UPDATE ON DEMONSTRATED RISKS IN HUMAN MEDICINE FROM RESISTANT PATHOGENS OF ANIMAL ORIGINS

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DIRECTLY OR INDIRECTLY BACTERIA ARE TRANSMITTED FROM ANIMALS TO HUMAN (1)

- Food borne disease are a global persistent and challenging problem:
  - High frequency circa 70 millions patients/year in USA
  - Unconfirmed diagnostic often
  - High incidence of unknown or new causal agents
  - Lack of surveillance systems in many countries
- Food borne disease are likely on the rise: increasing population; large scale production; wide distribution of food; globalisation of food supply

DIRECTLY OR INDIRECTLY BACTERIA ARE TRANSMITTED FROM ANIMALS TO HUMAN (2)

- The most studied bacteria :
  - Non typhoidal salmonellas
  - Campylobacter jejuni, coli
  - Escherichia coli
    - Commensals
    - Pathogenic
- Methicillin resistant staphylococcus aureus
- Salmonella and campylobacter are the cause of 20% of food borne illness (Scallan, 2011).
- Acquisition of antimicrobial resistance traits is frequent(constant evolution)
- A huge diversity of pattern of antimicrobial resistance can be observed.

DIRECTLY OR INDIRECTLY BACTERIA ARE TRANSMITTED FROM ANIMALS TO HUMAN (3)

- Antimicrobial resistance traits in bacterial pathogens widen the medical problem of a food borne illness and make it both individual and social:
  - Treatment of the patients: need appropriate antibiotic (Lab. Test; cost; delay of treatment)
  - Possible association of the resistance traits to virulence markers
  - Clonal spread of the strains
  - Horizontal transfer and dissemination of the resistance traits.

(Watanabe 1963. Transferable plamids – Shigella dysenteriae)

E.S. Anderson, 1968

"The transmission of drug resistant Salmonella typhimurium type 29 directly on indirectly from bovines to man, resulted in many human infections.

Transferable drug resistance reaching man from enterobacteria of animal origin may ultimately enter specifically human paghogens"

M. Swann, Report 1969

"Acquired antimicrobial resistance traits are related specially to low dose antibiotics used as growth promoters"

45 years later

- Large number of studies – Link between acquired resistance and usage of a particular antibiotic and transmission of bacteria from animal to human were established.
- Antibiotics as growth promoters banned in Europe, 2006.
- Global awareness:
  - Important antibiotics in humans and in animals
  - Danger of antimicrobial resistance.
- Need to tackle the problem.

ACTIONS AND RESEARCH (1)

Surveillance programmes:

- Surveillance of antimicrobial resistance on selected bacterial species: pathogens and commensals – from patients, animals, retail food…
- Surveillance of antibiotics consumption in animals and in humans

- Different level of integration possible

- Surveillance aimed to:
  - Follow-up of antimicrobial resistance
  - Follow-up of antibiotic consumption
  - Detection of emerging problem
  - Outbreak early recognition
  - Data assembling for risk analysis process

ACTIONS AND RESEARCH (2)

Surveillance programmes (contd):

- Implementation needed in most countries
- Harmonisation of methods is essential
- Major role of OIE, WHO and FAO
- More countries are recently developing, adapting and improving surveillance systems.
- Already such effort allowed:
  - global follow-up of salmonella
  - characterisation of ESBL(CTX-M-1) in E. coli isolated from animals and from a human
  - Quicker detection of outbreak origin.

ACTIONS AND RESEARCH (3)

Tentative to quantify

- OIE Standard and Codex Alimentarius Guidelines

- Few studies have measured the risk for human related to antimicrobial resistance bacteria originated from animals. Detailed studies are uncommon. Absence or paucity of data needed for such studies is recognised. Their results remain limited.

- For fluoroquinolone-resistant campylobacter it was shown that variation of fitness costs for resistance may explain the persistence and the slow disappearance of resistant strains in absence of the selecting antibiotic(Kempf 2011) The withdrawal of fluoroquinolone use in poultry was effective in the US sept. 2005

ACTIONS AND RESEARCH (4)

Modelisation – Emergence – Dissemination

- In order to define strategies and choose management options, the model linking usage of antimicrobial and emergence and spread of resistance:
- Need to incorporate new technological findings, and new factors of spread, to previous models, taking in account ecological characteristics of bacterial populations and mechanism of resistance:
  - an antibiotic is not the sole selector
    - Cross selection
    - Co selection (genes link and multiple resistance mechanisms: e.g. efflux)

ACTIONS AND RESEARCH (4)

Modelisation – Emergence – Dissemination (cont.)

- other compounds than antibiotics (biocides, heavy metals, etc.) may select for resistance
- Emergence may occur in different places (animal gut, soil, water, different animals…)
- Spread and vehicles (vegetables, fruit, water..)
- Ways and junction of ways. Loops, cross contaminations.
- Bacteria along food processing. Stresses and resistance to them.

- There is no compartment, all usage of antibiotics contribute to the life of resistant bacteria. Factors regulating their incidence in different eco-niches or systems desserve some careful investigation,

THE BIG TASK

- Promotion of the prudent use
  - human priority
  - animal health
- Cooperation of all actors from farmer to consumer
- Country diversity and priorities
- Implementation of surveillance (no scapegoating)
- Decreasing the usage of antibiotics and combined it to hygiene and improvement of animal husbandry will hopefully help the control of antimicrobial resistance