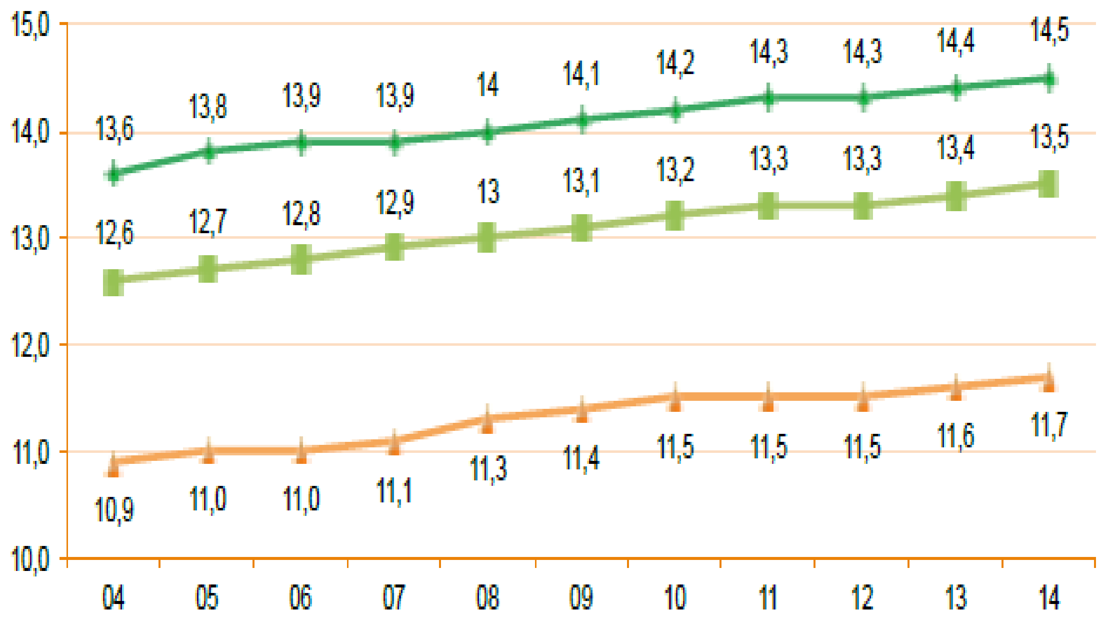
# 지속적인 성적 개선 (프랑스 양돈)

'천하제일, 새로운 50년'

Piglets weaned per sows per year (PSY)



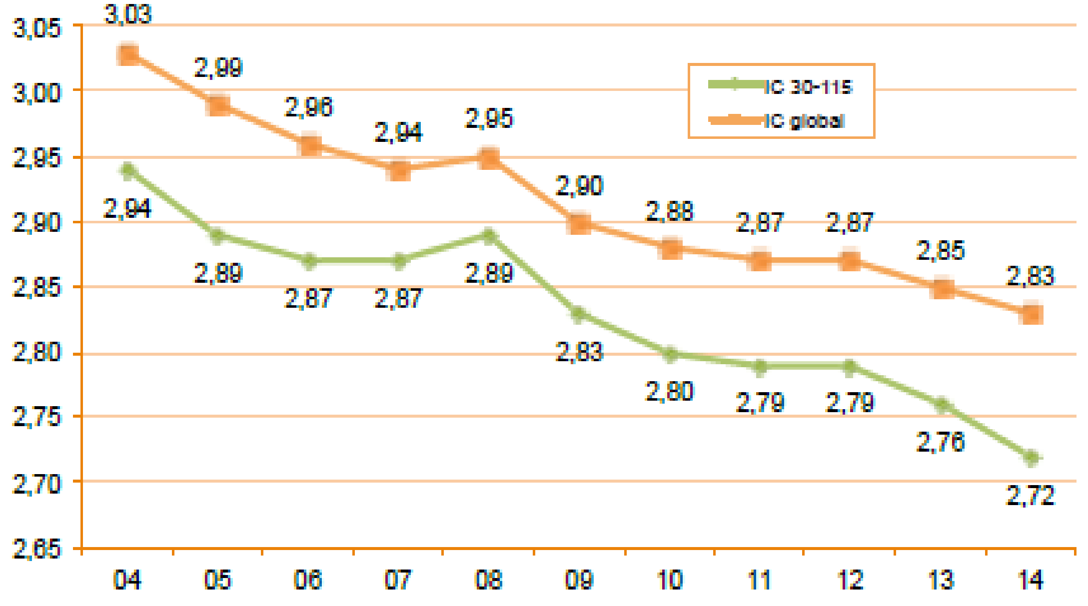

총산자수, 생존산자수, 이유두수



# 지속적인 성적 개선 (프랑스 양돈)

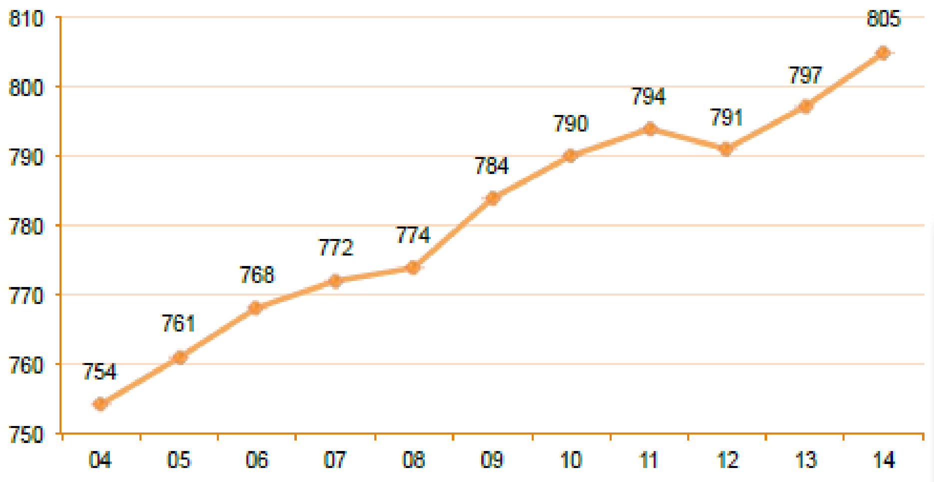
'천하제일, 새로운 50년'

## 총 FCR & 30-115 kg FCR



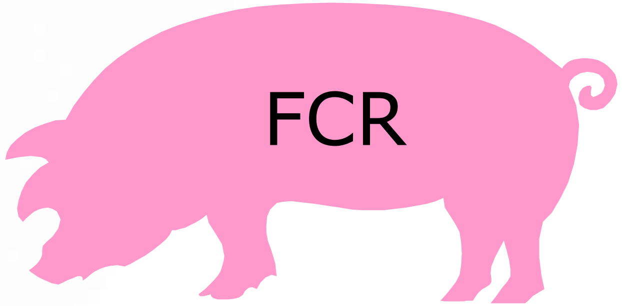

| Brittany figure of 2014 | Average | Top 10% |
|---|---|---|
| Pigs sold / sow/year | 22.8 | 25.5 |
| **농장 FCR** | **2.83** | **2.71** |
| **FCR 8-30kg** | **1.68** | **1.67** |
| ADG8-30 kg | 474 | 473 |
| **FCR 30-115 kg** | **2.72** | **2.65** |
| ADG 30-115kg | 805 | 811 |
| Mortality rate 8-115 kg | 6.2 | 4.7 |

## ADG 30 ~ 115 kg

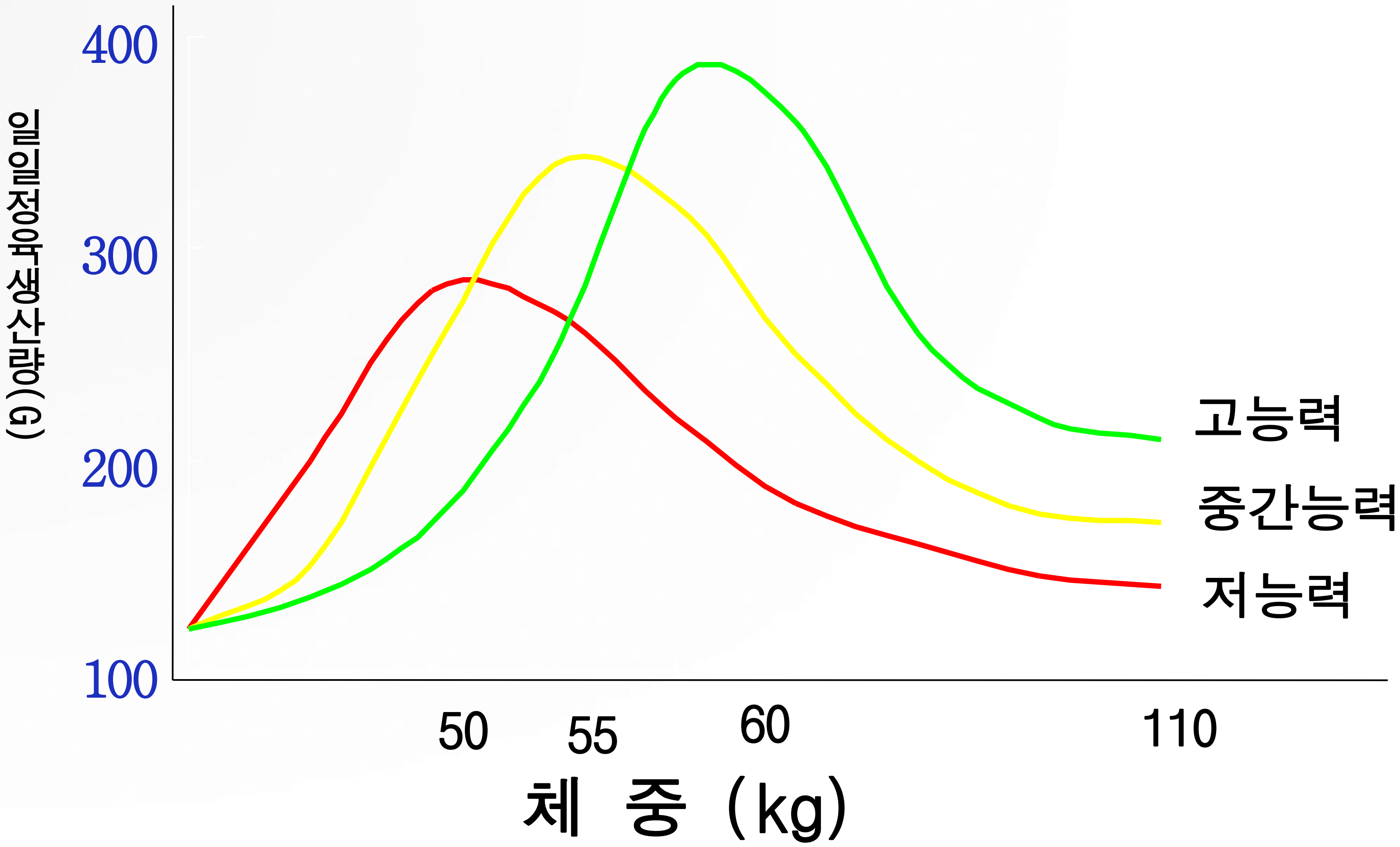


# FCR에 영향을 미치는 요인

- 품종 (유전력)
- 사료/영양
- 환경
- 돼지 관리
- 건강
- 질병/면역상태
- 사양기술

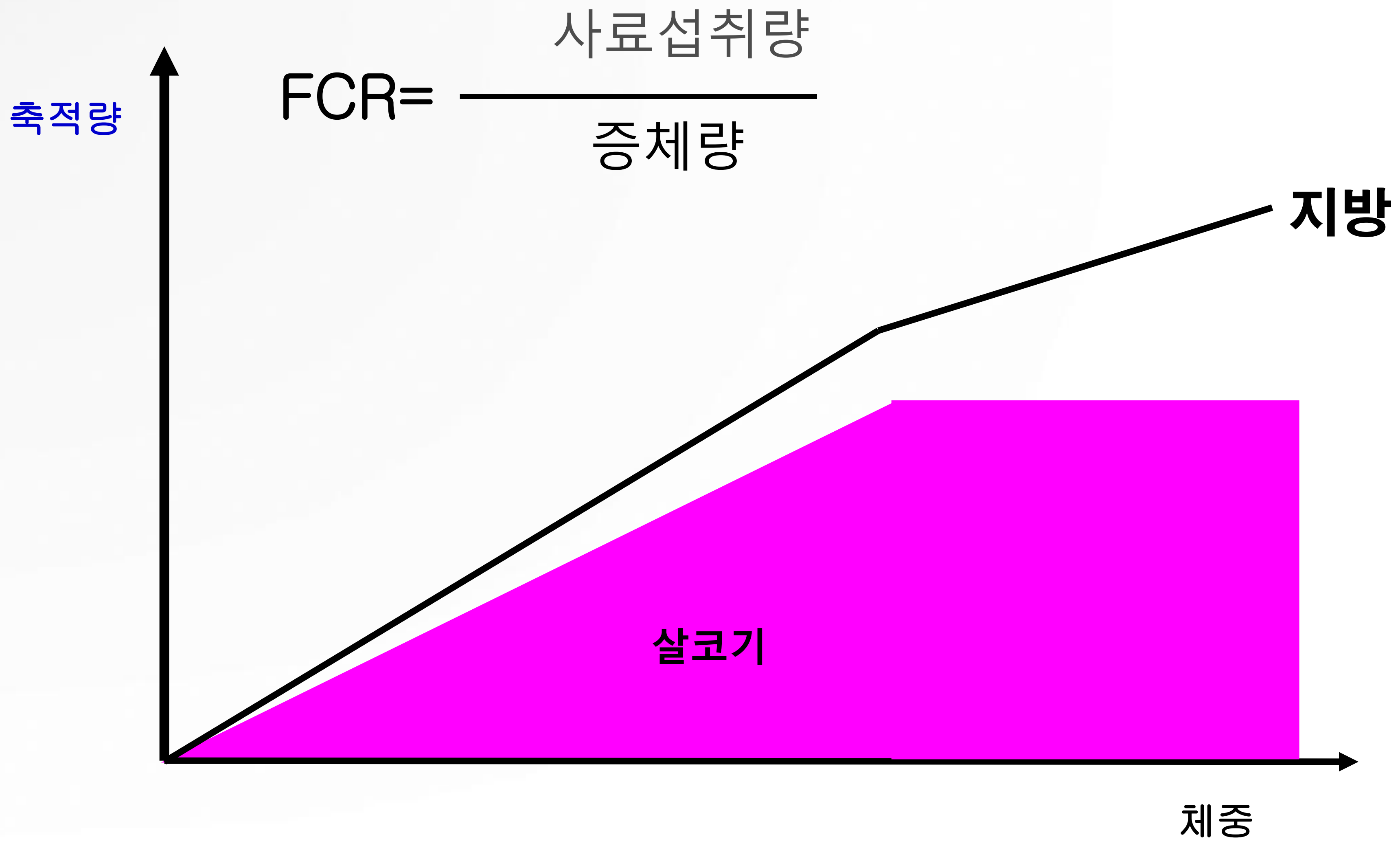


# 유전적 능력에 따른 정육 축적



# 성장단계별 FCR





# 살코기와 지방 축적 효율 차이

'천하제일,새로운 50년'

➢ 살코기 (Lean Tissue)

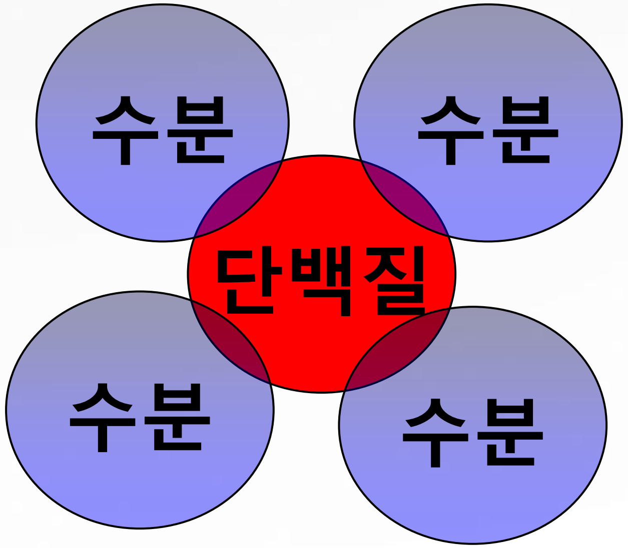
✓ **단백질 (20%) + 수분 (80%)**

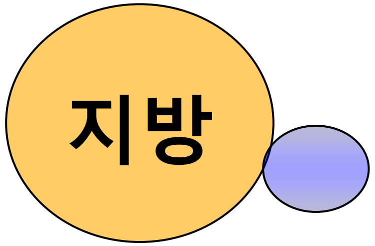
✓ 축적에 필요한 에너지= **11.5 Kcal/g**

➢ 지방조직 (Adipose Tissue)

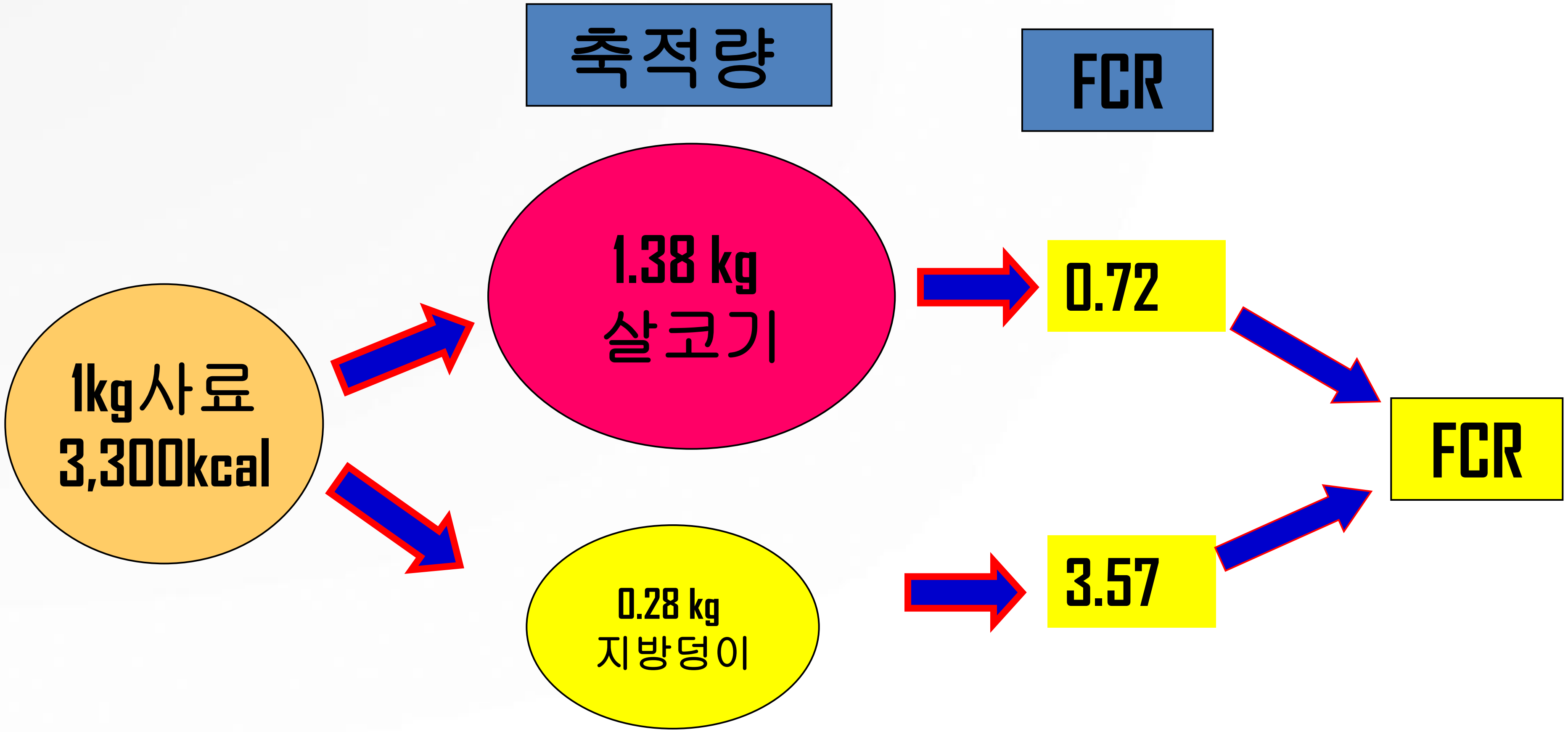
✓ **지방 (90%) + 수분 (10%)**

✓ 축적에 필요한 에너지= **12.8 kcal/g**



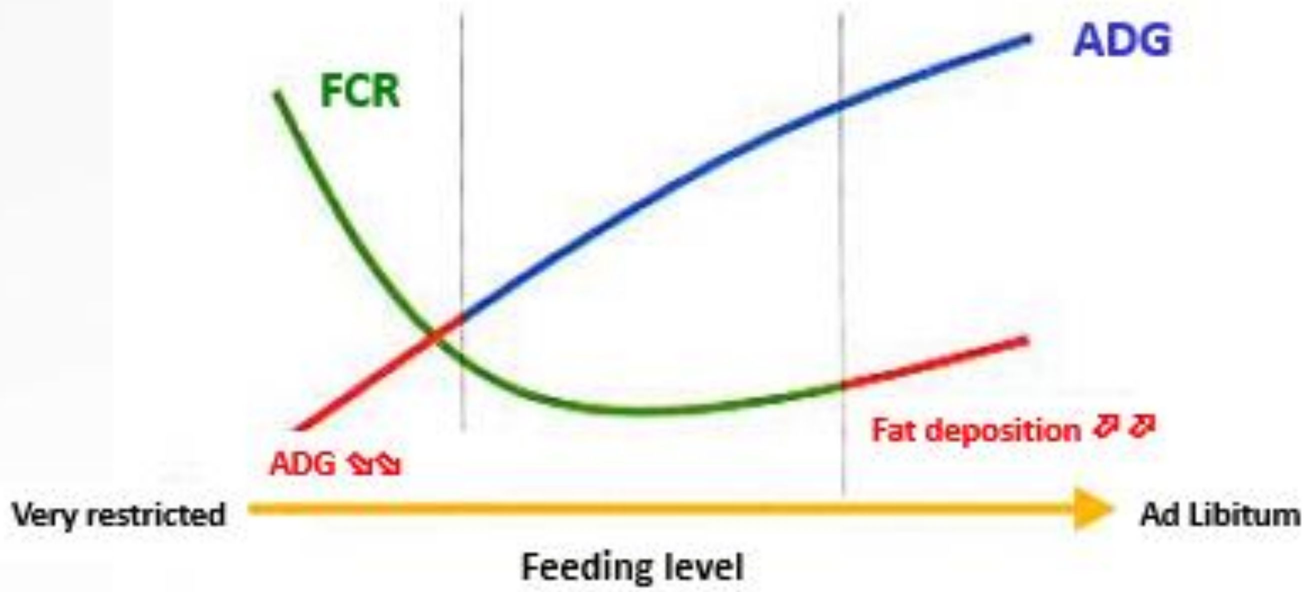



# 체조성별 축적을 위한 사료효율



# 수익성 향상을 위한 3가지 선택 기준

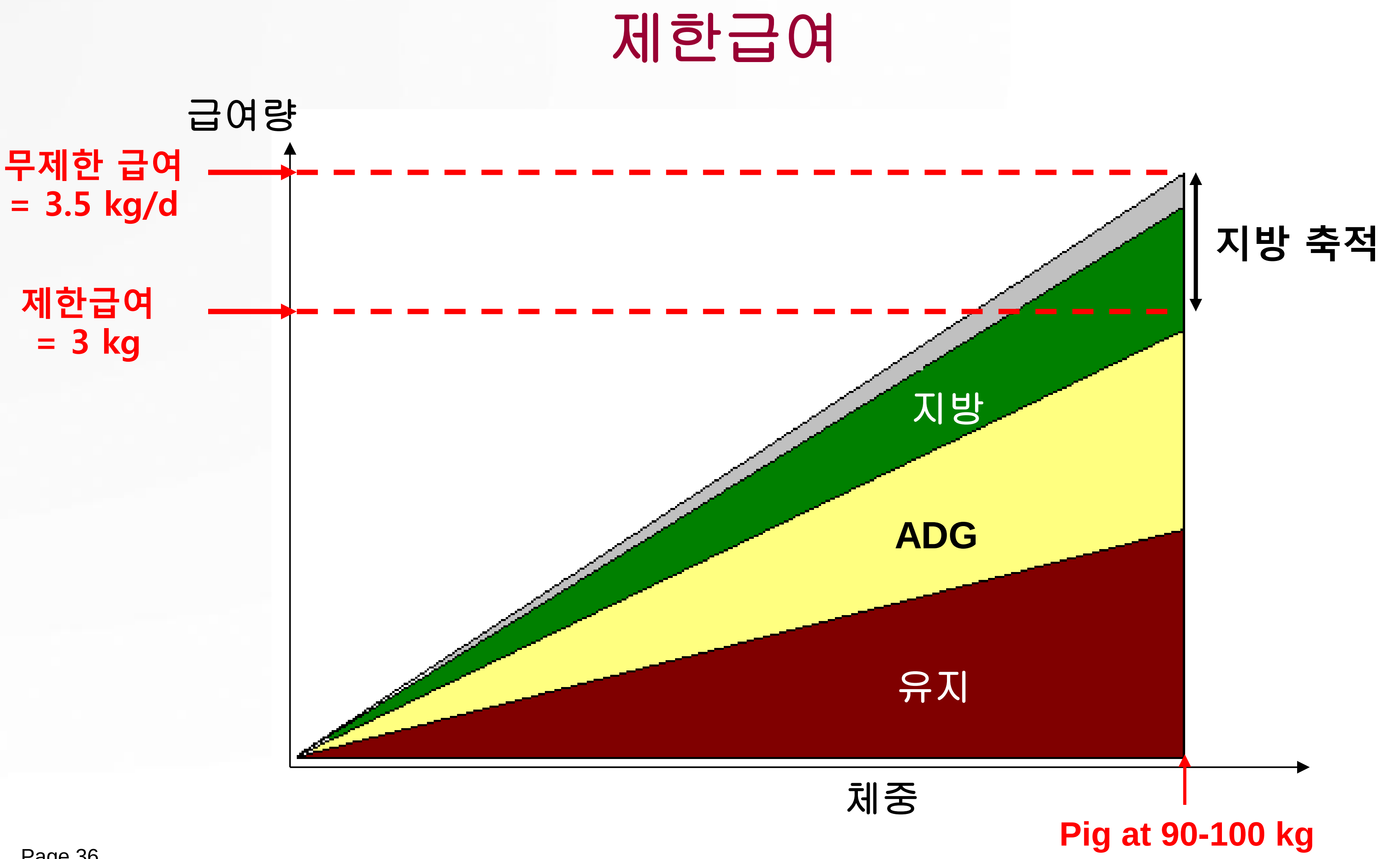
- ADG & 출하체중 & FCR




➔ **Optimum 선택 for ADG, FCR**

# 체조성 변화에 따른 급여량 조절

'천하제일, 새로운 50년'

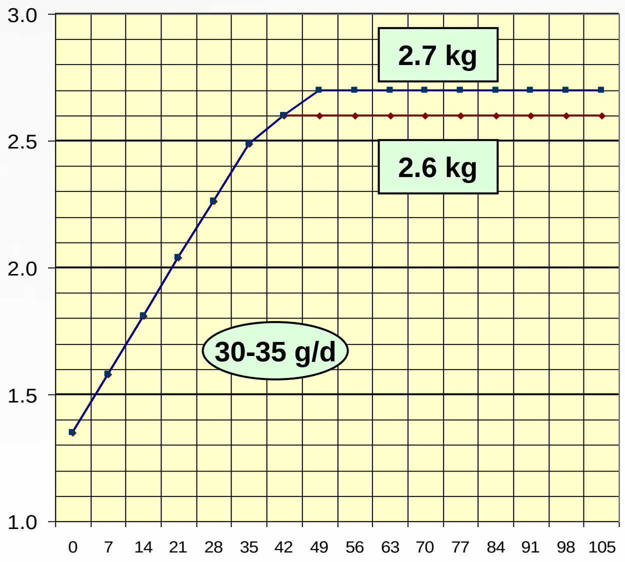


# 목적에 따른 급여 프로그램 설정



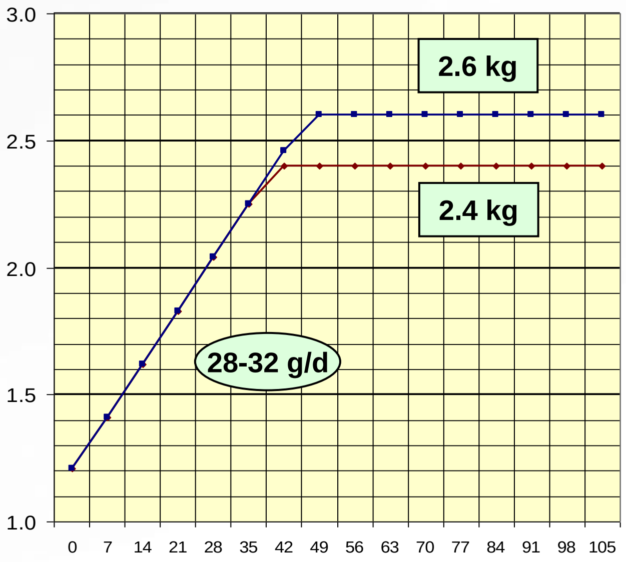
## ADG improvement

D 0 = Entry weight x 45 g/d
Daily increasing = 30-35 g/d
Maxi / males = 2.6 kg
Maxi / females = 2.7 kg



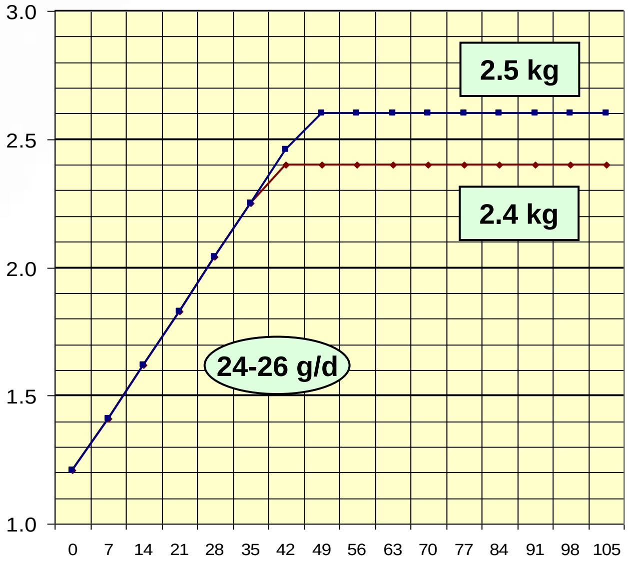

## FCR control

D 0 = Entry weight x 40 g/d
Daily increasing = 28-32 g/d
Maxi / males = 2.4 kg
Maxi / females = 2.6 kg



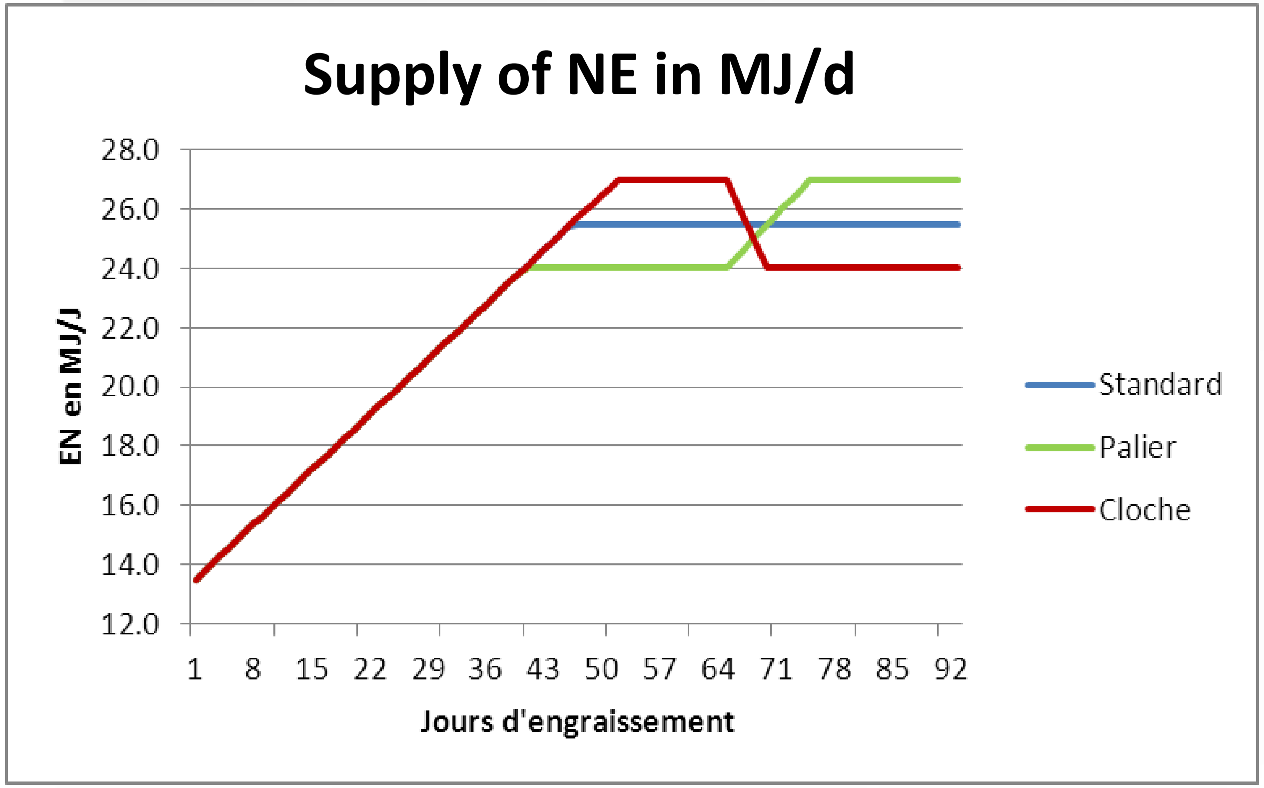

## Muscle % improvement

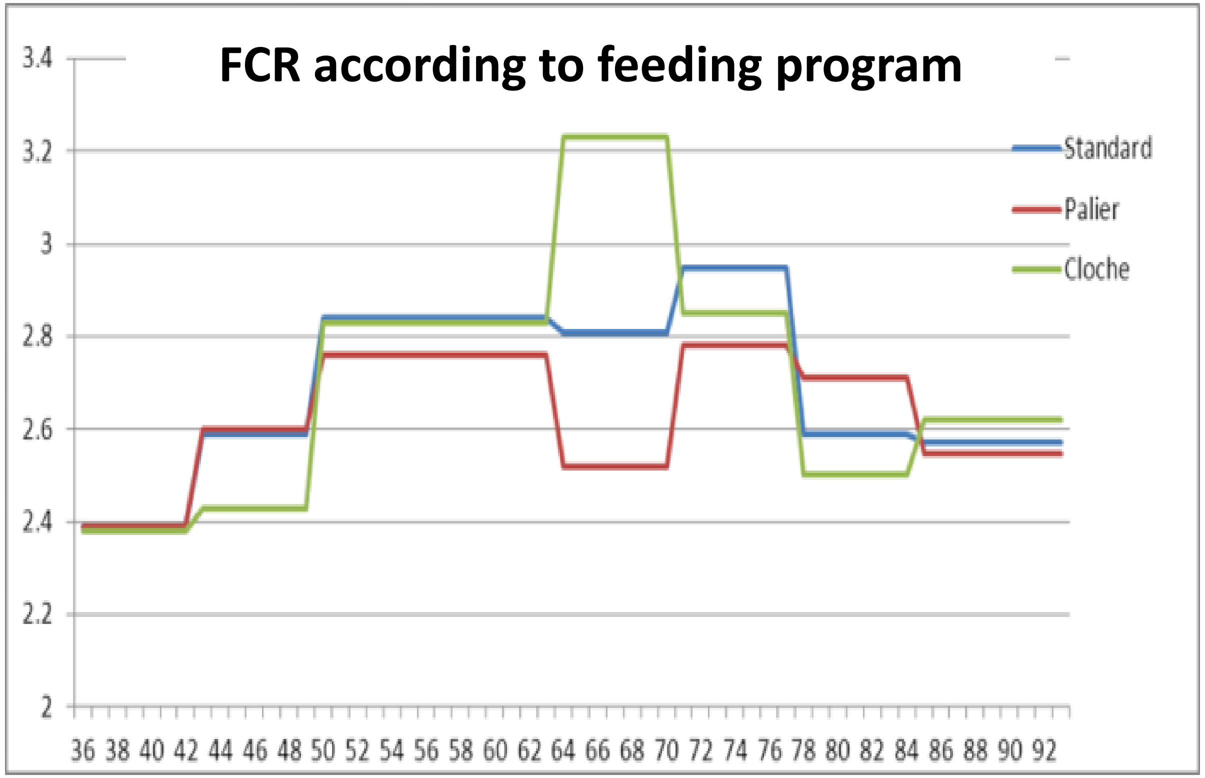
D 0 = Entry weight x 40 g/d
Daily increasing = 24-26 g/d
Maxi / males = 2.4 kg
Maxi / females = 2.5 kg



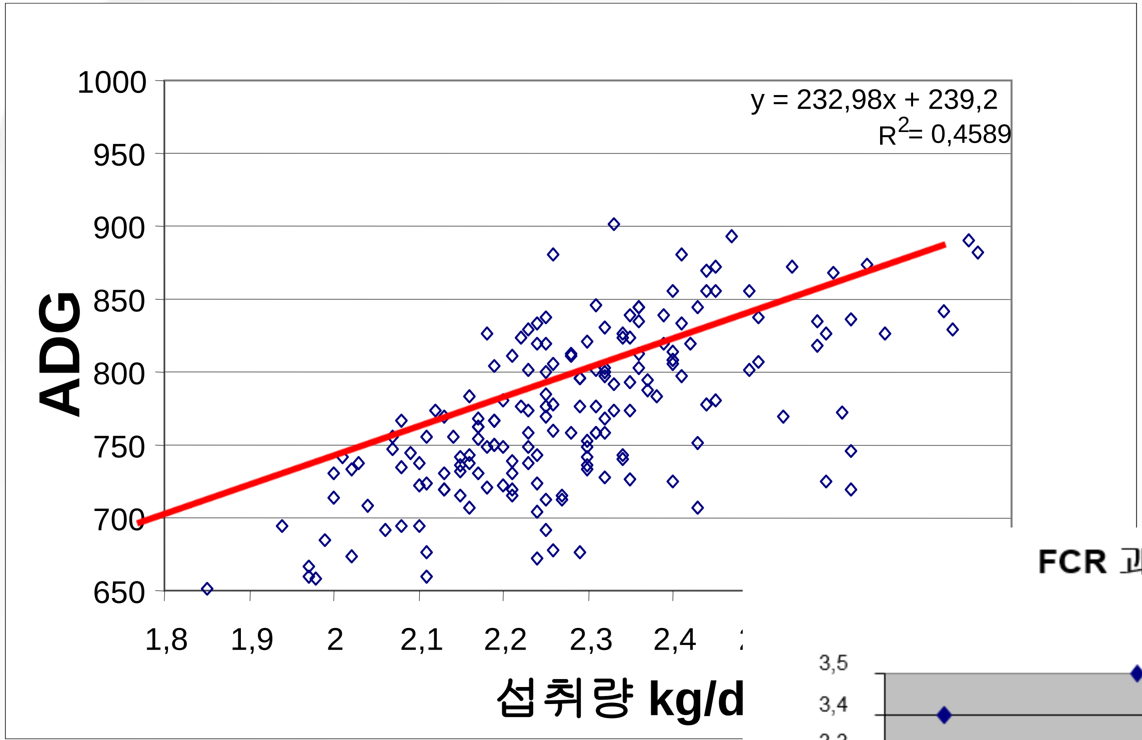
# Feeding curves 비교 연구

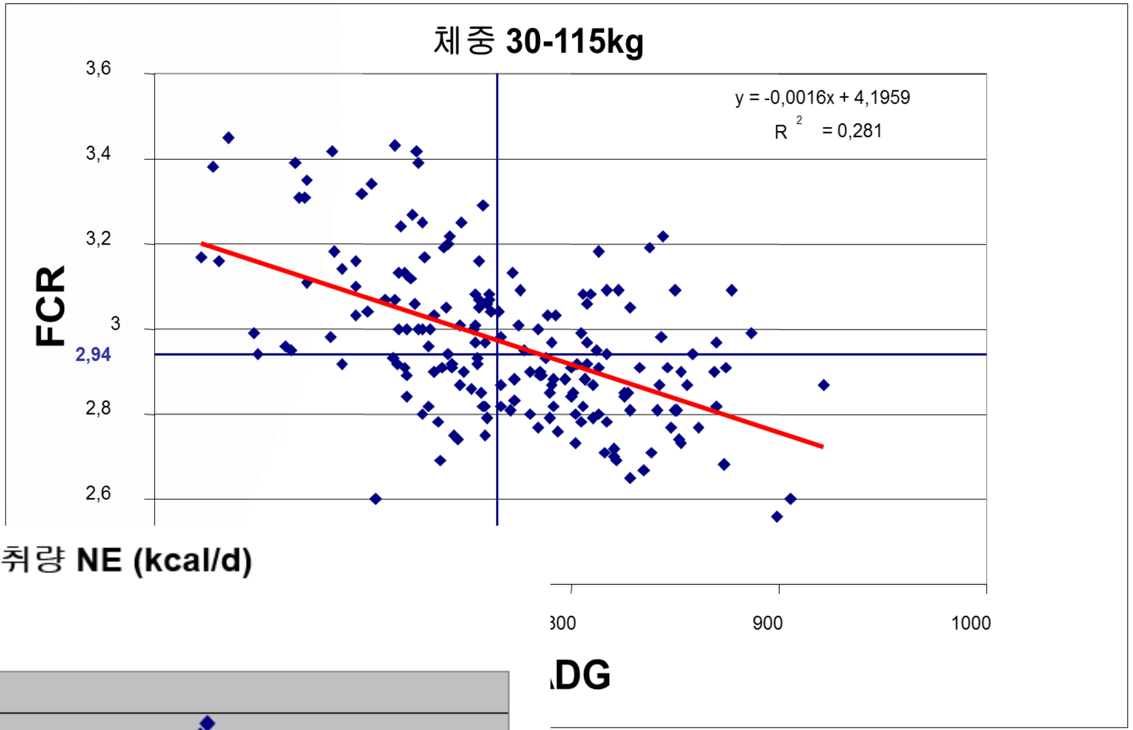


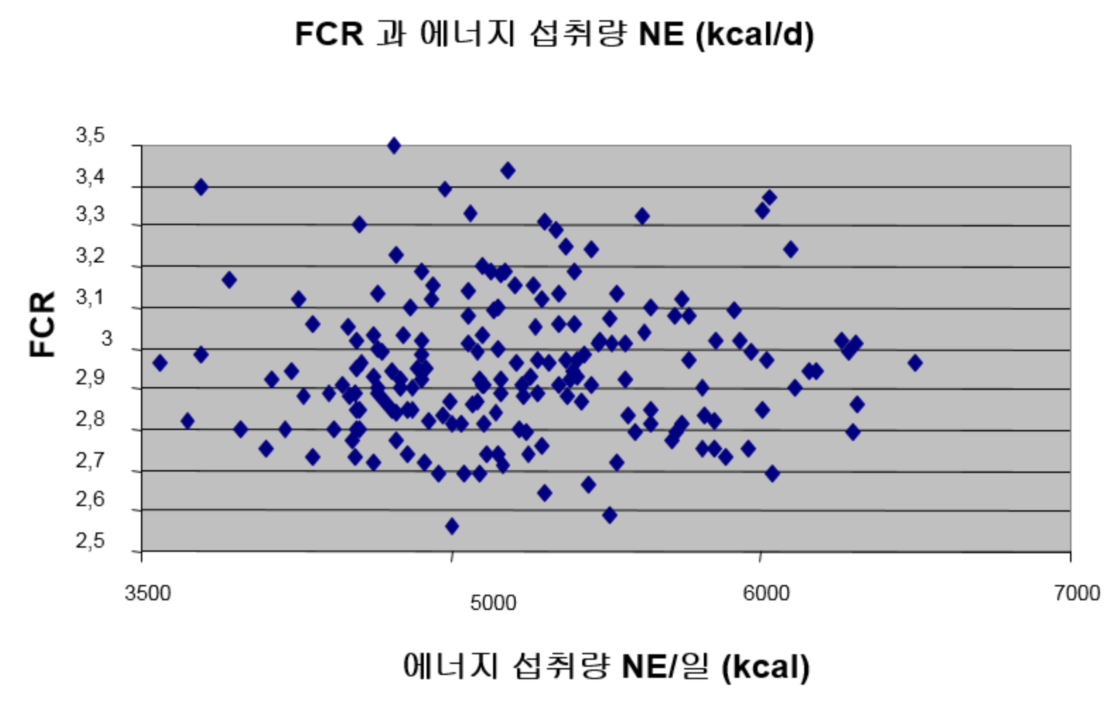


# FCR은 사료 외적인 요인도 큼



# 사료효율 개선을 위한 사양관리

# 철저한 소독



➢ 수세로 99% 박테리아 제거 가능

1) 유기물 제거→ 90% 박테리아 제거

2) 소독제 사용→ 6-7% 제거

3) 훈증소독(Fumigate)→ 1-2% 제거

- 건조가 중요

PRRS: 11일간 생존가능 in Water

건조시: 사멸

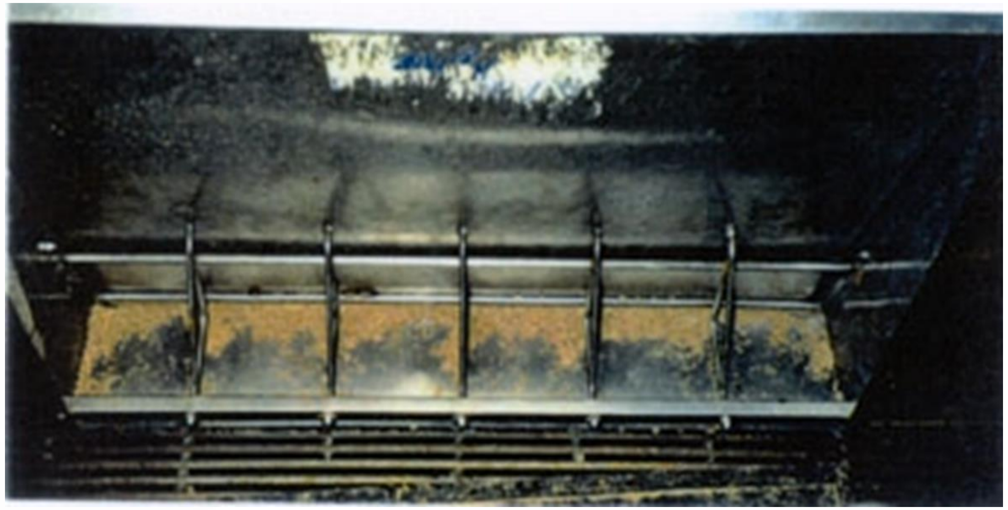
# 돈방 수세 효과

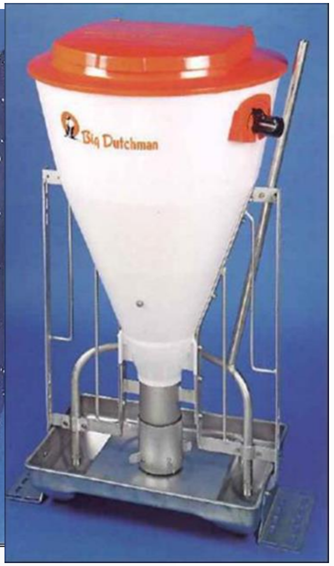
| 출하체중,kg | All-in All-out + 수세소독 | Continuous | All-in All-out; Not Cleaned |
|---|---|---|---|
| **ADG** | 658 | 610 | 619 |
| 공기중 분진 **($mg/m^3$)** | 1.80 | 2.51 | 2.31 |
| 호흡성 분진 **($mg/m^3$)** | .201 | .290 | .265 |
| **Bacteria** **($CFU \times 10^3/m^3$)** | 132 | 201 | 177 |
| **Bacteria (그람양성)** **($CFU \times 10^3/m^3$)** | 82 | 122 | 109 |

# 적정한 급이기는 관리



## 사료허실 : 10-15% 방지


W-TKKR



2005 9 14


2005 9 14


2005 9 14


2005 9 14


2005 9 14


2005 9 14


2005 9 14

Pellet coverage

Meal coverage

# 급이기 조절에 따른 FCR 차이

'천하제일, 새로운 50년'

| Reference | 구간 | 급이기 | 급이기 바닥 % | | 유의적 차이 | FCR 개선, % |
|---|---|---|---|---|---|---|
| | | | 최소 | 최대 | | |
| Smith et al., 2004 | 자돈 | 건식 | 6 | 93 | ADG, ADFI | **2.1** |
| Duttlinger et al., 2008 | 비육 | 건식 | 26 | 79 | - | **3.1** |
| Duttlinger et al., 2009 | 비육 | 건식 | 24 | 78 | ADG | **2.6** |
| Bergstrom, 2011 Exp.1 | 육성 | 건식 | 9 | 79 | ADFI | **2.2** |
| Bergstrom, 2011 Exp.1 | 육성 | 건/습식 | 35 | 65 | ADG, ADFI | **-1.6** |
| Bergstrom, 2011 Exp.2 | 비육 | 건식 | 25 | 83 | - | **0.0** |
| Bergstrom, 2011 Exp.2 | 비육 | 건/습식 | 53 | 82 | ADG, ADFI | **5.7** |
| Bergstrom, 2011 Exp.3 | 비육 | 건/습식 | 63 | 83 | ADG, ADFI | **0.4** |
| Myers et al., 2010 | 비육 | 건식 | 28 | 75 | ADFI, F:G | **3.9** |
| Myers et al., 2010 | 비육 | 건식 | 43 | 87 | ADFI, F:G | **4.9** |
| **Average** | | | | | | **2.9** |

자돈: 6구 건식급이기, 9.2-31.5mm 급이구 높이 조절, 크럼블 사료

# 출하체중에 따른 FCR 차이?

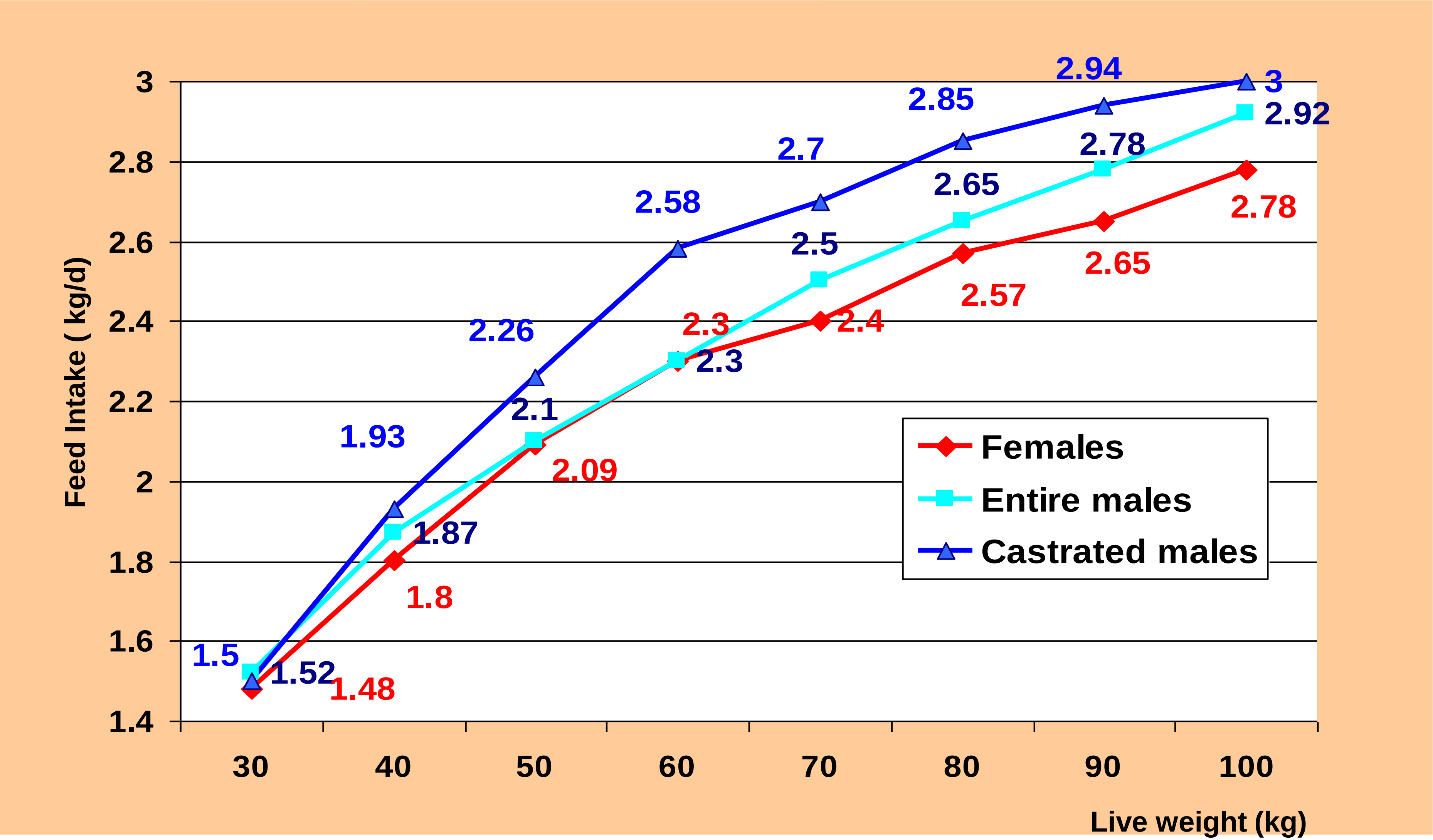
| 출하체중,kg | 116 | 124 | 133 |
|---|---|---|---|
| 개시체중 | 74.9 | 74.7 | 74.8 |
| ADG | 843 | 788 | 769 |
| ADFI | 2.69 | 2.56 | 2.68 |
| FCR | 3.19 | 3.24 | 3.48 |

# 선별출하 따른 FCR 차이?

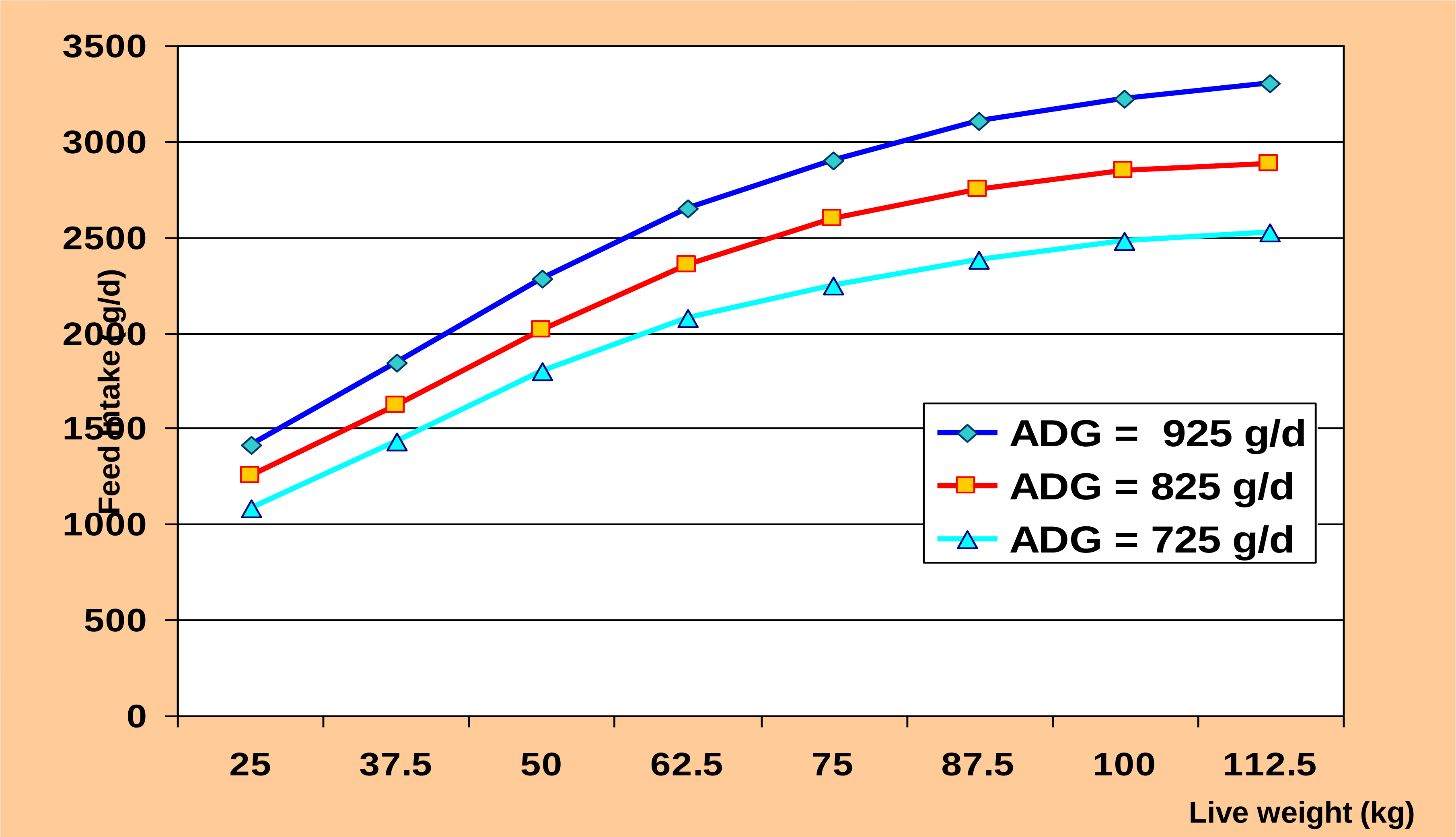
'천하제일, 새로운 50년'

| 두수 | 52 | 52 | 52 |
|---|---|---|---|
| 조기출하두수 | 0 | 13 (25%) | 26 (50%) |
| 개시체중 | 113.0 | 113.7 | 113.3 |
| 출하후 체중 | 113.0 | 110.5 | 105.8 |
| 종료체중 | 126.0 | 126.5 | 122.2 |
| **ADG** | **659** | **829** | **834** |
| **FCR** | **4.24** | **3.76** | **3.63** |
| 돈방당 출하체중,kg | **6,536** | **6,566** | **6,334** |
| 사료량 차이/돈방 | - | -401 | -1,244 |
| 사료량차이/두 | **-** | **-7.7** | **-23.9** |
| 두당 사료비 차이 | | | |

# 암수에 따른 섭취량 차이


Feed Intake ( kg/d)
Live weight (kg)
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
30
40
50
60
70
80
90
100
Females
Entire males
Castrated males
1.5
1.52
1.48
1.93
1.87
1.8
2.26
2.1
2.09
2.58
2.3
2.3
2.7
2.5
2.4
2.85
2.65
2.57
2.94
2.78
2.65
3
2.92
2.78

# 증체량에 따른 사료섭취량

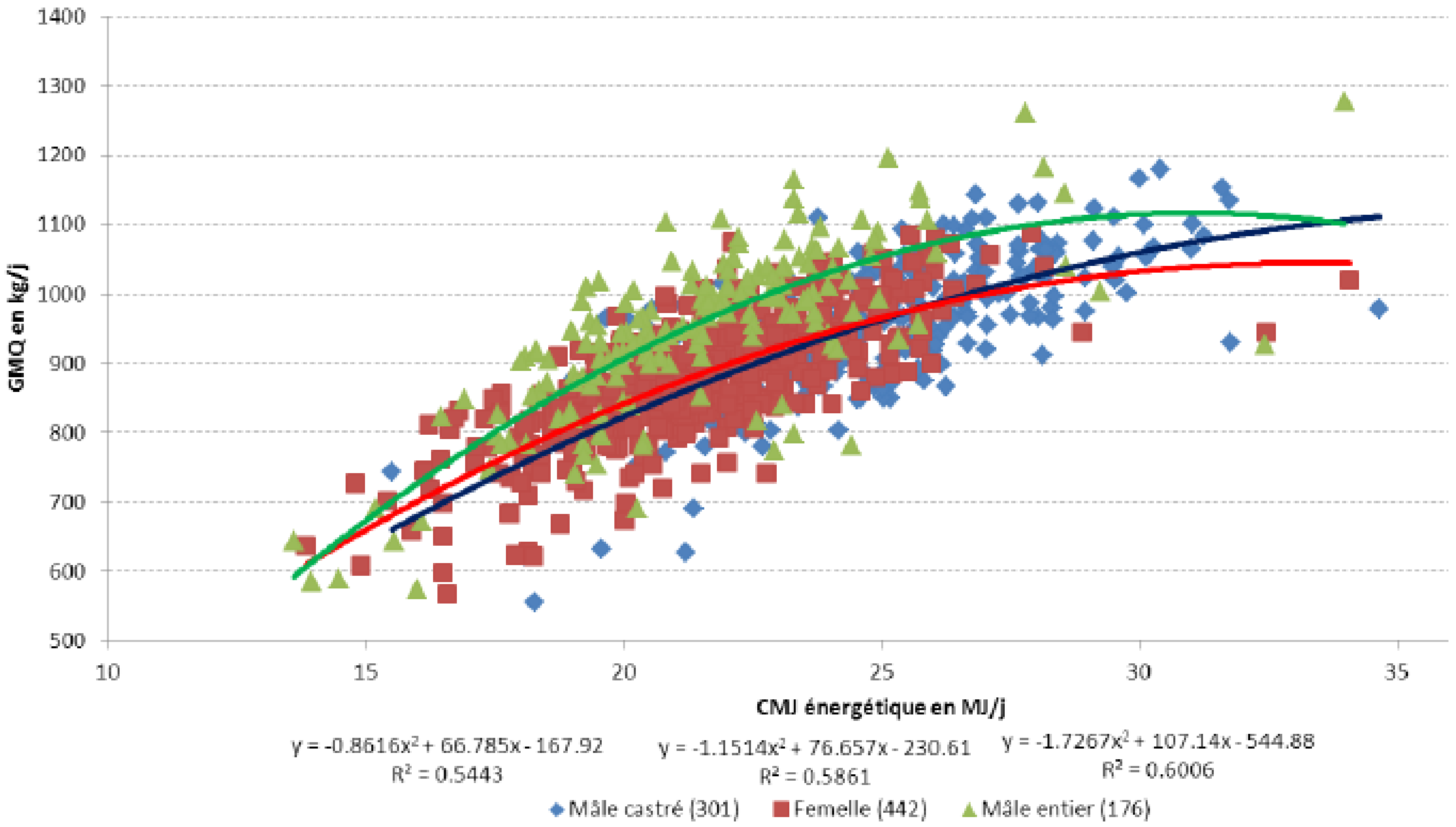



(mixed males and females)

# 암수에 따른 성장성 차이

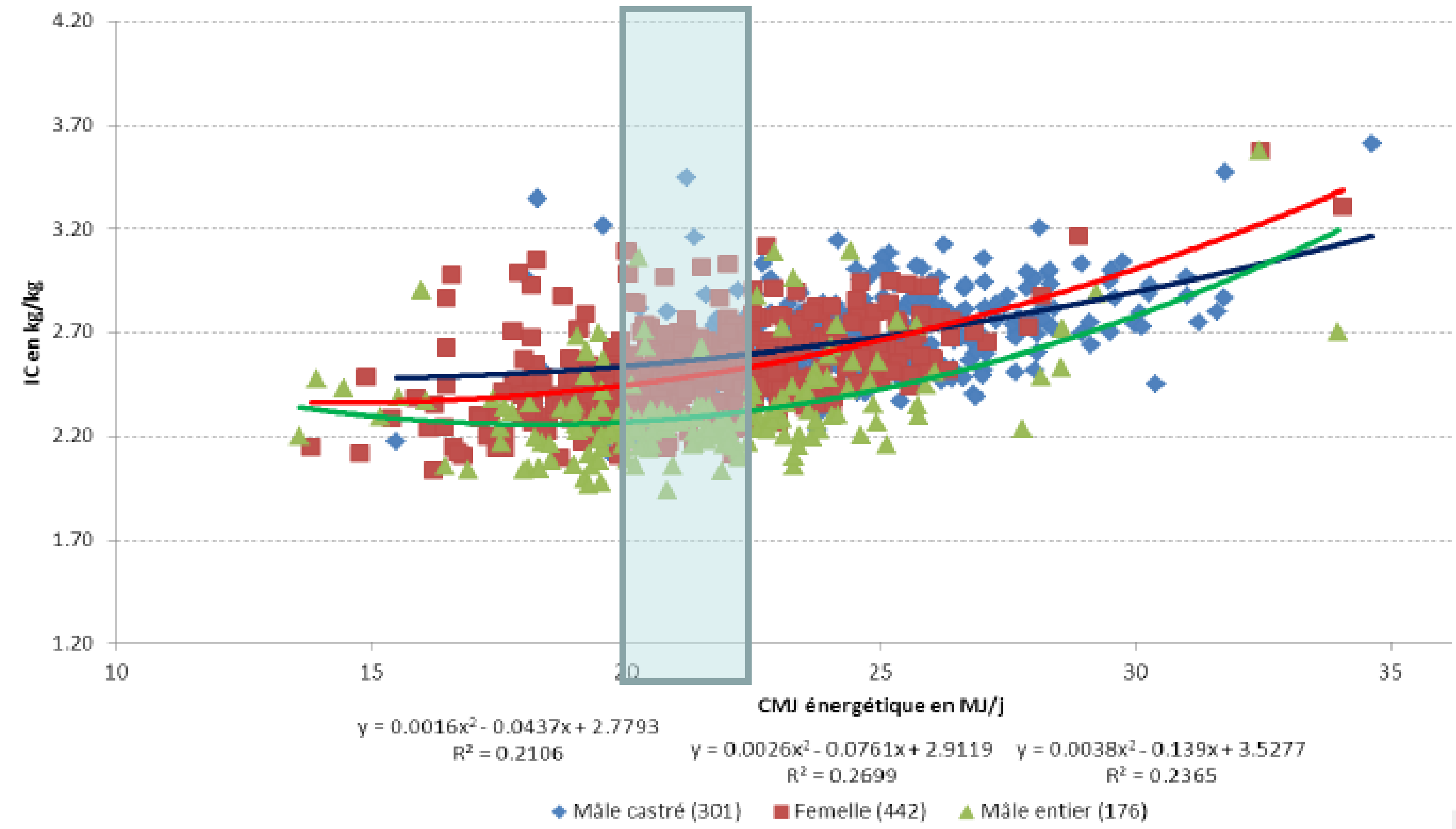
'천하제일, 새로운 50년'

➢ 에너지 섭취량에 따른 ADG



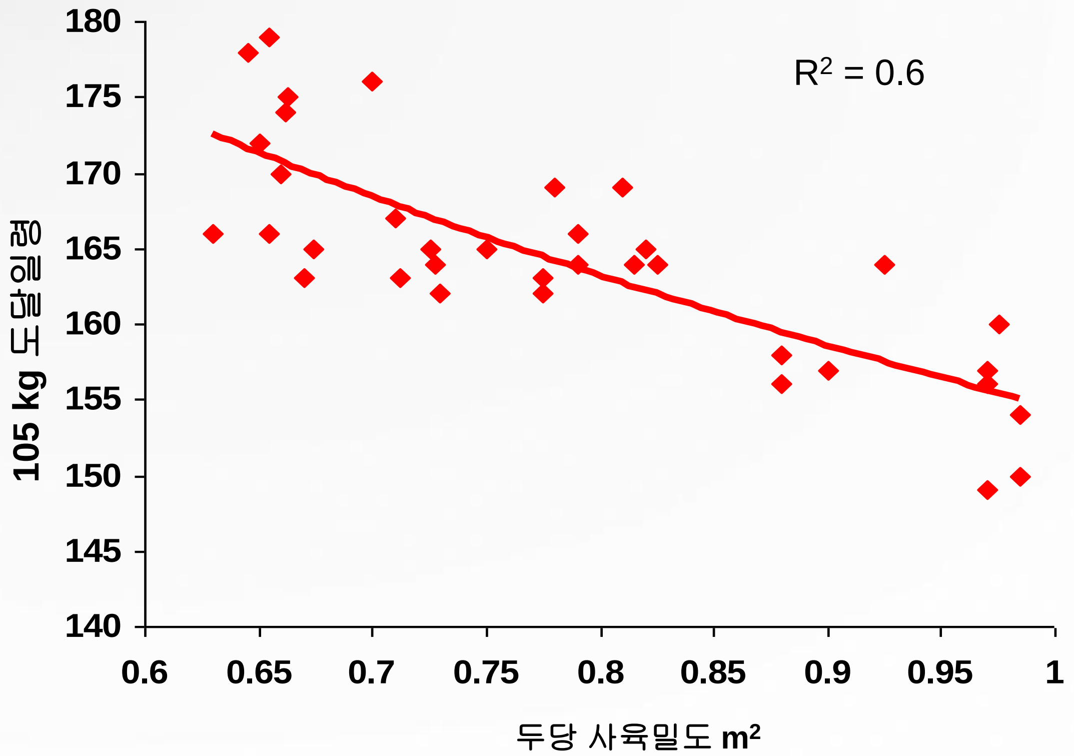
# 암수에 따른 FCR 차이

- 에너지 섭취량에 따른 FCR



# 사육밀도






| 두당 사육밀도( $m^2$) | 0.65 | 0.75 | 0.85 |
|---|---|---|---|
| 두수 | 200 | 173 | 153 |
| ADG (g/d) | 770 | 805 | 841 |
| FCR | 2,86 | 2.73 | 2.62 |
| 출하일령,일 | 178 | 174 | 170 |
| 출하체중, kg | 112 | 112 | 112 |

# 사육밀도와 온도관리에 따른 성장성 차이

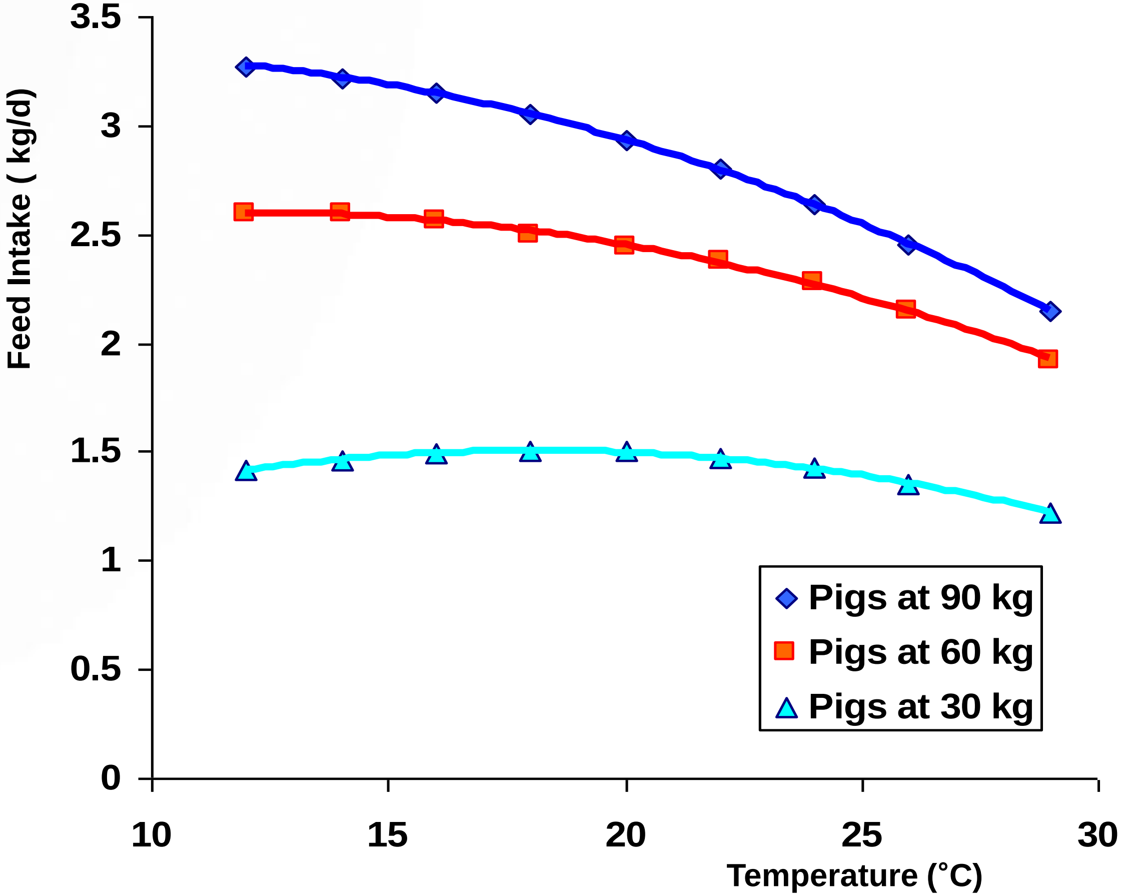


| | 1,024g/d | | | 802g/d | | |
|---|---|---|---|---|---|---|
| 온도 (°C) | 20 °C | | | 28 °C | | |
| 두당사육밀도($m^2$) | 0.66 | 0.84 | 1.02 | 0.66 | 0.84 | 1.02 |
| ADG (g/d) | 963 b | 1068 a | 1043 a | 787 b | 796 ab | 825 a |
| ADFI (g/d) | 2.51 | 2.63 | 2.67 | 2.02 | 2.03 | 2.1 |
| FCR | 2.57 | 2.46 | 2.60 | 2.58 | 2.58 | 2.51 |

# 돈사 온도가 섭취량에 미치는 영향

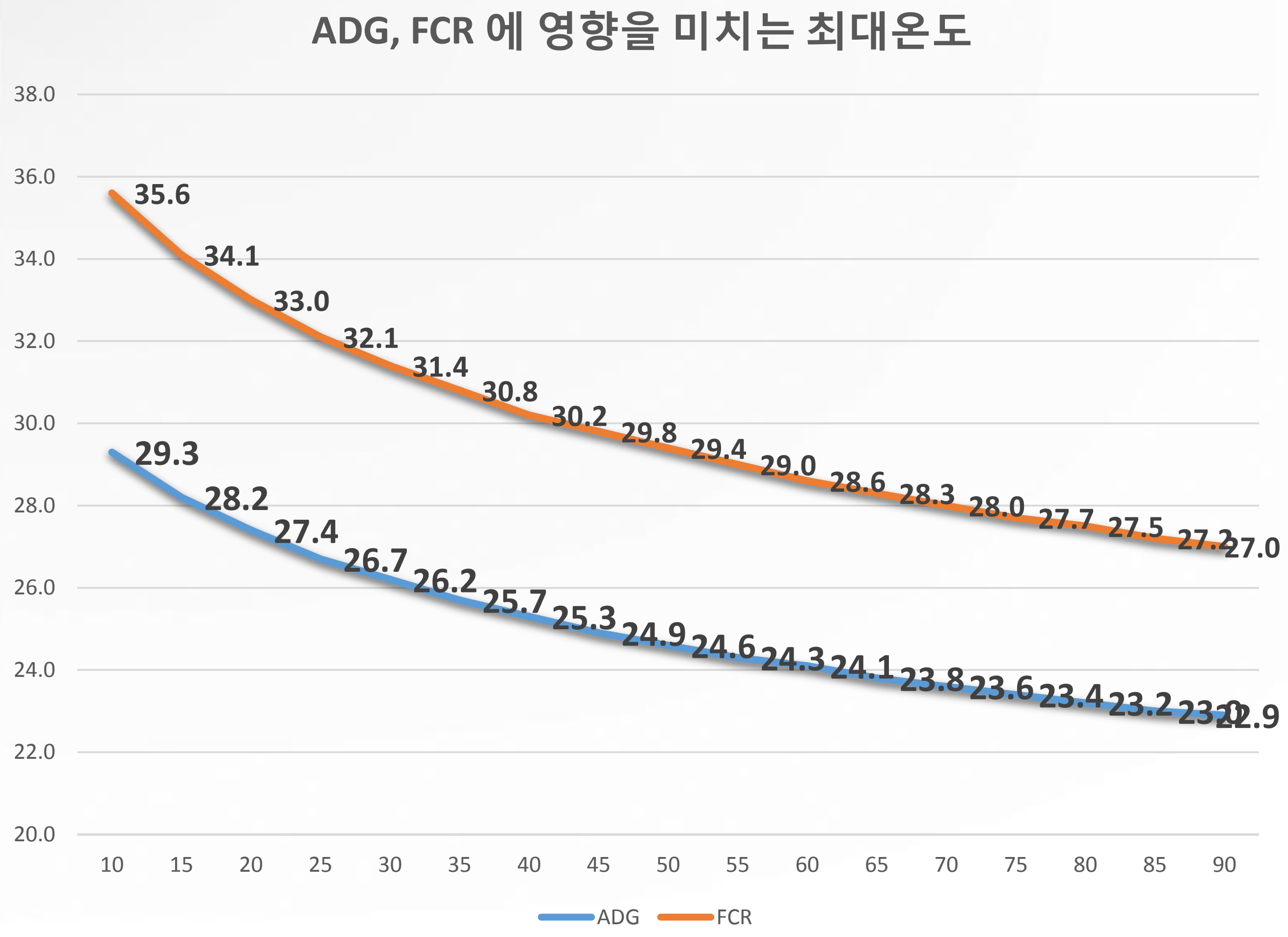


| 온도, °C | 17 | 20 | 24 | 28 | Statistical Test |
|---|---|---|---|---|---|
| 섭취량 (g/d), Exp 1 | 2,450 | 2,380 | 2,210 | 1,980 | $p < 0.001$ |
| 섭취량 (g/d), Exp 2 | 2,500 | 2,420 | 2,260 | 2,000 | $p < 0.001$ |



# 성장성에 영향을 미치는 온도






## 품종개량에 따른 차이?
## 더위 스트레스에 약한가?

50kg
(20°C→ 30°C)
~ 1990 : -12g/°C
~ 1999 : -18g/°C
~ 2009: -25g/°C

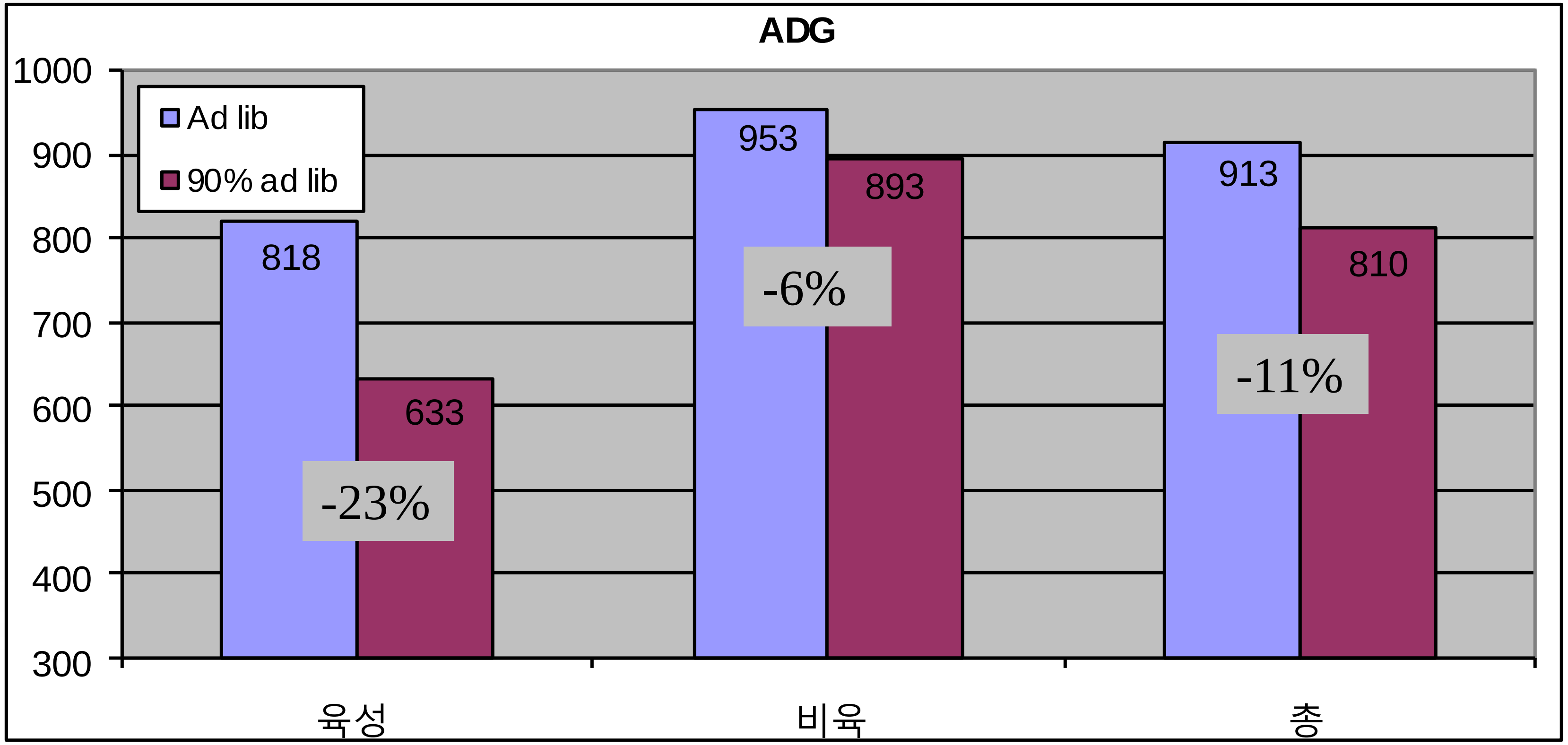
# 질병이 FCR과 출하일령에 미치는 영향

'천하제일, 새로운 50년'

| 질병이 성장과 FCR에 미치는 영향 | | | | |
|---|---|---|---|---|
| 질병 | 급성 | | 만성 | |
| | FCR | 90 kg 도달일령 | FCR | 90 kg 도달일령 |
| 흉막폐렴 | 0.1 - 0.4 | + 7 - 30 | 0.1 - 0.3 | + 4 - 15 |
| 위축성비염 | 0.1 - 0.2 | + 4 - 15 | 0.1 - 0.2 | + 4 - 15 |
| 만성호흡질병 | 0.1 - 0.4 | + 7 - 30 | 0.1 - 0.3 | + 7 - 28 |
| 유행성 폐렴 | 0.1 - 0.4 | + 10 - 21 | 0.05 - 0.1 | + 3 - 21 |
| 외부기생충 | 0.1 | + 7 - 18 | 0.1 | + 5 - 8 |
| 연쇄상구균 | 0.05 | + 1 - 3 | 0.05 | 0 |
| 돈적리 | 0.1 - 0.3 | + 5 - 20 | 0.3 | + 4 - 5 |
| TGE | 0.1 | + 4 - 10 | 0 - 0.15 | + 0 - 3 |

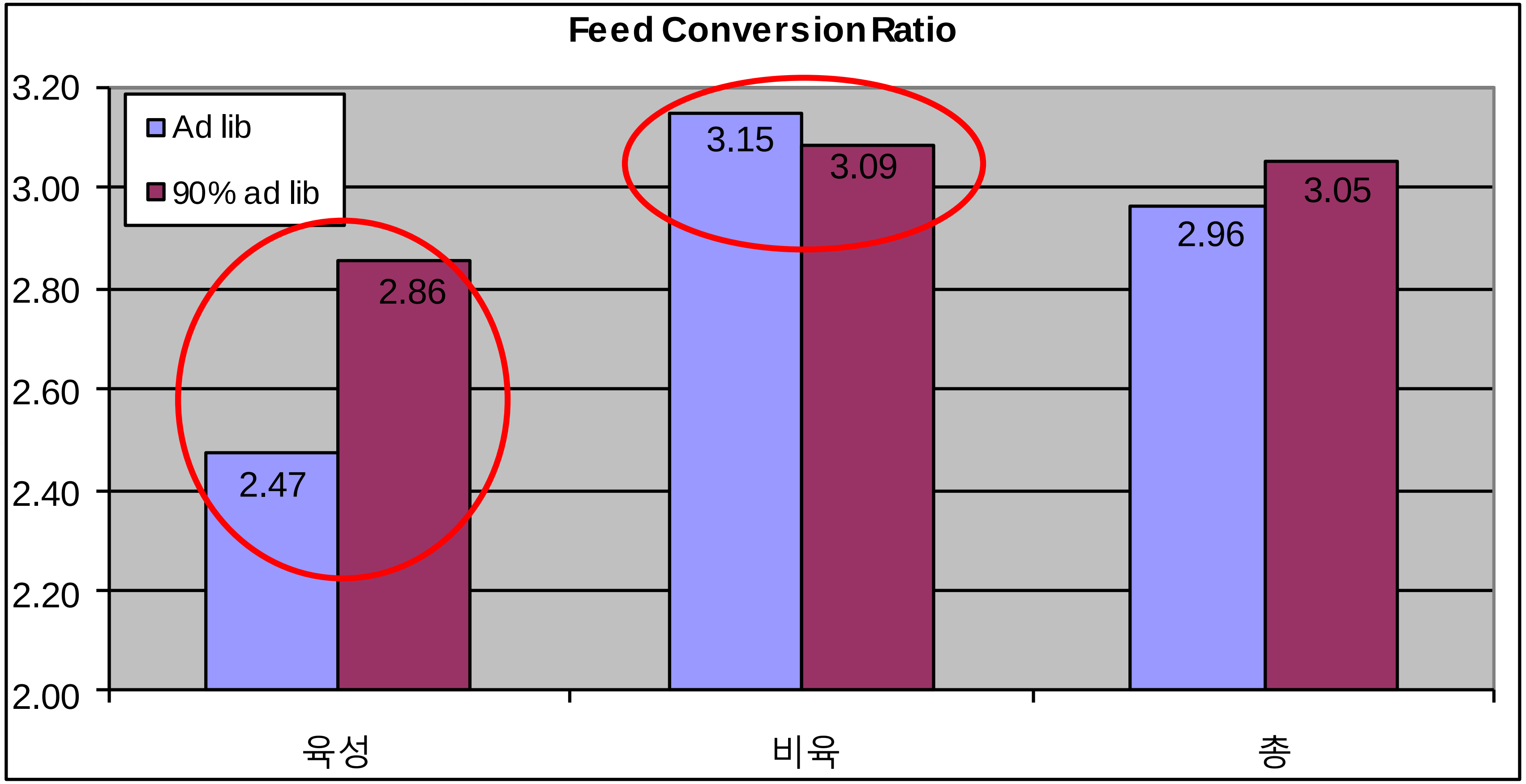
# 섭취량 제한이 성장과 FCR 미치는 영향

'천하제일, 새로운 50년!'



# 섭취량 제한이 성장과 FCR 미치는 영향

- 초기 섭취량 제한의 영향 큼

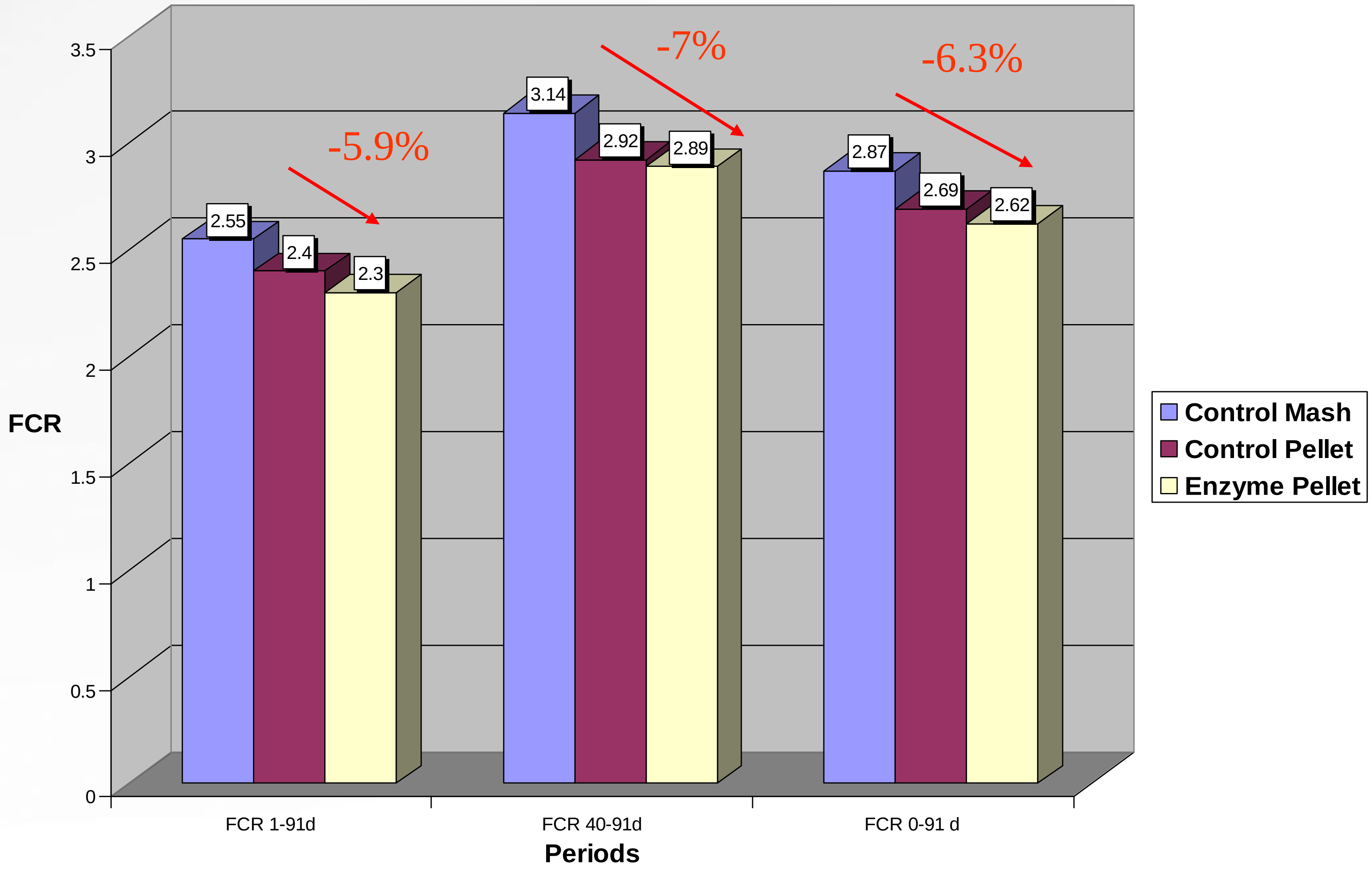


# 체중분리 사육의 효과?

| | 대 | 중 | 소 | 평균 | 미분류 |
|---|---|---|---|---|---|
| ADG | .94 | .92 | .91 | **.92** | **.94** |
| ADFI | 2.67 | 2.66 | 2.73 | **2.69** | **2.70** |
| FCR | 2.85 | 2.93 | 3.02 | **2.93** | **2.88** |
| 체중,kg (d91) | 123.4 | 117.8 | 113.2 | **118.1** | **119.9** |

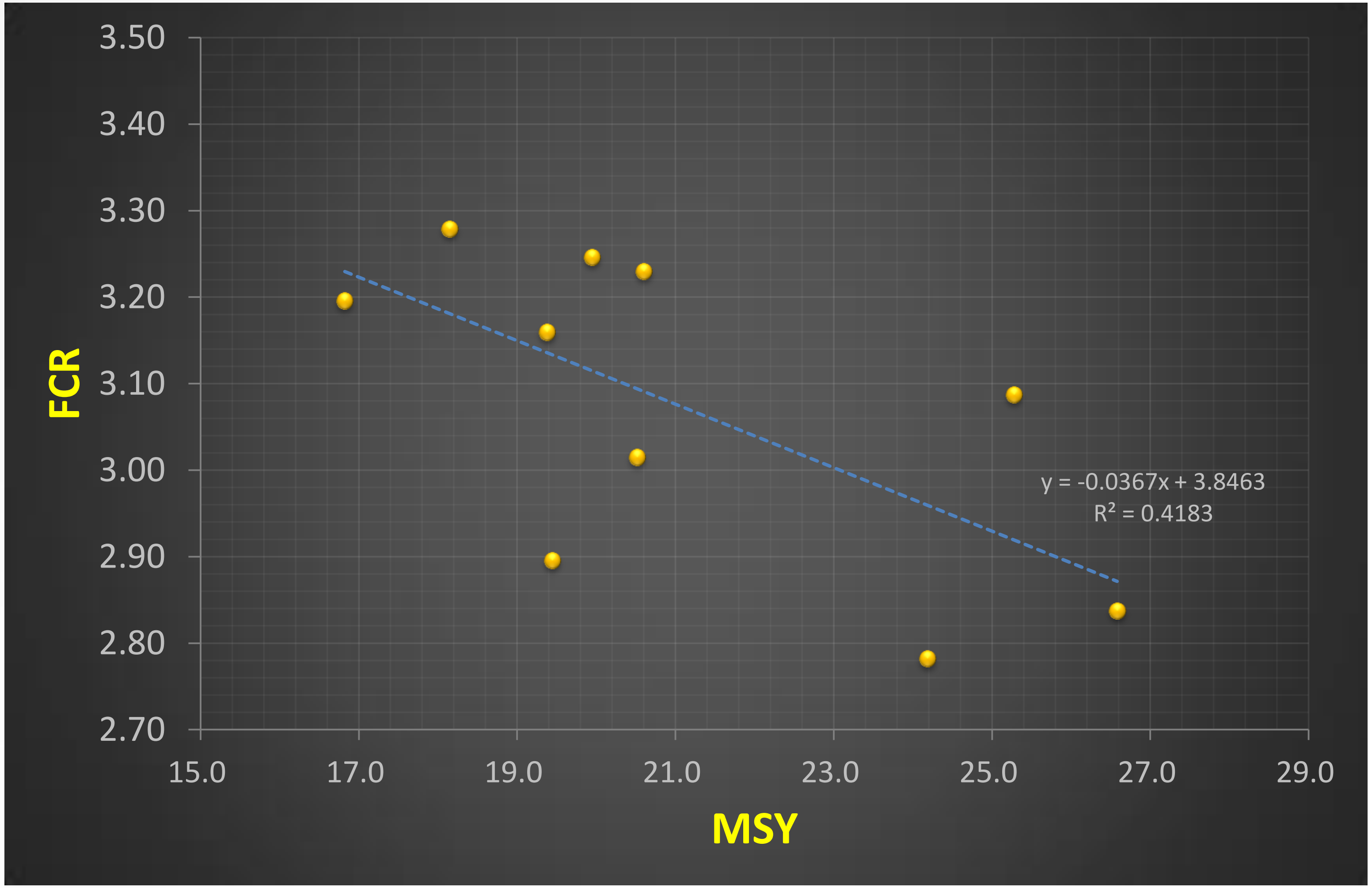
# 사료가공의 효과, FCR

'천하제일,새로운 50년'



# 농장의 생산성 & FCR

'천하제일, 새로운 50년'



# FCR 개선을 위한 종합적인 3-전략

'천하제일, 새로운 50년'

**Selection** 품종

- 우수한 유전력
- 성장성
- 항병력
- 섭취량

**Control** 질병

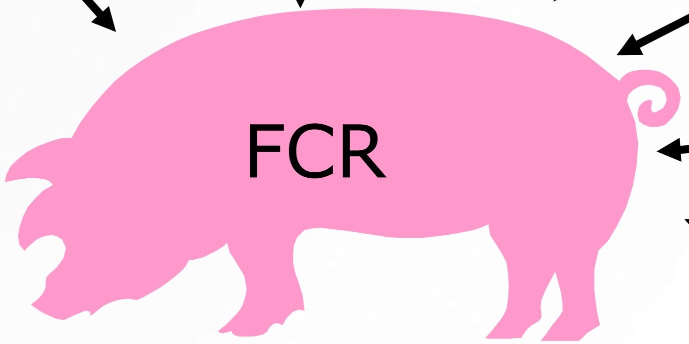
- 백신
- 격리/순치
- 차단방역
- 위생관리
- 수세/소독

**Management** 영양

- 영양소 요구량
- 급여프로그램
- 영양소 함량
- 사양관리

# FCR에 미치는 영향과 개선 방안






**출하체중**

>110kg,

10kg = +0.1 FCR

**생시체중**

**질병**

–0.4 FCR

**모돈 갱신율**

**MSY**

**선별출하**

25% 선출하

- 0.1 ~ 0.6 FCR

**사료가공**

–0.15 FCR

**돈방관리**

암수분리

**폐사율**

**사육밀도**

비육돈 > 0.65 m²

- 0.1 ~ 0.6 FCR

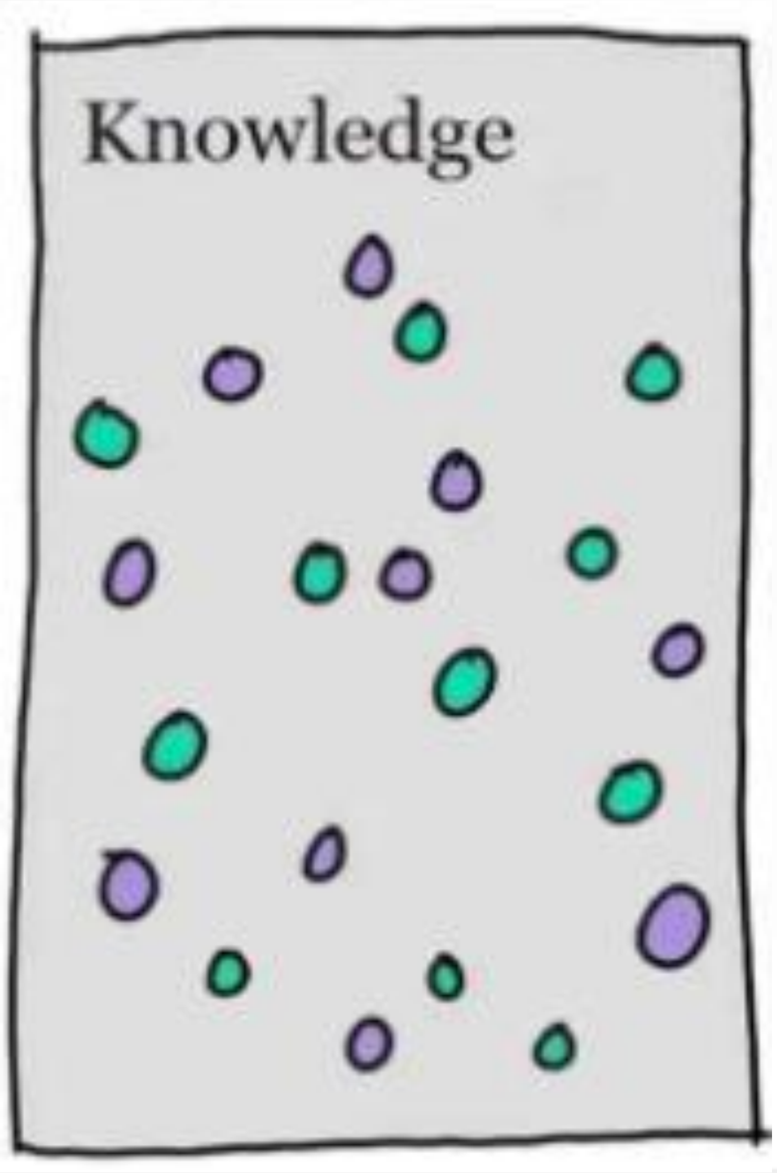
**급이기 관리**

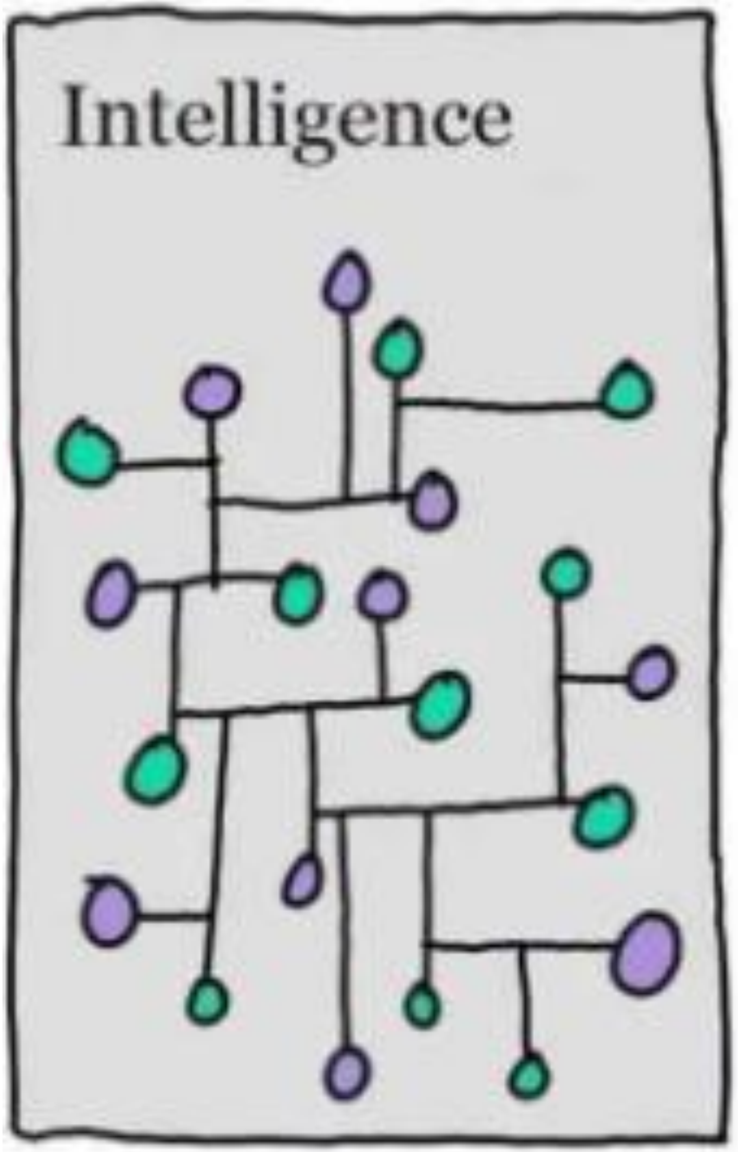
사료허실 10-15%

+0.1~0.2 FCR

# 사료효율 개선을 위해서........





# The future of pig production by 2025 is 2:1 feed conversion

***Is it possible to achieve such dramatic reduction in feed conversion ratio by 2025? Yes, if we identify the causes that do not allow commercially raised pigs to reach their full genetic potential.***

By Aidan Connolly, vice president, and Russell Gilliam, U.S. swine business manager, Alltech, rgilliam@alltech.com

Imagine what could be achieved in pig production with 1.4 million tons of extra pig feed globally. That's the impact a 0.01 reduction in feed conversion rate would have on the industry. The pig industry already has made a gradual genetic improvement over time on feed conversion rates: 6:1, 4:1, 3:1 and now 2.7:1.

As genetics continue to advance, the entire pig industry should be able to reach a feed conversion of 2:1 as soon as 2025. In a global context, this means we would be able to feed 5 million more pigs with the same feed or make pork more economical, ensuring its availability to an ever-growing world human population.

This may be difficult today to envision amid our current state of expensive feed costs and downward pressure on pig prices that are pulling profits down. Pig operations are already efficient, but there are gaps between genetic potential and commercial pig performance. So, is reaching a 2:1 feed conversion rate by 2025 a dream or a reality? We estimate that today's producers are losing as many as 40 points of feed conversion through five barriers as highlighted at Alltech's 29th Symposium in May.

## 1 Viral problems: PRRS, swine influenza, mycoplasma hyopneumoniae, and PEDV

A recent study estimated that porcine reproductive and respiratory syndrome (PRRS) costs the pork industry US$664 million per year — $1.8 million per day or $114.71 per sow annually. The previous study in 2005 calculated PRRS losses at $560 million annually.

In another study, it was estimated that porcine circovirus type 2 costs the U.S. swine industry $3 to $4 per pig and, in extreme cases, as much as $20 per pig because of increased mortality rates and reduced growth performance of infected pigs relative to pigs of higher health.

Mark Fitzsimmons, Swine Graphics, said in his presentation that PRRS is still 'beating us up' after 25 years of dealing with the disease. There is a need to retain the ability to use antibiotics therapeutically but also a need to reduce dependence on the use of growth promotant antibiotics. Achieving this will require learning how to better manage the health and nutrition of the pigs we are raising by looking at alternatives.

In another study, conducted by North Carolina State university, swine influenza, mycoplasma hyopneumoniae and PRRSV were ranked the top three disease challenges in the finishing herd among U.S. pig operations. Swine influenza was cited as a health challenge in the finisher for 18 of 19 companies surveyed with an average rank of 3.1.

> **Pig operations are already efficient, but there are gaps between genetic potential and commercial performance.**

Finally, porcine epidemic diarrhea virus (PEDV) is another virus that can often affect feed conversion rates in pigs. PEDV is most serious in neonatal piglets where morbidity and mortality can be 80 to 100 percent.

"We continue to place pigs in situations where their health status puts them so close to the edge, all the time," said Fitzsimmons. "What we are missing is how to feed pigs when they get sick."

## 2 Feed: Mycotoxins, NIR analysis and enzymes

Increasing feed utilization and the use of NIR and chemical analyses of feed helps to more accurately target the pig's nutritional needs and improve feed conversion ratios. Enzymes may also allow reduction of nutrient levels fed yet maintenance of optimum performance.

In addition, mycotoxins often stand in the way of improved feed conversion ratio as they continue to plague pig producers globally by reducing performance and increasing resistance to disease challenges by compromising the immune system.

In swine, there is a higher sensitivity to contaminated feed, and feed avoidance is a common symptom of mycotoxicoses. For gestating and lactating sows, where feed intake is compromised, symptoms such as immune suppression, reduced ability to absorb nutrients from the gastrointestinal tract and reduced utilization of proteins in the body are more common. Zearalenone, a particular concern in breeding sows, can result in abortions and an increased number of non-productive sows. The cost of lost productivity from this has been calculated to $4 per sow, per non-productive sow day.

Some mycotoxins — for example zearalenone — are transferred in milk and might affect the piglet. If quality of feed for sows is suspect, an effective mycotoxin absorbent should be added to the diet.

## 3 Gut health: Salmonella, E.coli, Campylobacter, Clostridium

Gastrointestinal challenges can also affect feed conversion ratios and continue to pose a risk to not only animal, but human health. Some pathogens pose no risk to the animal but can pose a risk to food safety. The same can be said for some pathogens that do not affect human health but cause reduced performance or increased death loss in swine production.

It is time to better

There is *no secret bullet* for high performance, FCR…

…Just *the thing done right at each step* !