

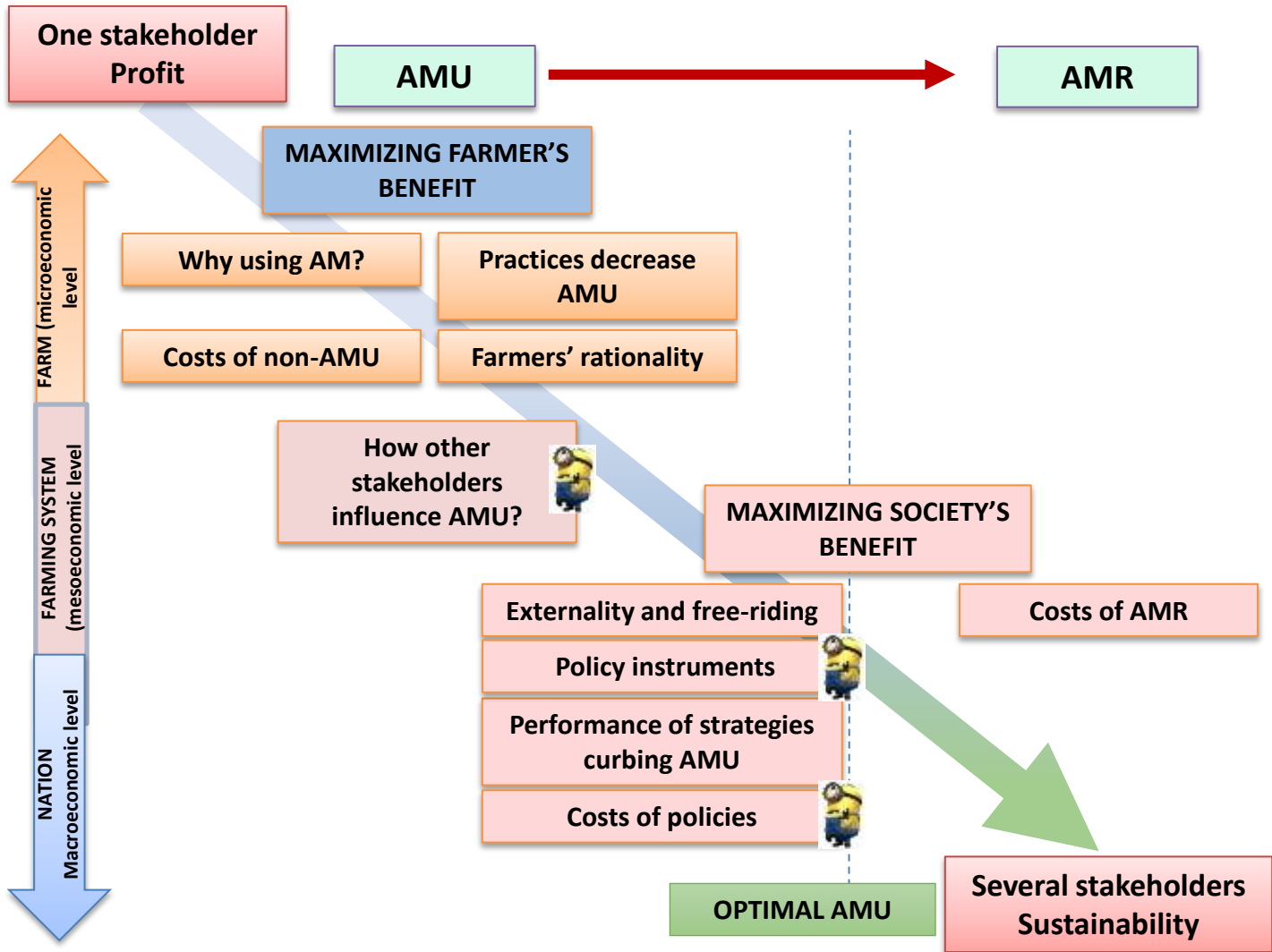
Perspective socio-économique des politiques publiques encourageant l'usage raisonné des antibiotiques en élevage



Carrefours de l'innovation
agronomique

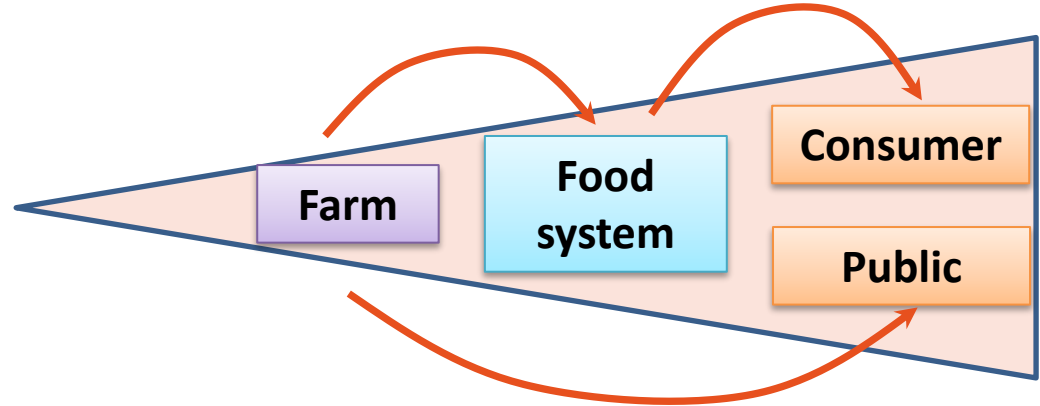


Guillaume Lhermie – Didier Raboisson | 27 juin 2019 | PARIS



Risk assessment

- Hazard
 - Resistant bacteria
- Risk of treatment failure
 - Release
 - Exposure
 - Consequence



AMR – Risk – Cost

- What we know
 - Cases studies
 - Transmission Animal to humans
 - Transmission humans to animals
 - Impact of AMU in agriculture on AMR

RATIONALE FOR THE PUBLIC POLICIES

Journal of Antimicrobial Chemotherapy Advance Access published December 29, 2011
Journal of Antimicrobial Chemotherapy
doi:10.1093/jac/dks108

J Antimicrob Chemother 2012
doi:10.1093/jac/dks108
Advance Access publication 27 March 2012

Escherichia coli producing VIM-1 carbapenemase isolated on a pig farm
Jennie Fischer¹, Irene Rodriguez¹, Silvia Schmoger¹, Anika Friese², Uwe Roesler², Reiner Helmuth¹ and Beatriz Guerra^{1*}

Non-ST131 Escherichia coli from cattle harbouring human-like bla_{CTX-M-15}-carrying plasmids
Jean-Yves MeDEC^{1*}, Laurent Pain¹, Estelle Senechal¹, Aurélien Gougeon¹, Delphine Gillichy¹, Patricia Mondran¹ and Maria Heani²

Journal of Antimicrobial Chemotherapy (2008) 61, 1229–1233
doi:10.1093/jac/dkn131
Advance Access publication 26 March 2008

Multilocus sequence typing of IncII plasmids carrying extended-spectrum β -lactamases in Escherichia coli and Salmonella of human and animal origin
Aurora García-Fernández¹, Giuseppina Chiaretto², Alessia Bertini¹, Laura Villa¹, Daniela Fortini¹, Antonia Ricci² and Alessandra Carattoli^{1*}

JAC

Restricting the use of antibiotics in food-producing animals and its associations with antibiotic resistance in food-producing animals and human beings: a systematic review and meta-analysis



Karen L. Tang, Niamh P. Coffey, Diego B. Nobrega, Susan C. Cook, Paul E. Rankley, Herman W. Barkema, Alicia J. Pollock, Heather Garnham, Nishan Sharma, James D. Kitcher, William A. Ghali



AMR – Risk – Cost

- What we don't know
 - Quantitative contribution
 - Thresholds
 - Costs in animal health
- What we estimate
 - Costs in public health
 - Additional diagnostic/treatments
 - Longer hospital stay, time off work
 - Increased likelihood of death
 - \$[2-17] par AM course treatment
 - \$20,000 for MRSA BSI
 - \$7 billion per year for community MRSA

**RISKS AND COSTS ARE NOT FOR THE
PRODUCERS BUT THE PUBLIC POLICIES
TARGET AMU AT THE FARM**

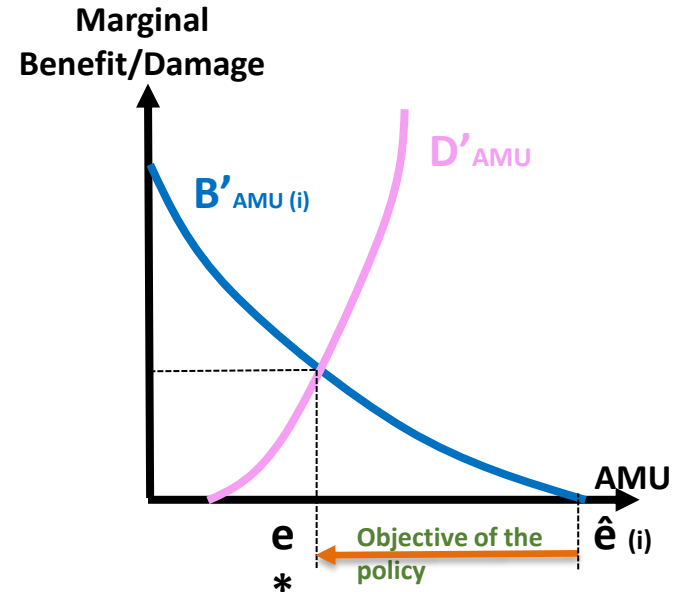
Naylor et al, ARIC, 2018

Michaelidis et al, BMC Inf Dis,
2016

Shrestha et al, ARIC, 2018

Public policies to curb AMR

- Regulatory instruments
 - AM bans
 - Standards
- Voluntary instruments
 - Economic incentives (taxes and permits)
 - Agreements
 - Industry self-regulation



Regulations

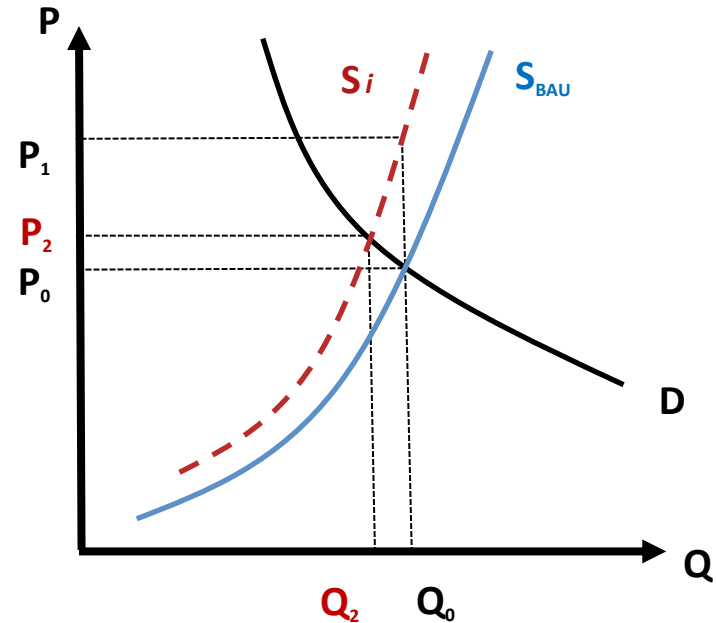
- Regulator specifies the objective
- Highly effective (if control)
- Generally more costly
- Ban of growth promoters
- 50% reduction target of AMU in farms animals in the Netherlands
- Specific requirements for the use of CIA in France

Taxes

- Producers choose their levels of inputs to production
- Challenges
 - Cost of the AMR externality necessary to set optimal tax
 - Inelastic demand
 - Imperfect information
- Differential taxes on AM sales in Denmark

Effects of potential taxes in the U.S.

- **Objective: assessing the impact of policy reducing AMU**
- Milk market
 - Constant elasticities $E_d = 0.65$ $E_s = 0.89$
 - BAU values: average 2012-2016
 - Milk production
 - Milk price
 - Production costs
- Policy impacts
 - Increase of marginal production costs
 - Estimated from a farm model



Effects of potential taxes in the U.S

- Changes in prices and quantities
- Changes in consumers and producers surplus

Scenario	BAU	Tax X 1.5	Tax X 2	Tax X 3	Tax X 4	Tax X 5	Prohibition
Equilibrium milk price (\$/kg)	0.423	0.423	0.424	0.424	0.425	0.426	0.425
Δ PS (million \$)	-	-5.23	-10.45	-20.87	-31.27	-41.65	-38.22
Δ PS (% of initial value)	-	-0.03	-0.06	-0.11	-0.17	-0.22	-0.21
Δ CS (million \$)	-	-31.71	-63.38	-126.63	-189.73	-252.70	-231.92

Voluntary agreements

- Initiatives from companies, and non-profit organizations
- Not legally binding



Plan Ecoantibio

- Quantitative objectives : -
25% AMU in 5 years
- Qualitative objectives : HP-
CIA (fluoroquinolones,
cephalosporins)



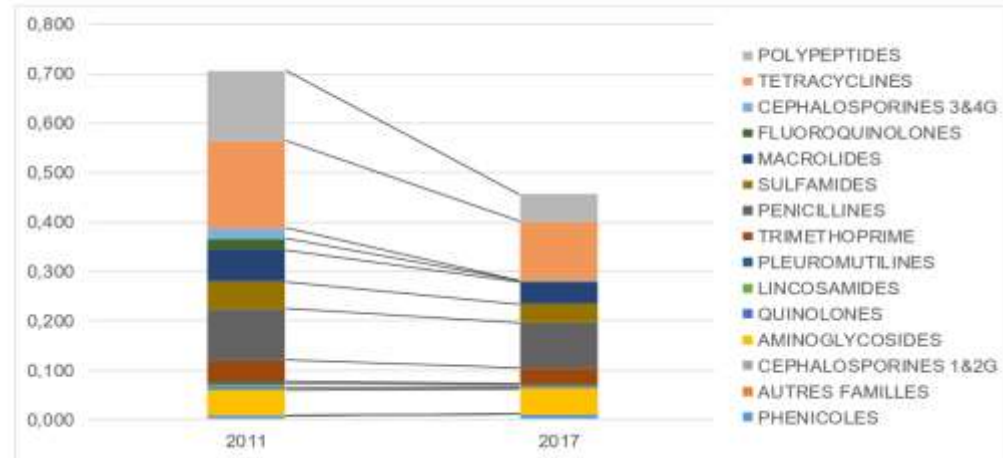
Results

Anses, 2018

- Between 2011-2017
 - Total exposure – 38.9%
 - 3rd 4th g cephalosporins -94,7 %
 - Fluoroquinolones -88,1 %
- High discrepancies between species
 - - 23 % in cattle
 - - 43 % in pig
 - - 49 % poultry

- ALEA: indicator of animal exposure
 - kg treated/kg at risk

Figure 3 : Comparaison de l'ALEA en 2011 et 2017



Remaining questions

- How the results were achieved
- By which category of farmer
- At which costs
- For whom



Influence of veterinarians

- **Objective: Identifying veterinarians' influence**
 - Rationale: conflict of interests
 - Substitution between AM in the veterinarian's interest?
 - Cattle production

- Available data
 - Regional AM sales data 2008-2013
 - Animal populations

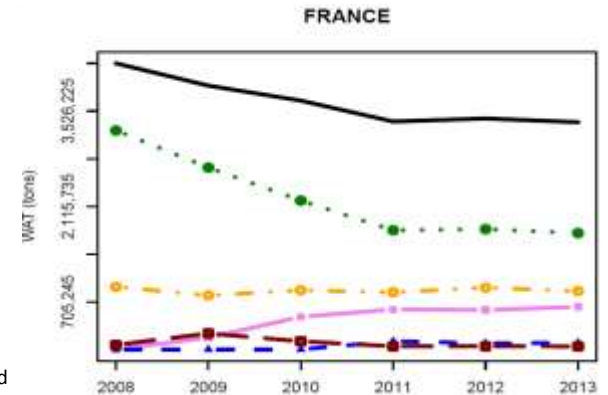
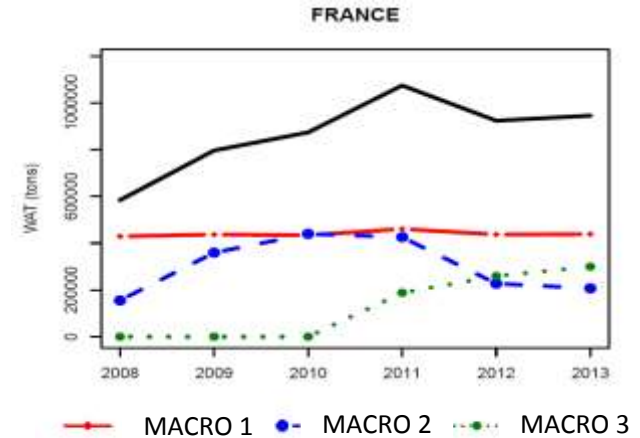
Working paper:

How veterinarians influence use patterns of antimicrobials? A spatial-temporal analysis of the prescribing-delivery complex in cattle.

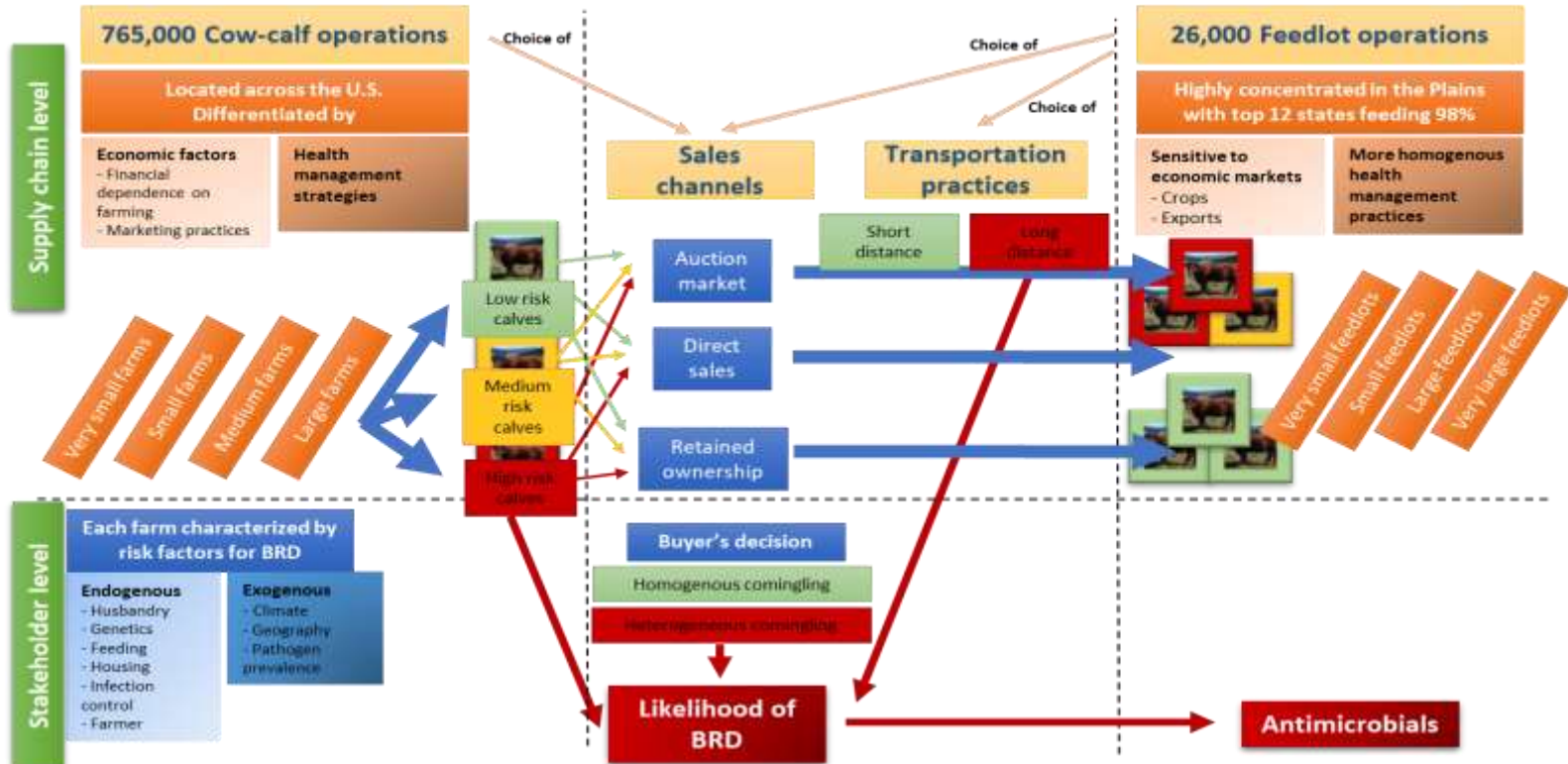
G. Lhermie, Y. Grohn, P. Sans, D. Raboisson.

Substitution between drugs with similar indications

- BRD treatments
 - Veterinarians do substitute
 - Technical equivalence
 - Without increasing AMU



Public policies in the U.S. beef system



Expected effects of policies

- Regulations
 - Effective, with high costs
- Taxes
 - Probably poorly effective
 - Inelastic demand
 - Hobby farming
- Voluntary agreements
 - Need transparency of information

Working paper: Antimicrobial policies in beef production: choosing the right instruments to reduce antimicrobial use and resistance under structural and market constraints

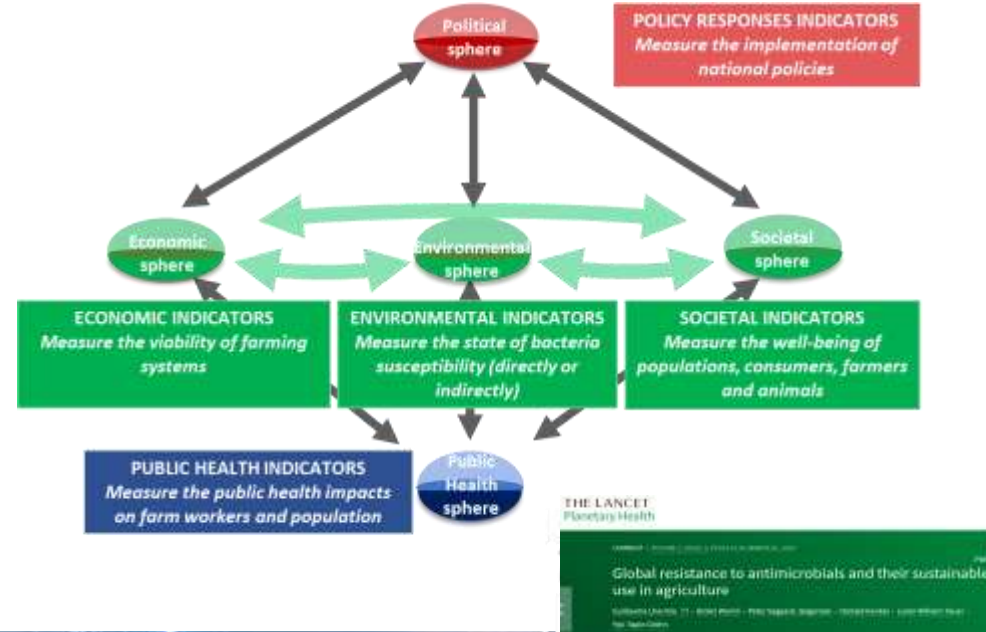
G. Lhermie, L. Verteramo Chiu, K. Kaniyamattam, L. Tauer, Harvey M. Scott, Y. Gröhn





Conclusion

- A risk unfortunately poorly quantified
- Costs and benefits of public policies remain to be studied
 - Even if several approaches are successful
- No innovation in the instruments
 - Be innovative in their implementation



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