Antimicrobial Resistance - the same for humans and other animals?

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Antimicrobial Resistance - the same for humans and other animals?

- **Yes ……..**
- **But then maybe …….. No?**

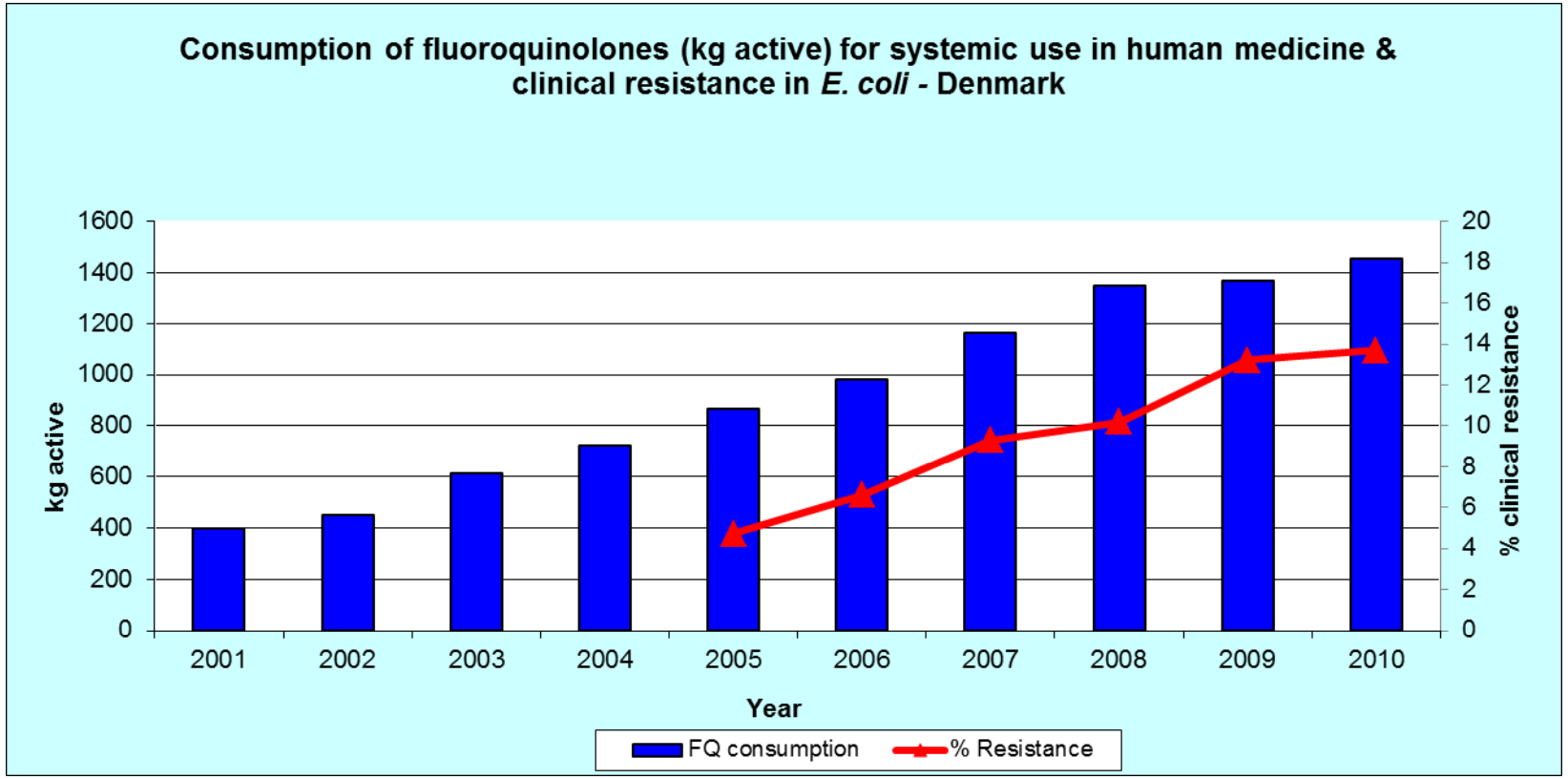
A Difference Of Focus

- **Animals – a dual focus**
  - **target animal pathogens**
  - **foodborne pathogens and commensal organisms**
    - **the major focus re resistance, is with respect to public health**
- **Man – generally a single focus**
  - **pathogens**

We Are Not Speaking The Same Language!

- **For foodborne pathogens & commensals in animals**
  - **“resistance” defined in European surveillance (EFSA) by epidemiological cut off values, not clinical breakpoints**
- **Human pathogens**
  - **clinical resistance defined by clinical breakpoints (EARS-Net, ECDC)**
    - **but different clinical breakpoints used across Europe**

Consequently Challenging To Interpret The Data – but the big picture shows ..



Fluoroquinolone use in food animals is very low in Denmark; data for 2010 shows 1 kg used in cattle. Fluoroquinolone decreased susceptibility levels are similarly very low in all animal species and clinical resistance is absent

Our Challenge

- **What does this mean for public health?**
- **We must not jump to simplistic and what can often be wrong conclusions**

FOODBORNE PATHOGENS AND DISEASE
Volume 9, Number 8, 2012

DOI: 10.1089/fpd.2012.1160

Letter to the Editor

Confusion over Antibiotic Resistance: Ecological Correlation Is Not Evidence of Causation

Louis A. Cox Jr.[1,2] and Randall S. Singer[3]

Vieira *et al* (2011) argued that resistance in *E. coli* isolates from food animals was highly correlated with resistance in isolates from humans supporting hypothesis that a large proportion of resistant *E. coli* isolates causing blood stream infections in man may be derived from food sources

Cox & Singer asked, "Is this causal interpretation of ecological correlations justified?"
They considered the answer to be no and argued that:

"Methods for sound causal inference, and guidance for refuting plausible alternative explanations, have been extensively developed in epidemiology. It would be well to apply them before announcing causal interpretations of ambiguous ecological correlations."

Communication between disciplines is imperative

Please Also Note

- **“Resistance” reported by EFSA for foodborne pathogens & commensals is different to resistance reported by US NARMS programme, for the same group of organisms**
  - **NARMS uses clinical breakpoints**
- **Have addressed the difference in definitions used in Europe re clinical breakpoints & epidemiological cut-off values**
- **BUT note that this impacts the scientific literature**

Resistance Transfer – Some Concluding Thoughts?

Antibiotic Resistance Transfer

- **Clearly it can happen but direct evidence is limited and indirect evidence does not always support transfer across animal species**
  - ***"We determined the prevalence of plasmid-mediated quinolone resistance mechanisms among non-Typhi Salmonella spp. isolated from humans, food animals, and retail meat in the US, 2007. Unlike the human strains, no animal or retail meat isolates harboured a plasmid-mediated mechanism"***

    ……Sjölund-Karlssson *et al* (2010)
- **and**

Functional Characterization of the Antibiotic Resistance Reservoir in the Human Microflora

Most of the resistance genes identified with culture independent metagenomic sampling from the same samples were novel when compared to all known genes in public databases. This suggests that barriers exist to lateral gene transfer between these bacteria and readily cultured human pathogens

Sommer *et al*, 2010

human pathogens, we
ny individuals. Most of the
een previously identified
half of the resistance
crobiome) are identical to
ance genes in the human
uman pathogens.

Science (2009) 325:1128

A Further Point of Note

- Issues different according to antibiotic class
- Issues different according to animal species
  - ESBLs can be considered an issue in poultry but not in cattle
    - yet 3 & 4 generation cephalosporins not approved for poultry
- Issues can be different from country to country
  - e.g. MRSA in pigs & ESBLs - The Netherlands vs UK

To Bring Everything Together
- we must follow a risk based approach

Journal of Food Protection, Vol. 67, No. 5, 2004, Pages 980–992

Public Health Consequences of Macrolide Use in Food Animals: A Deterministic Risk Assessment†

H. SCOTT HURD,[1]* STEPHANIE DOORES,[2] DERMOT HAYES,[3] ALAN MATHEW,[4] JOHN MAURER,[5] PETER SILLEY,[6] RANDALL S. SINGER,[7] AND RONALD N. JONES[8]

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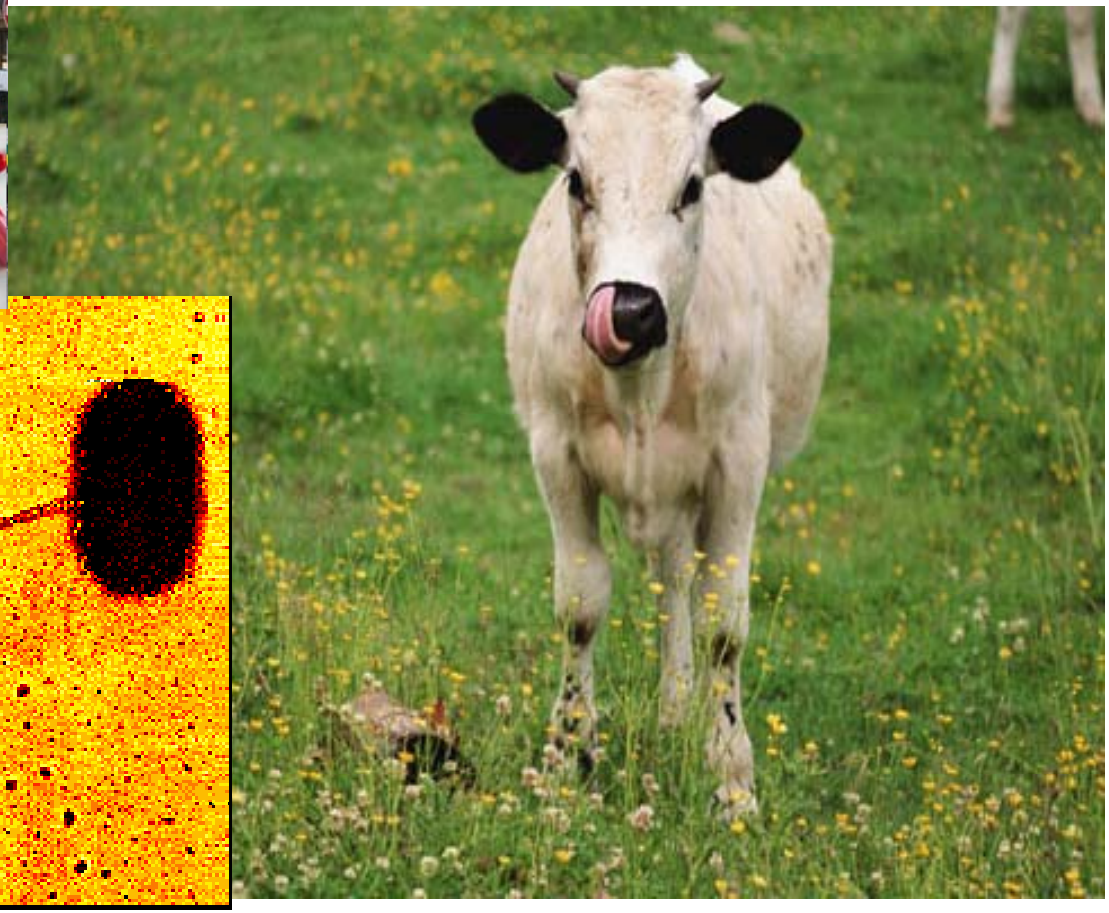
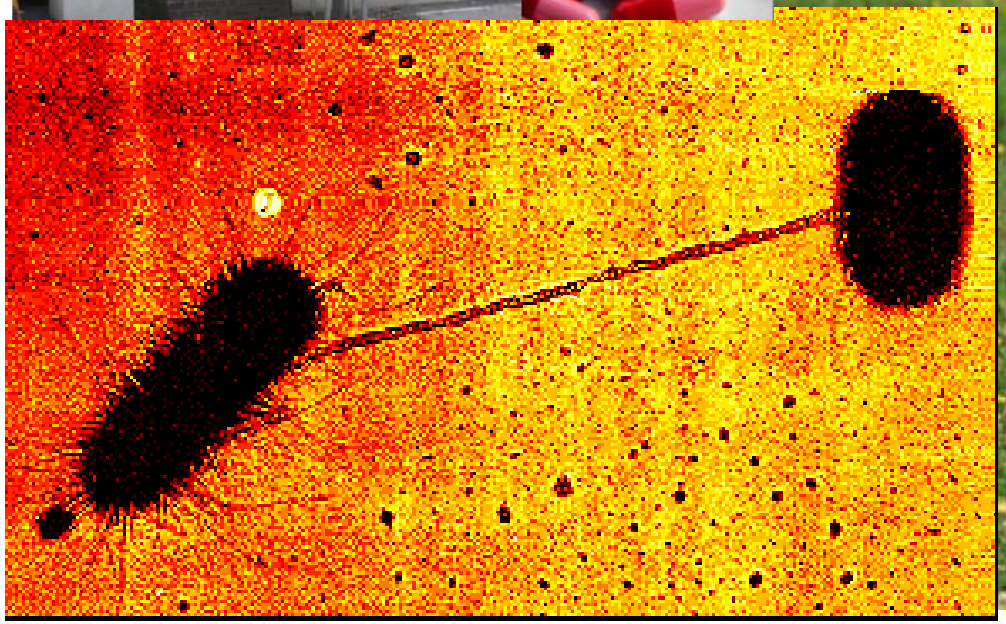
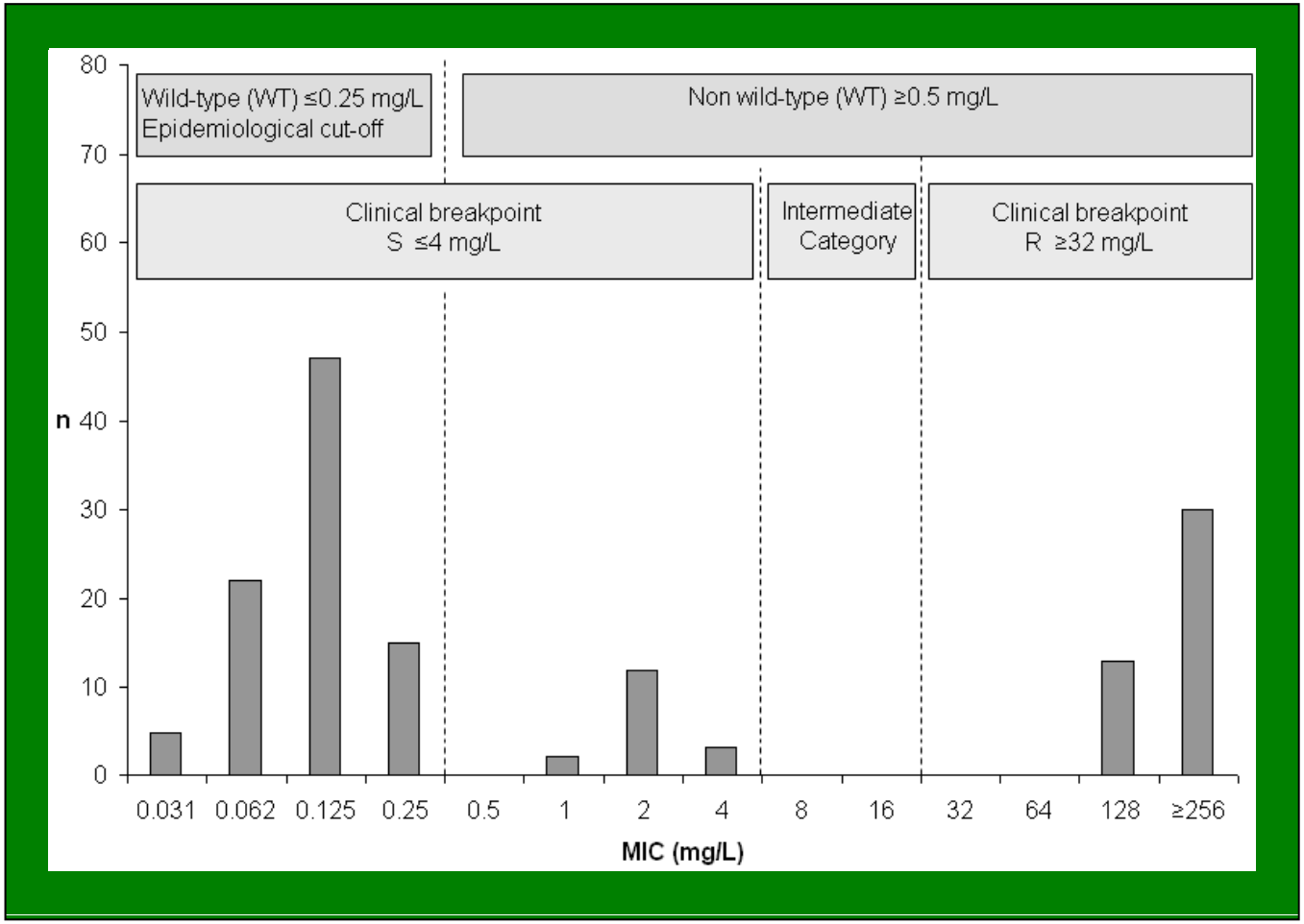
This farm-to-patient risk assessment demonstrated use of macrolides in food animals presents a low risk with an approximate probability of <1 in 10 million & <1 in 3 billion for foodborne illness from *Campylobacter* spp & *E. faecium* respectively, indicating current uses of macrolides in cattle, poultry & swine appear to create a risk much lower than the potential benefit to food safety, animal welfare & public health

Thanks for your attention





Resistance or Decreased Susceptibility?



Susceptibility distributions for ciprofloxacin & avian *E. coli*, SVARM 07, DANMAP 07, MARAN 07