

Antibiotic resistance from a food safety perspective



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Promiscuity of antibiotic resistance



- Any kind of antibiotic use, be it for human, animal or plant health purposes, can select for emergence of resistance and further promote the dissemination of resistant bacteria and resistance genes
- Antibiotic resistance does not respect phylogenetical, geographical or ecological borders
 - Antibiotic use in one ecological compartment, such as food animal production, can have consequences for the resistance situation in another ecological compartment, such as public health

Antibiotic use in food animals

- For therapeutic purposes
- For prophylaxis
- For growth promotion
 - Banned in the EU since 2006
- Use in food animals is substantial
 - Same antibiotic classes as in human medicine
 - Seems to outweigh use in humans in some countries
 - Nordic countries relatively low usage owing to prudent use policies
- Globalization of food trade - need for international action



Health consequences of resistance transmitted through the food chain

- Increased number of infections
- Increased frequency of treatment failures
- Increased severity of infections
 - Prolonged duration of illness
 - Increased frequency of bloodstream infections
 - Increased hospitalization
 - Increased mortality (*Salmonella*, *Campylobacter*)
- Increased costs to society
- Few new antibiotics are being developed to replace those becoming ineffective through resistance

Food as a source of antibiotic resistance



- Antibiotic resistant bacteria: *direct hazard*
 - Humans can be infected after food ingestion or handling
 - Zoonotic bacteria e.g. *Salmonella*, *Campylobacter*, *E. coli*
- Antibiotic resistance genes: *indirect hazard*
 - Transfer of resistance genes from a resistant bacterium to a pathogenic bacterium, directly, or via another commensal
 - Mobile genetic elements harboring resistance determinants can readily be transferred horizontally between bacteria from terrestrial animals, fish and humans
 - Can also take place in natural environments e.g. the kitchen
 - *E. coli* and *Enterococcus* spp.

Antibiotic resistant *Salmonella*



- Foodborne disease caused by antibiotic resistant *Salmonella* well documented
 - Through beef, pork, poultry, dairy products, eggs, fresh produce
 - The most common resistances observed are typically to those antibiotics that are frequently used in animal husbandry
 - E.g. 29% FQ resistance in *Salmonella* from broiler meat reported in the EU in 2007 (EFSA)
 - Multi-resistant clones a continuous problem
 - Antibiotic use in animals selects for antibiotic resistant *Salmonella*
 - Transmitted to humans in food, or through direct contact with animals
 - Resistance levels in *Salmonella* from pigs, cattle and broilers resembles those in corresponding foodstuffs and humans (EFSA)
 - Cephalosporin resistant *Salmonella* currently low in the EU, but spread along the food chain is of increasing concern

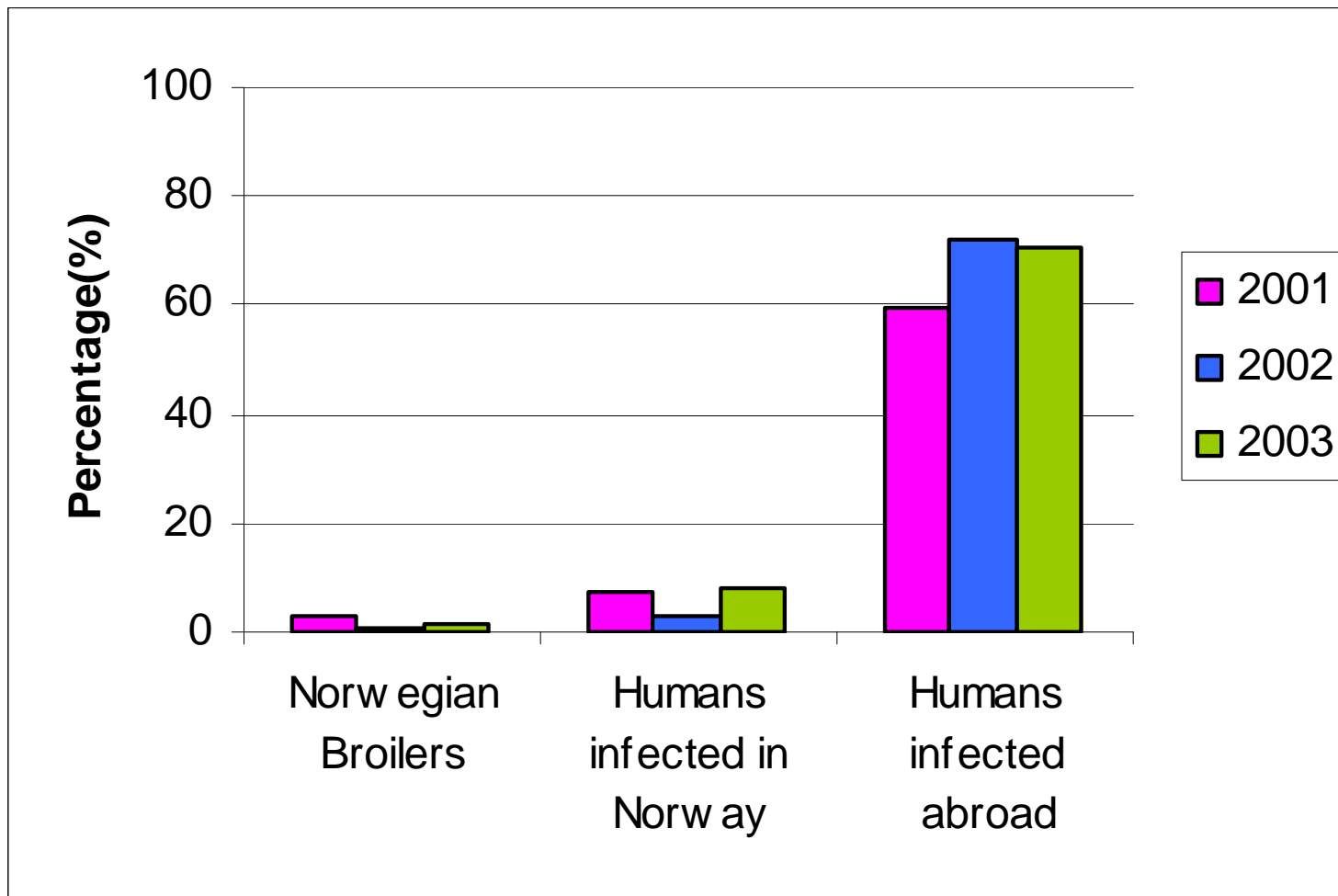
Antibiotic resistant *Campylobacter*



- Food, in particular poultry meat, is considered the most common infection route for *Campylobacter*, including resistant strains
 - *Campylobacteriosis* is the most frequently reported zoonotic disease in the EU
 - *Campylobacter* from poultry meat is frequently antibiotic resistant, in many countries also to fluoroquinolones
- Resistance emergence and its increase in *Campylobacter* from animals and humans is linked to the introduction of the antibiotic in food animals
 - FQ resistant *Campylobacter jejuni* in poultry
 - Macrolide resistant *Campylobacter coli* in pigs



FQ resistant *Campylobacter* in Norway



Source: Norstrom et al 2005

Antimicrobial resistance - EU

- Relatively high proportions of *Campylobacter* and *Salmonella* from animals and food are resistant to antimicrobials commonly used in human therapy
 - Fluoroquinolone resistance!



Source: EFSA and ECDC

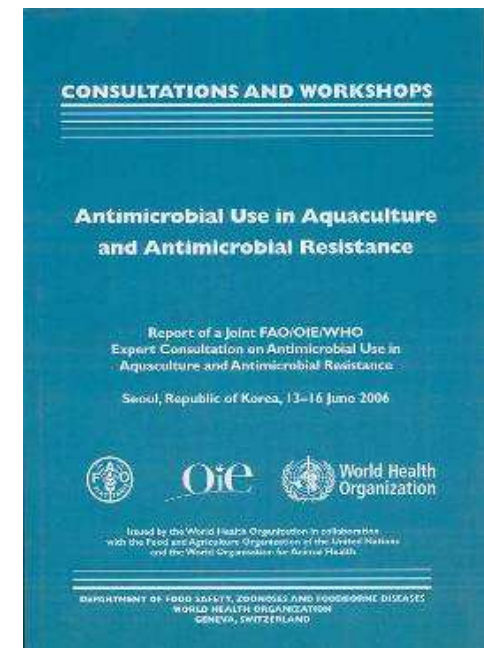
Antibiotic resistant *E. coli*



- Commensal *E. coli* can be a source of resistance genes for human pathogenic strains
 - Exchange of resistance genes between bacterial clones has been demonstrated experimentally in water, soil, on kitchen towels, on cutting boards, and on the surface of food
- A substantial proportion of resistant *E. coli* in human intestines might be derived from food and water
- Human pathogenic *E. coli* resistant to ciprofloxacin and 3rd generation cephalosporins are associated with the use of similar antibiotics (enrofloxacin and ceftiofur) in food animals, especially poultry
 - Emergence of extended-spectrum β -lactamase (ESBL)-producing *E. coli* in humans, cattle and poultry
 - Food, in particular chicken meat, could be important sources for spread to humans

WHO/FAO/OIE achievements on AMR since 1997

- International collaboration established
 - Codex Alimentarius, FAO, OIE, WHO
- Ca. 20 expert meetings and consultations
- Roles
 - Codex and OIE: normative work
 - FAO and OIE: practical guidance and capacity building
 - WHO: raise public awareness, monitoring, leading the debate
- Key publications



Codex ad Hoc Intergovernmental Task Force on AMR, 2007-2010

Objectives

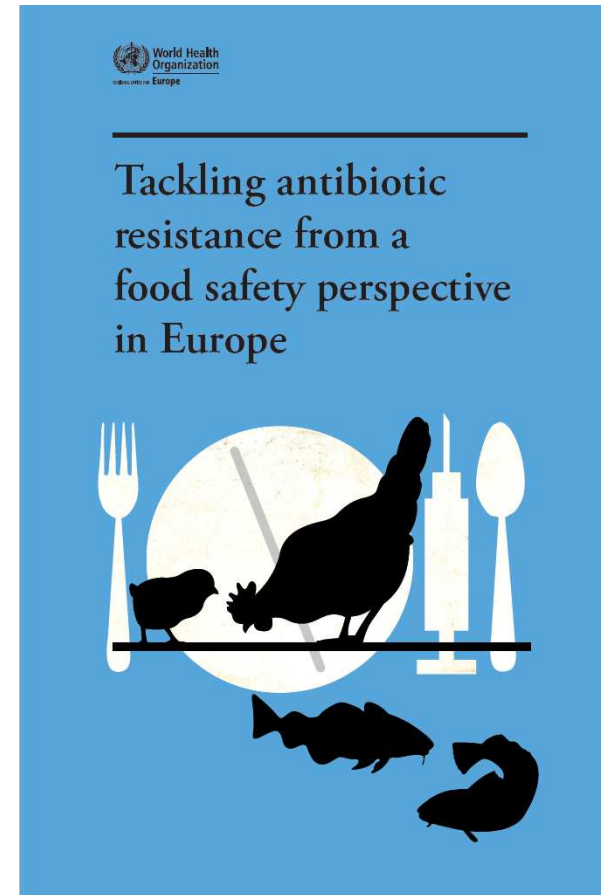
1. To assess the risks to human health associated with the presence in food and feed of antimicrobial resistant organisms, antimicrobial resistant genes or residues of antimicrobials
2. To develop risk management advice based on that assessment to reduce such a risk

Outcome

- Guidelines for the Risk Analysis of Foodborne Antimicrobial Resistance

Fighting antibiotic resistance is a priority for WHO/Europe

- European strategy adopted at RC61, September 2011
- New publication issued on occasion of the World health Day 2011 suggests actions for tackling antibiotic resistance from a food safety perspective



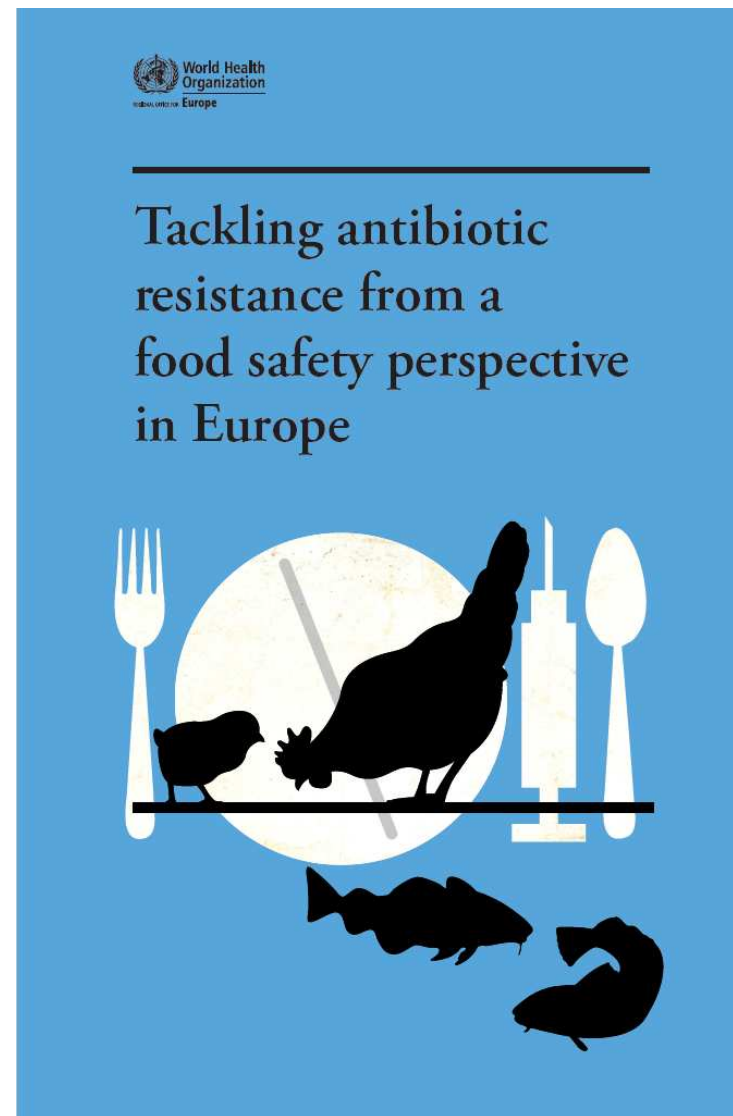
WHO European strategy on antibiotic resistance

Seven action areas:

1. Promote national coordination
2. Strengthen surveillance
3. Promote rational use of antibiotics, including surveillance of antibiotic consumption
4. Improve infection control and stewardship of antibiotic use in health care settings
5. Promote surveillance, prevention and control of antibiotic resistance in the food chain
6. Promote research and innovation on new antibiotics
7. Improve awareness on antibiotic use and risk of increasing resistance

Key messages for countries

1. Improve overall coordination
2. Improve regulatory framework
3. Reduce the need for and promote prudent use of antibiotics
4. Improve surveillance
5. Advocate and communicate
6. Build capacity and provide training
7. Address knowledge gaps and research needs



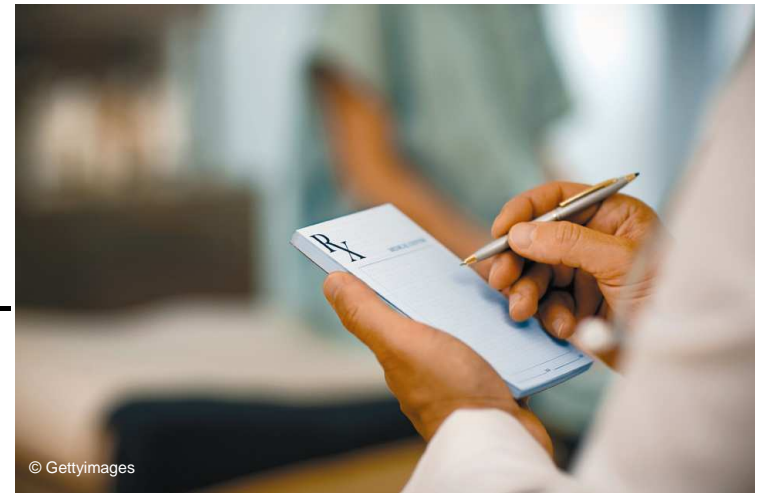
Action points for countries - I

- Overall coordination
 - National and international interdisciplinary cooperation
 - National intersectoral holistic strategy and action plan with an intergovernmental steering committee
 - Formal mechanism between health authorities and food safety/veterinary authorities



Action points for countries - II

- Improved regulatory framework
 - Eliminating the use of antibiotics as growth promoters
 - Requiring that antibiotics be administered to animals only when prescribed by a veterinarian
 - Requiring that antibiotics identified as critically important in human medicine – and especially fluoroquinolones and third- and fourth-generation cephalosporins – only be used in food animals if their use is justified



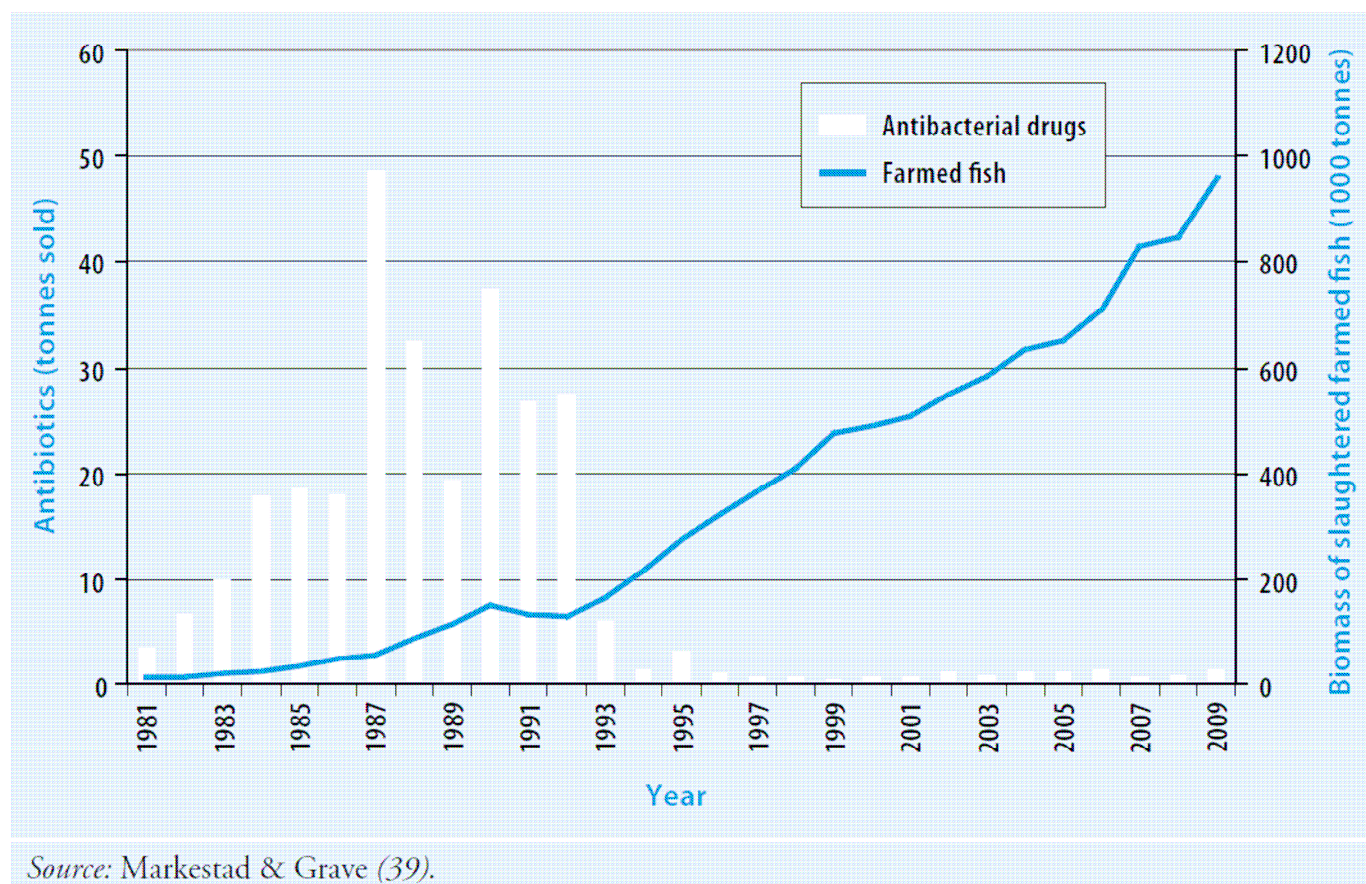
Action points for countries - III

- Reduce the need for and promote prudent use of antibiotics
 - Reducing the need for antibiotics in animal husbandry, by improving animal health through biosecurity measures, disease prevention (including vaccine use), and good hygienic and management practices
 - Eliminating economic incentives that facilitate the inappropriate prescription of antibiotics



Lessons learnt: the experience from Norway

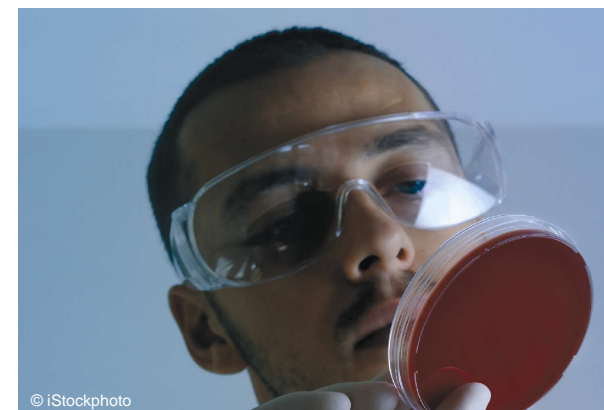
Antibiotic usage (tonnes) versus salmon and trout production (1000 tonnes) in Norway, 1981-2009



Action points for countries - IV

- Surveillance

- Establishing a surveillance system for the use of antibiotics in food animals
- Establishing an integrated (among public health, food and veterinary sectors) surveillance system to monitor antibiotic resistance in selected foodborne bacteria

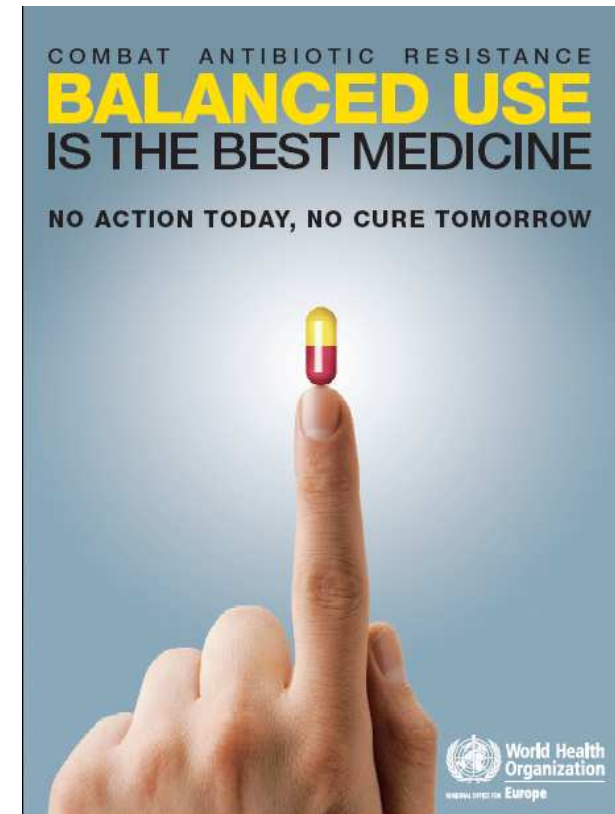


Survey in WHO EURO 2007

- Surveillance of antibiotic resistance in food bacteria
 - Most EU countries do have
 - Most non-EU countries do not have
- Surveillance of antibiotic usage in animals
 - Some EU countries do have
 - Most non-EU countries do not have
- Prescription for use of antibiotics in animals
 - Armenia, Kazakhstan, Russia, Turkmenistan, Ukraine:
Not required
 - Unknown in several other countries

Action points for countries - V

- Advocacy and communication
 - Raise awareness of antibiotic resistance from a food safety perspective
 - Prompt action that prevents the development and spread of antibiotic resistance in the food chain



Action points for countries - VI

- Training and capacity building
 - Develop guidelines on the prudent use of antibiotics in food animals, taking a multidisciplinary approach.
 - Provide the training needed to implement them



Action points for countries - VII

- Knowledge gaps and research needs
 - Support studies that help provide comparable data on antibiotic resistance and usage for risk assessment and risk management
 - Strengthen research on the development and spread of resistance and on the development of new antibiotics and alternative approaches to antibiotic therapy

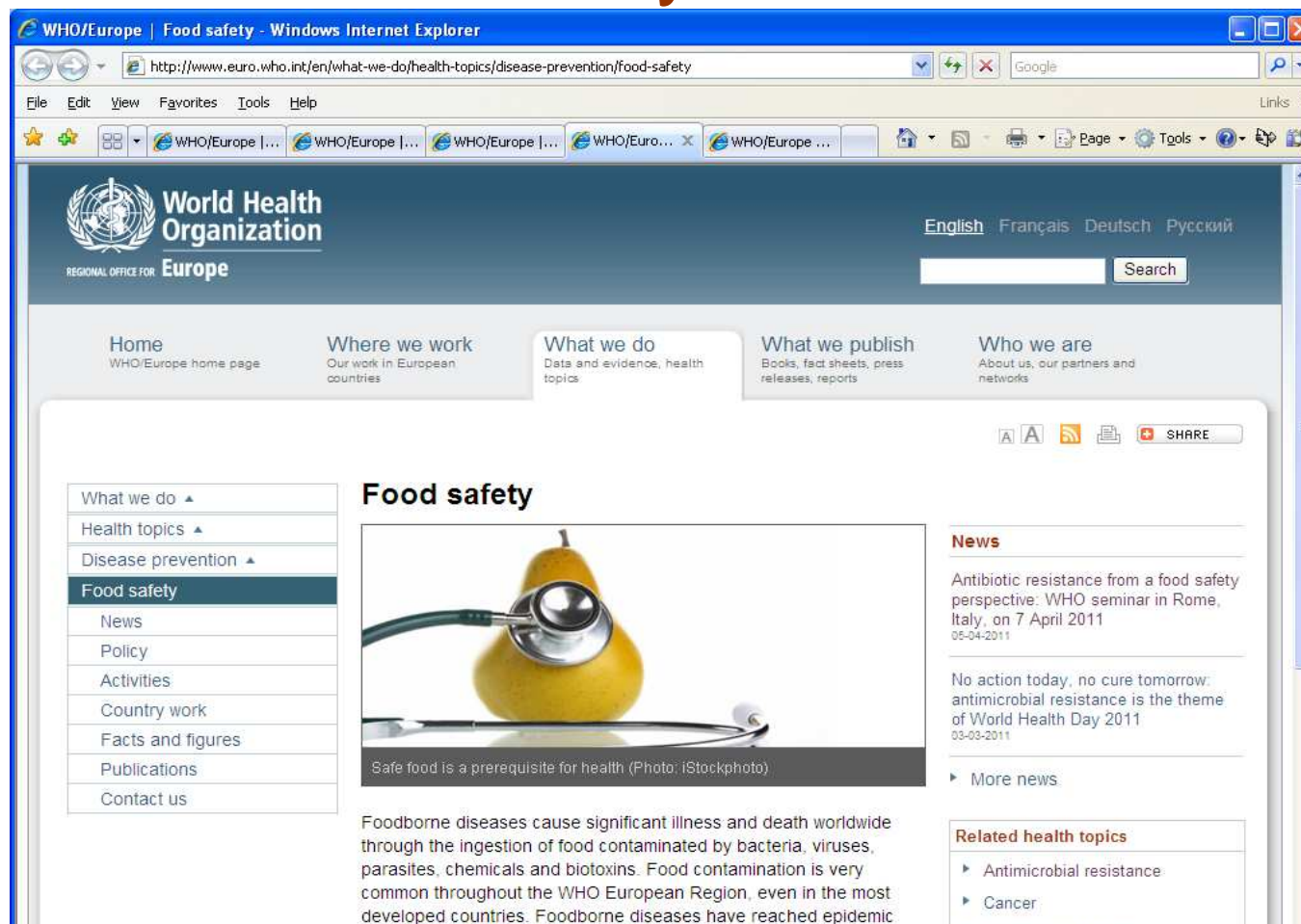


Source: US Centres for Disease Control and Prevention

Conclusions

- Spread of antibiotic resistance through the food chain a growing public health problem and concern
- Antibiotic resistance needs an intersectoral multifaceted response, nationally and internationally
- Many actions are necessary at the national level to address antibiotic resistance from a food safety perspective
 - WHO hopes that the booklet can be useful for national authorities in developing and carrying out policies to contain antibiotic resistance and protect public health

Thank you!



<http://www.euro.who.int/foodsafety>