Pros and cons of alternatives to piglet castration:

welfare, boar taint and other meat quality traits

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Surgical castration of male piglets

- **A traditional practice**
- **Still common in most countries**
- **Painful to the animal**
- **Most of the time performed with no pain relief**
- **Faces increasing criticism, particularly in Western European countries**

Pros and Cons of Alternatives

- **Why are piglets castrated ?**
- **Consequences of surgical castration**
- **What are the alternatives ?**
- **Entire male pigs**
- **Immunocastration**
- **Surgical castration with pain relief**
- **The current situation in Europe**
- **Summary / Conclusions**

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- **Why are piglets castrated ?** **Boar taint**
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What is boar taint ?

- **Unpleasant odours and flavours**
  - Perceived in hot/warm products
  - Associated with fat
  - Not all animals
  - Not everyone is sensitive

Product-related factors

Animal-related factors

Consumer-related factors

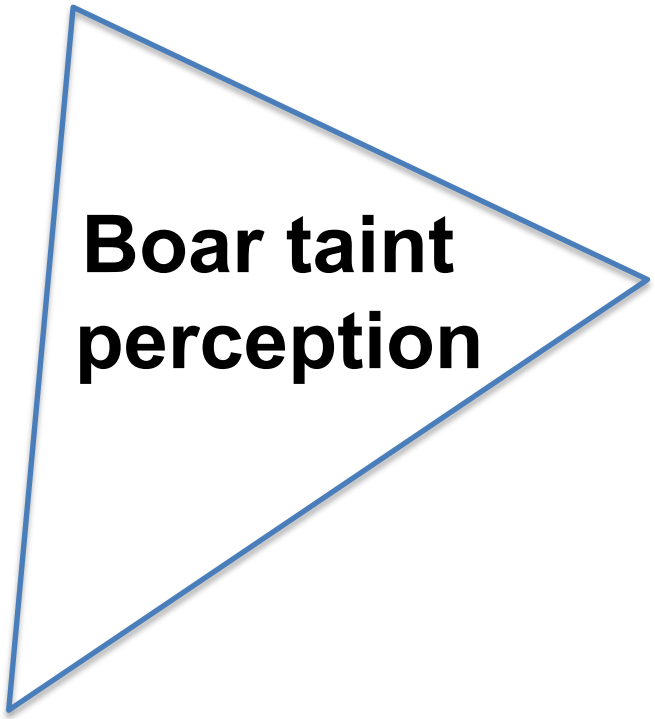
- **Boar taint mostly affects**
  - Fresh meat cooked at home
  - High fat products cooked at home and/or consumed warm

- **Highly tainted meat may also affect other products**

Boar taint perception

- Levels of malodorous compounds

Animal



- % fat
- Serving temperature

Product

- Masking ingredients
- % tainted meat
- Process

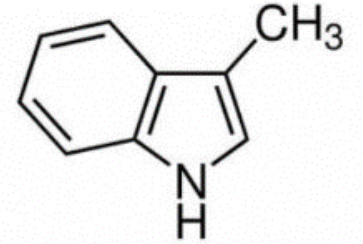
Consumer

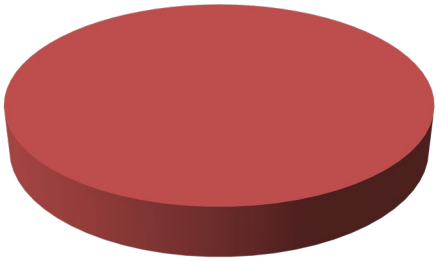
- Sensitivity to malodorous compounds

Boar taint compounds

- **Two compounds are mostly held as responsible for boar taint**

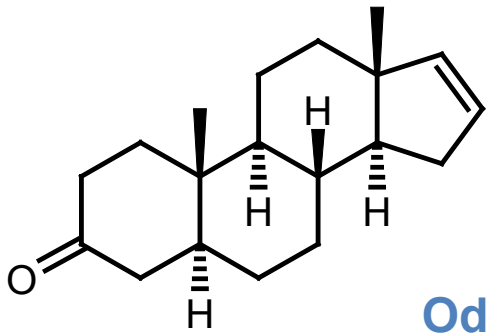
Skatole

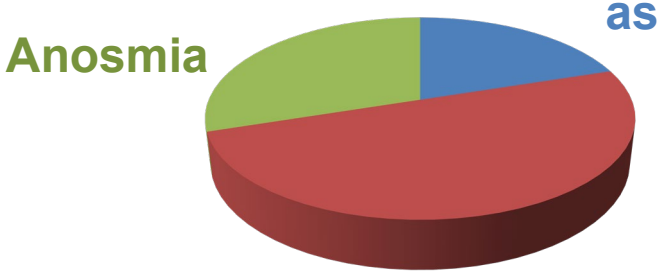




Odour perceived as unpleasant

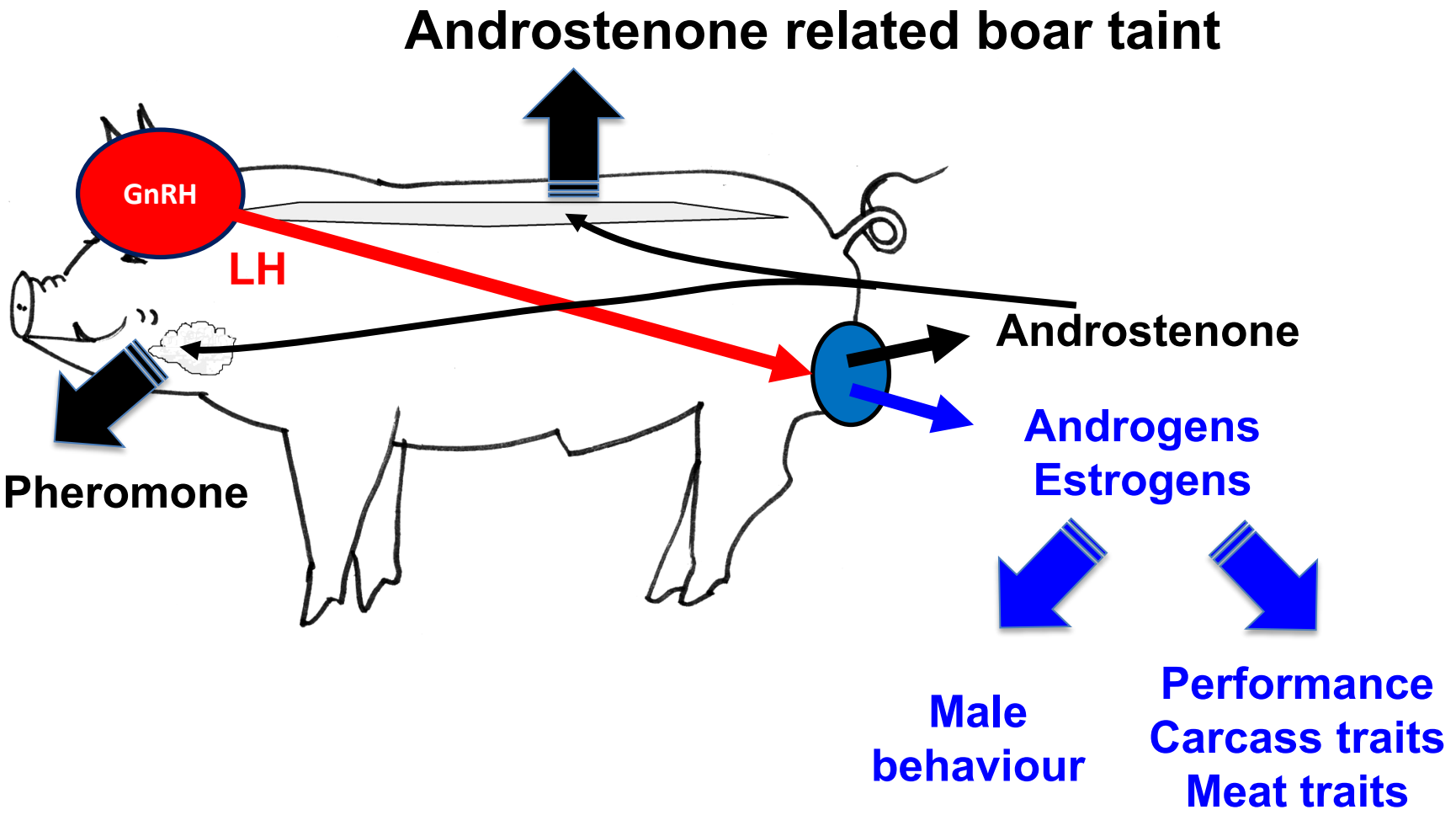
Androstenone



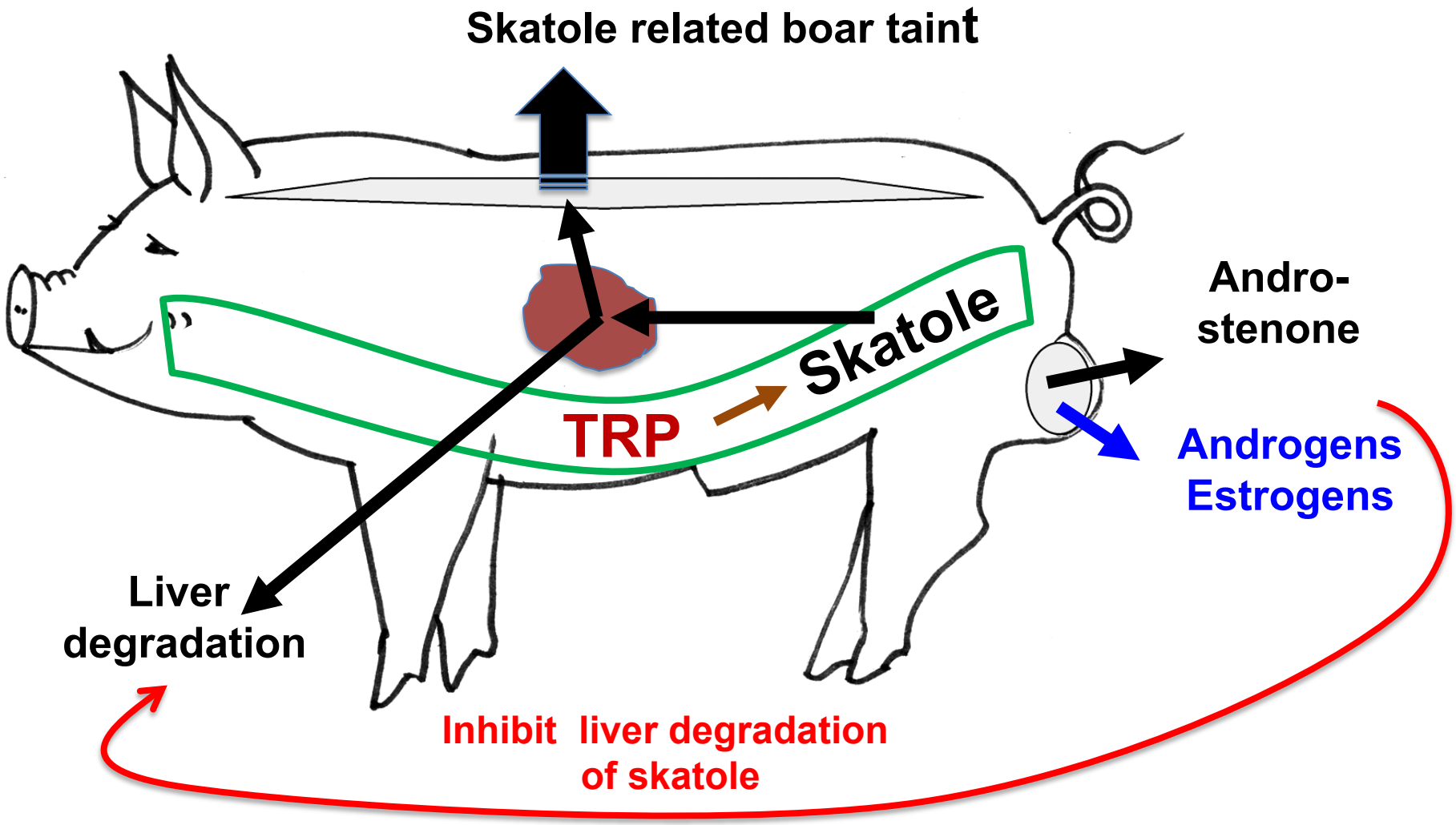


Odour perceived as unpleasant

Boar taint compounds: Androstenone



Boar taint compounds: skatole



Pros and Cons of Alternatives

- Why are piglets castrated ?
- **Consequences of surgical castration**
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- **Welfare**
- **Performance**
- **Carcass quality**
- **Meat quality**
- **Labour**

Consequences of surgical castration

- **Animal welfare**
  - ☹ **Pain during and after surgery**
  - ☺ **Less aggressive and mounting behaviour**
  - ☺ **No penile injuries**

- **Performance and carcass and meat quality**
  - ☹ **Sharp reduction in feed efficiency → increased costs/ environmental impact**
  - ☹ **More fat in the carcass → decreased selling value**
  - ☺ **Less DFD meat, more intramuscular fat**
  - ☺ **Higher quality of fat (firmer, less prone to rancidity)**

- **Other**
  - ☹ Increased labour before weaning

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What are the alternatives ?

- Sperm sexing to produce only females
- Injection of chemicals to destroy testicular tissue
- Exogenous hormones

} Not feasible

- Entire male pigs
- Immunocastration
- Surgical castration with pain relief

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- **Pros and cons**
- **Boar taint management**
  - **Reducing boar taint incidence**
  - **Detecting boar taint**
  - **Reducing boar taint perception**

Entire males: Pros and cons (1)

- Animal welfare
  - ☺ Surgery-associated pain avoided
  - ☹ Aggressive and mounting behaviour
  - ☹ Penile injuries
- Performance and carcass and meat quality
  - ☺ Sharp improvement in feed efficiency → decreased costs and environmental impact
  - ☺ Less fat in the carcass → increased selling value
  - ☹ Boar taint
  - ☹ More DFD meat, less intramuscular fat
  - ☹ Lower quality of fat (softer, more prone to rancidity)

Entire males: Pros and cons (2)

- **Other**
  - ☺ **Reduced labour on the farm before weaning**
  - ☹ **Animal management more difficult**
  - ☹ **Boar taint detection → increased costs**
  - ☹ **Reduced value of tainted meat**

Management of boar taint: an integrated approach

- **Reduce the incidence of boar taint**
  - **Androstenone**
    - Mostly via genetic selection
    - High heritability
    - Secondary effects on reproductive performance in dam lines
  - **Skatole**
    - Mostly via nutrition and management
    - Moderate heritability
- **Detect boar taint on the slaughterline**
  - **Human nose detection**
    - cheap
    - claimed to be efficient to detect highly tainted meat
    - Efficiency not scientifically established
    - Subjective, operator-dependent
  - **Promising instrumental methods are on the way**
- **Reduce perception of boar taint**
  - **Via processing**

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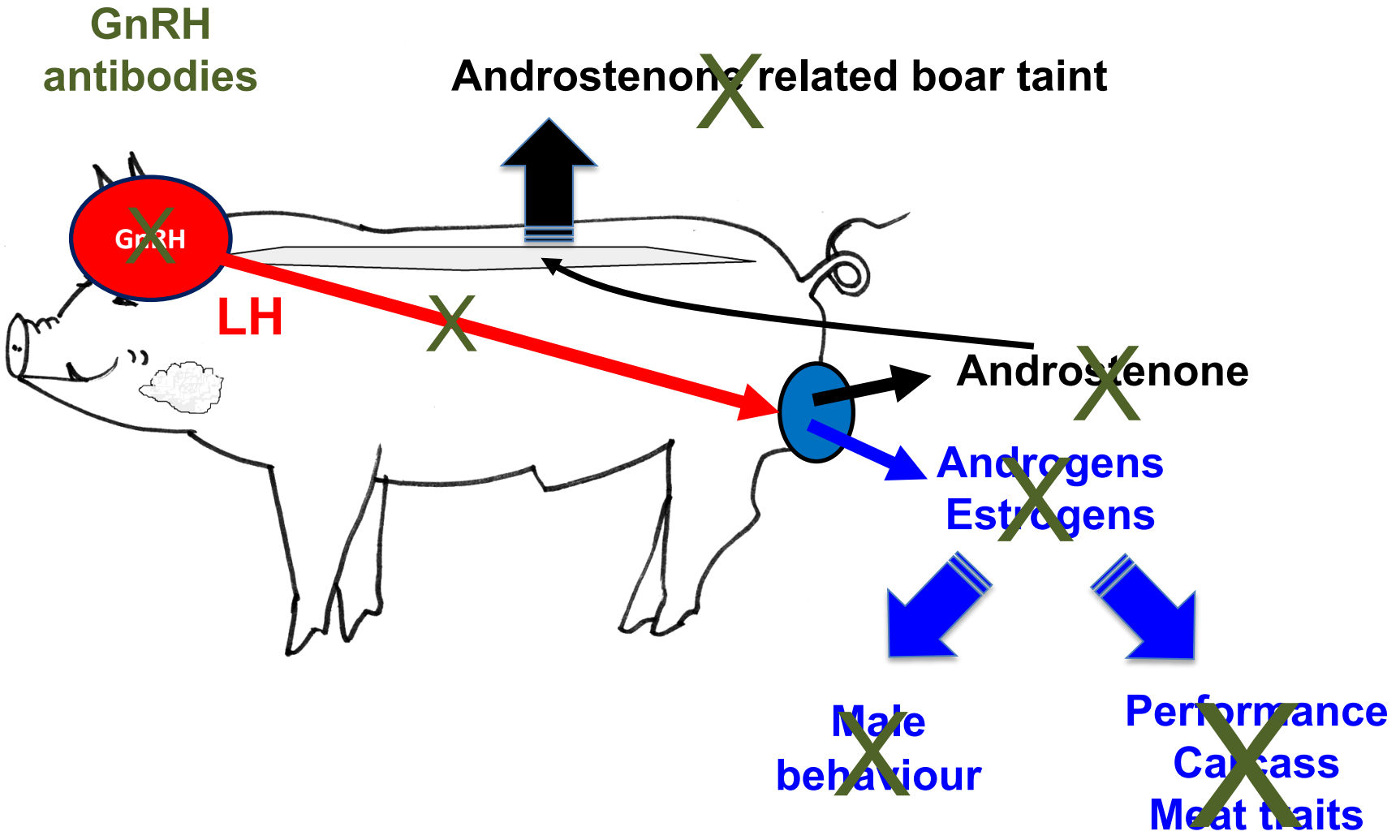
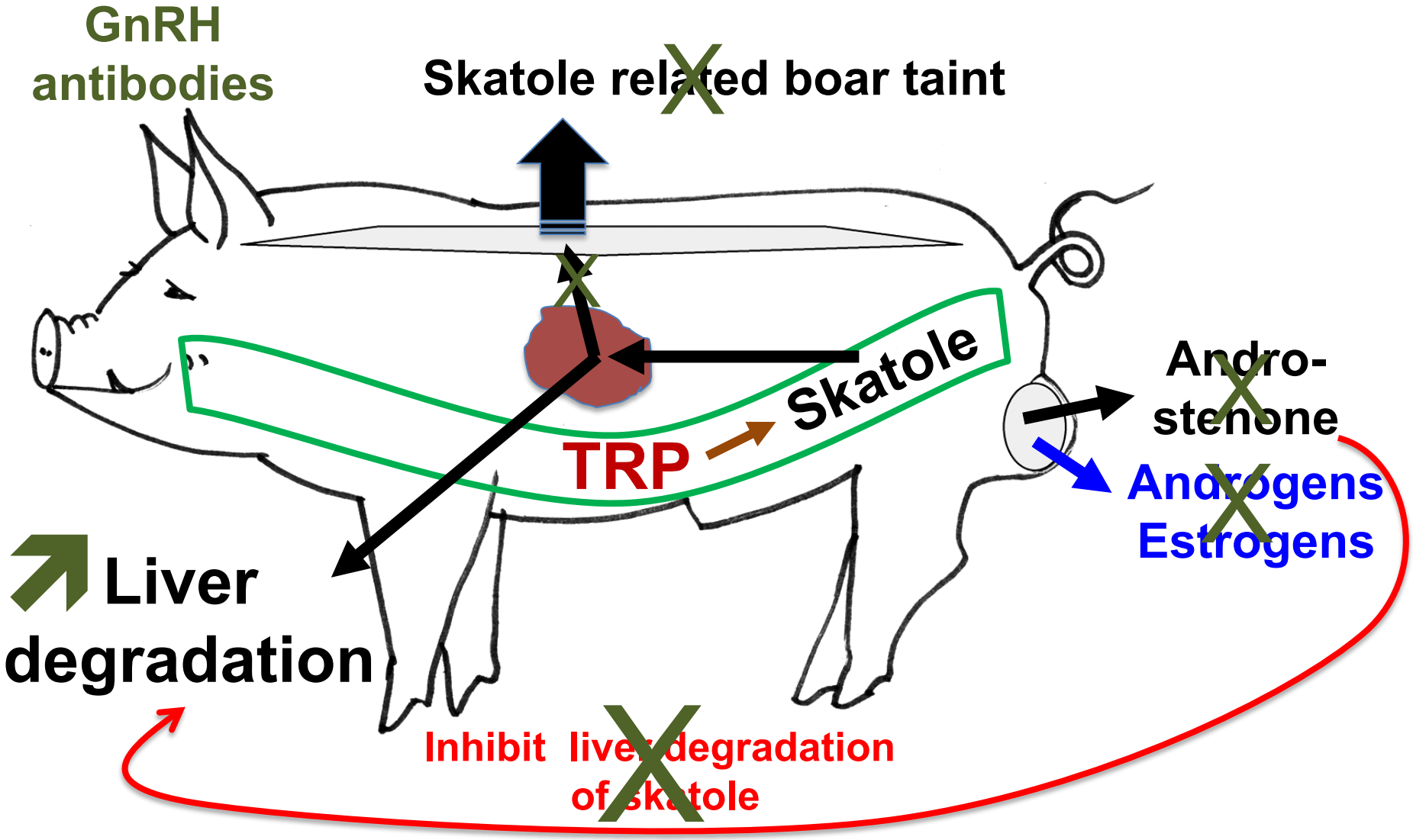
- **Effects of immunocastration**
- **Pros and cons**

Immunocastration: How does it work?



Immunocastration works also on skatole



Immunocastration: how is it used in practice ?

- **First immunisation 8-12 weeks of age**
  - Priming
  - The animals continue to behave and perform like entire male
- **Second immunisation 4-6 weeks before slaughter**
  - Steroid secretions down within a few days
  - Feed consumption and fat deposition increase dramatically
  - A few weeks are needed to ensure
    - Complete disappearance of androstenone and skatole stored in fat
    - Sufficient reduction in testis size to monitor effectiveness of vaccination
- **A third vaccination is needed for animals slaughtered at older ages / heavier weights**

Effects of immunocastration

- **% of non responders very low when both vaccinations are properly administered**
- **In practice, there are non responders that have the same advantages and disadvantages as entire males**
- **Performance and quality traits are intermediate between entire males and surgical castrates**
- **The longer the delay between 2nd vaccination and slaughter, the closer they are to surgical castrates**

Immunocastration: Pros and cons (1)

- **Animal welfare**
  - ☺ **Surgery-associated pain avoided**
  - ☺ **Aggressive and mounting behaviour avoided after 2nd vaccination**
  - ☺ **Penile injuries mostly avoided**
  - ☹ **Vaccination may result in stress, particularly in heavier animals (2nd vaccination and 3rd vaccination where required)**

Immunocastration: Pros and cons (2)

- **Performance and carcass and meat quality**
  - ☺ Improvement in feed efficiency but less than with entire males
  - ☺ Less fat in the carcass but more than in entire males
  - ☺ Boar taint mostly avoided but may be present in non responders
  - ☺ Intramuscular fat usually close to surgical castrates

  - ☹ Lower quality of fat (softer, more prone to rancidity) but less so than in entire males

Immunocastration: Pros and cons (3)

- **Other**
  - ☺ Labour costs for surgical castration avoided
  - ☹ Labour costs to perform vaccination
  - ☹ 2nd (and particularly 3rd when required) vaccination laborious
  - ☹ Cost of vaccines
  - ☹ Labour cost to monitor non responders
  - ☹ Risk of self-injection of the vaccine

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- **Anaesthesia**
  - **General**
  - **Local**
- **Analgesia**
- **Pros and cons**

Surgical castration with pain relief

- **Anaesthesia**
  - Efficient to relieve pain during surgery but not after
  - General anaesthesia
    - with CO_2: aversive to the animals
    - with isoflurane
      - Costly
      - negative impact on environnent and worker's health
    - General anaesthesia with injection: dangerous for the animal
  - Local anesthesia
    - Efficient to reduce pain; costly if performed by vets

- **Analgesia**
  - Efficient to relieve pain after surgery but not during it
  - Can potentialise the effect of anaesthesia

Surgical castration with pain relief: Pros ans cons

- **Only combined anaesthesia and analgesia is efficient to relieve pain both during and after surgery**
  - **Very costly (2.5 € → 4 €)**

- **Surgical castration with pain relief**
  - **Has all the advantages and disadvantages of surgical castration**
  - **Additional costs for application of pain relief**

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Current situation in Europe

Mostly entire males since > 40 years

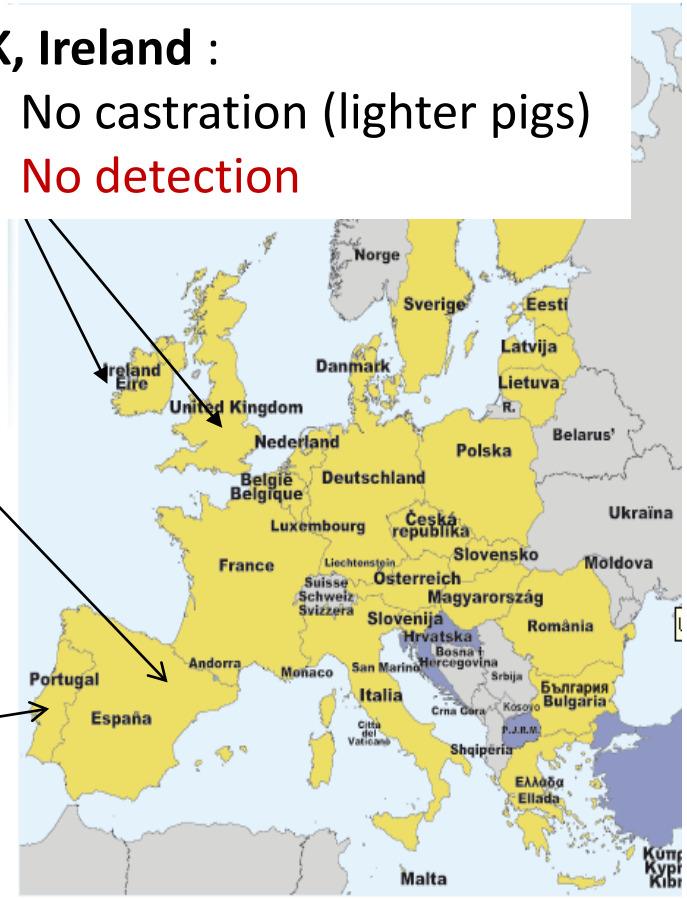
Spain :

- 70-80 % entire male pigs (standard production).
- High quality production with surgical castrates
- On line detection started in 2013, using human nose
- Immunocastration trials in Iberico pigs

Portugal : Similar to Spain

UK, Ireland :

- No castration (lighter pigs)
- No detection



Current situation in Europe

The countries where nothing changes

Eastern Europe :

- Surgical castration not an issue yet
- A few trials with immunocastration to improve performance

Italy :

- Sticks to castration (heavy pigs ; fat quality critically important)
- Trials with immunocastration in heavy pigs (3 shots)

Current situation in Europe

Recent changes

Norway : Local anaesthesia by vet

Denmark :
- Analgesia
- 5% entire males for UK with skatole detection
- New instrumental detection on the way

Netherland :
- Anaesthesia with CO_2
- 80% entire males with human nose detection

Belgium:
- Analgesia
- 20% Immunocastration
- 15% entire males

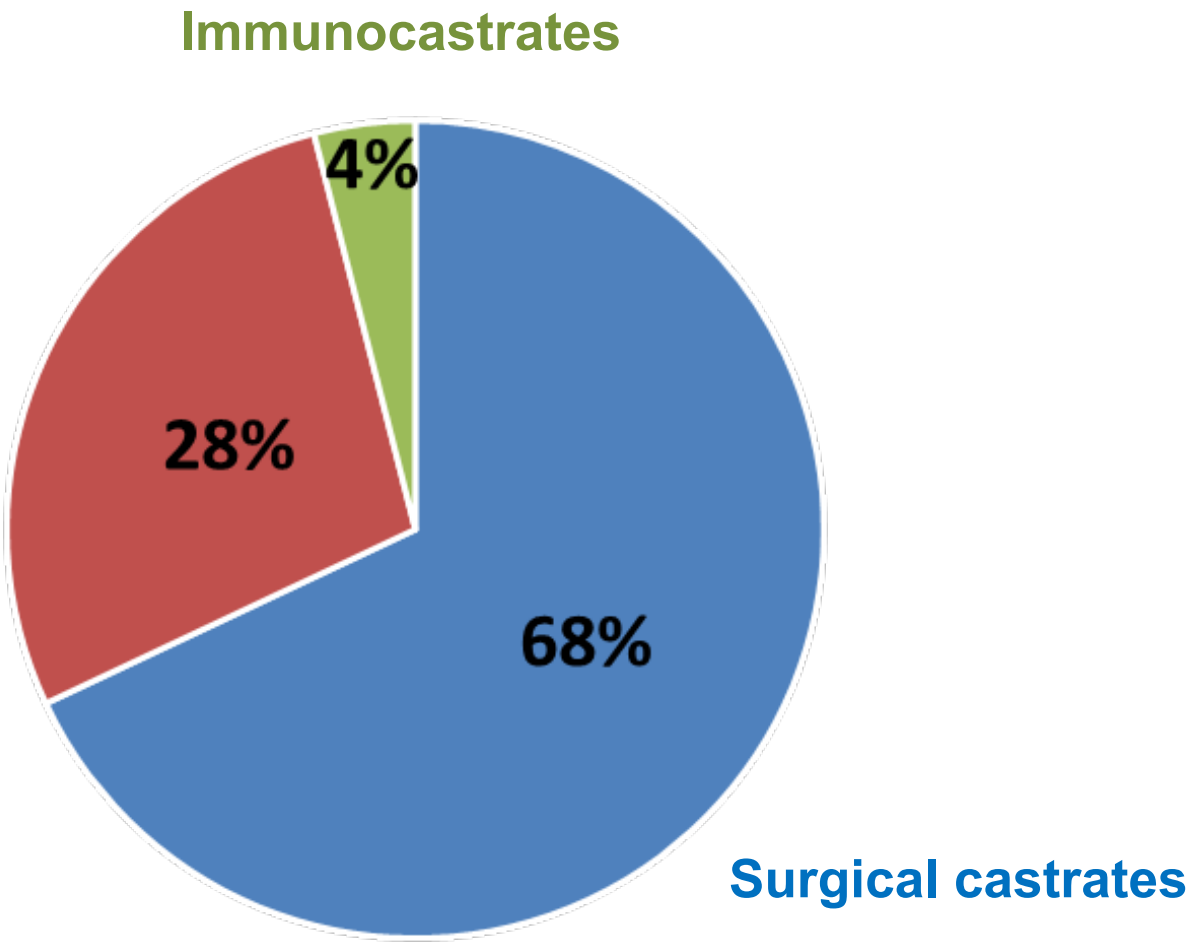
Germany
- Analgesia since 2009 (QS)
- Ban on castration without pain relief delayed from 2019 to 2021
- General anaesthesia with Isoflurane under consideration

  20 % entire males with human nose detection

France :
- Analgesia since 2012,
- 20 % entire males with human nose detection

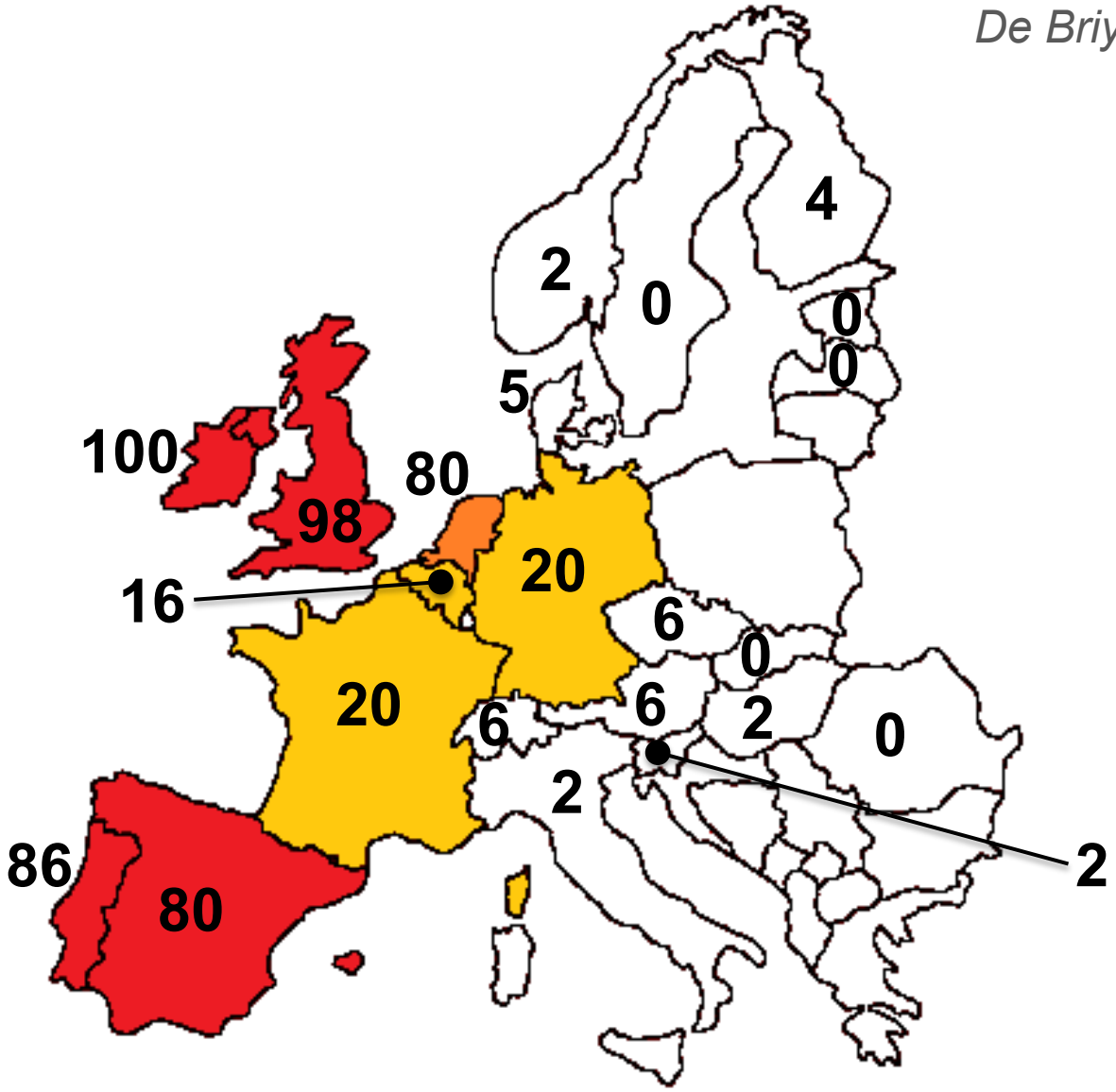
Switzerland :
- Anaesthesia Isofluran + Analgesia

Estimate 2015 : 34 millions entire males / 250 millions pigs in EUROPE



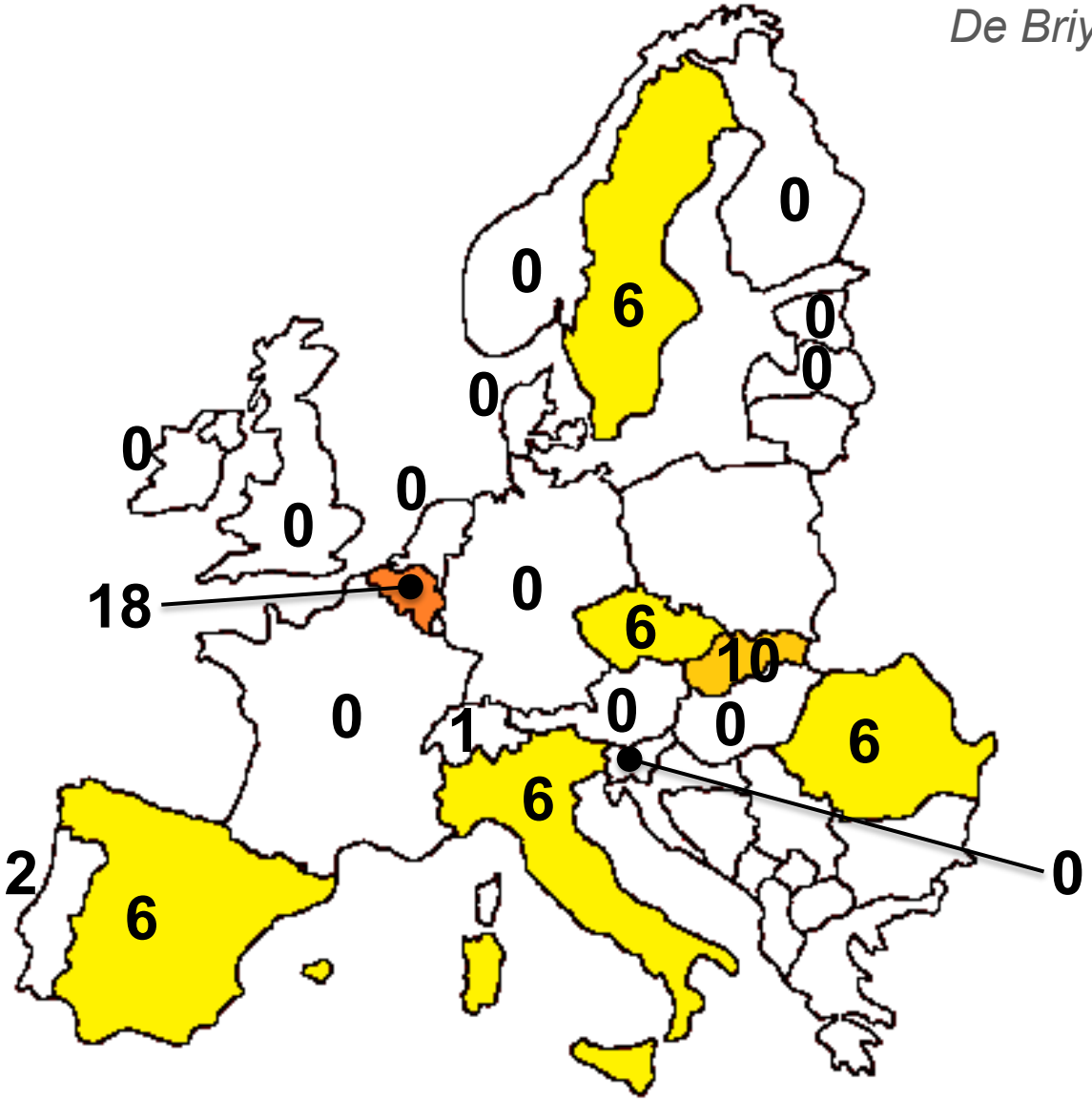
Entire males, % males

De Briyne et al., 2016



Immunocastrates, % males

De Briyne et al., 2016



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Tentative summary of Pros and Cons

		Surgical castration					Immuno-castration	Entire males
		No pain relief	Isofluran	Local anaesthesia	Analgesia	Anaesthesia + analgesia		
Animal	Animal integrity	No	No	No	No	No	Yes	Yes
	Pain during surgery	Yes	No	No	Yes	No	No	No
	Pain after surgery	Yes	Yes	Yes	No	No	No	No
	Mortality/health	↗	↗	↗	↗	↗	Unchanged	Unchanged
	Aggressive/mounting behaviour	Low	Low	Low	Low	Low	Low after 2nd shot	High
Farmer	Impact environment	↗	↗	↗	↗	↗	↘	↘↘
	Feeding costs	↗	↗	↗	↗	↗	↘	↘↘
	Carcass quality	↘	↘	↘	↘	↘	↗	↗↗
	Health risk workers	No	Some	No	No	Isofluran	Self injection	No
	Additional costs/ workload farmers	No	High	Yes	Low	High	Vaccinations + monitoring	Penalty tainted carc.
Slaughterhouse Consumer	Additional costs slaughterhouses	No	No	No	No	No	No	Boar taint CTL + Taint. meat
	Meat quality	High	High	High	High	High	High	↘
	Boar taint	No	No	No	No	No	Low	Yes

Conclusion

- **Each alternative has its pros and cons**
- **There is no European-wide best solution**
- **Pork chains have to choose for themselves the alternative that fits best their situation, depending on socio-economic context, technical constraints and target markets**

Thank you for your attention

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