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English version

Report on antimicrobial resistance of zoonotic bacteria and commensal

2014

Poultry sector

Under the Decision 2013/652/UE

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Acronyms and definitions

AmpC	Ampicillinasi C, producing broad-spectrum cephalosporinases
AMR	Antimicrobial resistance
Zoonotic bacteria	Any bacterium that may cause a zoonosis.
Carbapenemi e tigeciclina	Antimicrobial molecules of critical importance for humans reserved for the exclusive use of human and for the therapy of severe infections. The monitoring of resistance towards these molecules is important in view of the fact that the use in the zootechnical sector of other molecules could cause emergency and diffusion of cross-resistance also towards tigecycline or carbapenems
CIAs	Critically Important Antimicrobials
Co-resistance	Contemporary resistance to two or more specific classes and sub-classes of antimicrobials
CRN-AR	Centro di Referenza Nazionale per l'Antibiotico-resistenza (National Reference Centre for Antibiotic Resistance)
DGSAF	Direzione Generale della Sanità Animale e del Farmaco Veterinario (Directorate General for Animal Health and Veterinary Drugs)
ECDC	European Centre for Disease Prevention and Control
EMA	European Medicines Agency
EFSA	European Food Safety Authority
ESBL	Extended Spectrum Beta-Lactamases (β-lattamasi ad ampio spettro)
ESC	Extended-spectrum cephalosporins (es. cefalosporine di 3° e 4° generazione)
ESVAC	European Surveillance of Veterinary Antimicrobial Consumption
FQ-R	Resistenza ai fluorochinoloni (Resistance to fluoroquinolones)
Isolates	Individual strains of microorganisms isolated by the use of culture media
IZS	Istituto Zooprofilattico Sperimentale
MIC	Minima Concentrazione Inibente (Minimum Inhibitory Concentration)
MR	Multi-resistance (resistance to at least 3 different classes of antimicrobials)
OIE	World Organisation for Animal Health
PNC	Piano Nazionale di Controllo (National Control Plan)
Clinical Resistance (RC)	It is the degree of resistance of a bacterial agent to a particular antimicrobial agent, which results in a therapeutic failure highly likely even if the bacterial agent is exposed to the maximum amount that can be used for such therapeutic antimicrobial in the patient to be treated. A specified threshold value-guide of MIC (clinical breakpoints, CB), expressed for example in mg/L for each combination antimicrobial/bacterial agent is used to define the clinical resistance. This value of MIC for a bacterial agent isolated from clinical samples, is related to the concentrations that can be achieved in organs/ tissues of the infected patient.
Microbiological resistance (RM)	It is defined by the ability of a bacterial agent to survive (resist) in the presence of concentrations of a given antimicrobial agent to which a bacterial agent "sensitive" of the same species can not survive. To define the Microbiological Resistance, it is used as a threshold value of MIC, called "Epidemiological Cutoff value" (ECOFF), for each combination antimicrobial / bacterial species. It is based on analysis of data distributions of MIC obtained for that combination antimicrobial / bacterial species (eg. EUCAST, www.eucast.org). The value of MIC used may or may not coincide with that used in the clinical breakpoints, which serve to define the Resistance Clinic.
Sulfonamides - interpretive criteria	The current criteria for interpretation of susceptibility testing related to sulfonamides of isolates of Salmonella spp. not allow its categorization in sensitive or resistant. However, isolates of Salmonella spp. which record very high concentrations of MIC for sulfamethoxazole (values ≥ 1024 mg / L, ie the higher concentration of antimicrobial provided in the test by dilution) demonstrate without doubt the ability to resist against this molecule.
Zoonoses	Any disease and/or infection which is naturally transmissible directly or indirectly between animals and humans.

Foreword

The antimicrobial resistance is a major threat to public health worldwide, with a significant impact in the field of animal health and food safety.

The AMR is a natural biological phenomenon of adaptation of some organisms that acquire the ability to survive or grow in the presence of a concentration of an antimicrobial agent that is usually sufficient to inhibit or kill microorganisms of the same species. The capacity of resistance occurs by genetic mutations or by acquiring, from other organisms, the pre-established resistance genes. As defined in the OIE Terrestrial Animal Health Code, an antimicrobial agent is a natural semi-synthetic or synthetic substance that exhibits antimicrobial activity (kill or inhibit the growth of microorganisms) at concentrations attainable in vivo. Anthelmintic and other substances classed as disinfectants or antiseptics are excluded from this definition.
The Antimicrobials are essential in human and veterinary medicine, in the fight against infectious diseases caused by bacteria, but their overuse and/or misuse can contribute greatly to exacerbate the phenomenon of AMR, exerting strong selective pressures on the microbial population, resulting in:

- loss of efficacy of therapies;
- greater likelihood and severity of the disease;
- greater spread of disease;
- reduction of productivity and efficiency of breeding.

In 2011, the European Commission has set up a five-year action plan, divided into 12 key actions, including “Strengthening AMR systems surveillance and the consumption of antimicrobials in veterinary medicine “(Action 10), in order to combat the growing threats connected with antimicrobial resistance.

Among the concrete initiatives to implement such action, there is the Commission implementing decision of 12 November 2013- Decision 2013/652/EU- regarding the monitoring and the reports on antimicrobial resistance of zoonotic bacteria and commensals, whose results are contained in this report.

Antimicrobial resistance of zoonotic bacteria such as Salmonella, Campylobacter, Escherichia coli, is a source of concern as it may compromise the effective treatment of the infection in humans.

Surveillance and monitoring

Improper use of antimicrobials in livestock is a potential risk factor for the selection and spread of resistant microorganisms and determinants of AMR from animals to humans through the consumption of foods. However, it is necessary to deepen the impact that the use of antimicrobials in animal husbandry has on human health. In fact, the mechanism by which the resistance can be transferred to humans and the extent of the threat that this poses to human health is still unclear.

The EU Summary Report on antimicrobial resistance in zoonotic and indicator bacteria from humans, animals and food (EFSA / ECDC) relates the use of antimicrobials in livestock production and the development of resistance in zoonotic bacteria, such as Salmonella spp. and Campylobacter spp., as well as the increase of resistance genes in commensal bacteria (Escherichia coli or Enterococcus spp.), animals and humans, which act as a reservoir of resistance determinants.

Hence the need to collect comparable data on antimicrobial resistance in zoonotic agents and non – zoonotic agents, along the entire food chain, in order to evaluate trends and sources of resistance.

Currently, the surveillance and monitoring of AMR are based on different provisions, both European and national as well as on recommendations on the prevention and reduction formulated by EFSA:

- **Directive 2003/99/EC** on the monitoring of zoonoses and zoonotic agents transposed by Legislative Decree 4 April 2006, n. 191;
- **Decision 2007/407/EC** on a harmonized monitoring of antimicrobial resistance in Salmonella in poultry and pigs repealed by Decision 2013/652/EU on the monitoring and the reports on antimicrobial resistance of zoonotic bacteria and commensals.

These activities allow to:

- Evaluate and determine the trends and sources of AMR;
- Detect the emergence of new mechanisms of AMR; Provide the necessary data for risk analysis both in veterinary and human field;
- Provide principles for recommendations and/or provisions in veterinary and human field;
- Provide information for the evaluation of prescribing practices and recommendations on prudent use of antimicrobials;
- Evaluate and determine the effects of actions taken to combat the phenomenon.

Active

It is the execution of specific samples in implementation of AMR national programs of surveillance or monitoring aimed at providing reliable information on the presence and/or absence and/or extent of the phenomenon.

1. Surveillance and monitoring of zoonoses and zoonotic agents

Directive 2003/99/EC, implemented with L. decree April 4, 2006, no. 191, establishes for the Member States the obligation to ensure an appropriate surveillance of zoonoses, zoonotic agents and antimicrobial resistance related thereto and a proper epidemiological investigation of food-borne outbreaks, to enable the collection in the Community of the information necessary to evaluate relevant trends and sources.

For specific aspects of surveillance of antimicrobial resistance, the Memebr States must ensure that the monitoring system provides relevant information at least with regard to a representative number of isolates of Salmonella spp., Campylobacter jejuni and Campylobacter coli originated from cattle, pigs and poultry as well as food products of animal origin derived from those species.

Decision 2007/407/EC, repealed by Decision 2013/652/EU provides also detailed rules for the monitoring of antimicrobial resistance in Salmonella spp. in chicken (*Gallus gallus*), turkeys and pigs for slaughter.

The surveillance is carried out by the Veterinary Services of the competent authorities in the local stage or stages of the food chain most appropriate to the zoonosis or zoonotic agent concerned, in particular:

- at the level of primary production;
- at other stages of the food chain, including the production of food and feed.

In addition, food business operators, in case of detection of zoonoses and zoonotic agents that are subject to surveillance, have the obligation to communicate the results, providing the isolates requested by the competent authority, for the necessary investigation food- borne outbreaks.

By the end of May of each year, the Ministry of Health shall send the European Commission a report on trends and sources of zoonoses, zoonotic agents and antimicrobial resistance, covering the data collected during the

previous year. The monitoring of the antimicrobial resistance in the agents under the law is supported by the CRN-AR, at the IZS Lazio and Tuscany.
National reports are used as basis for the European summary reports, elaborated by EFSA and ECDC, and are available at the following link:
http://www.efsa.europa.eu/en/zoonosesscdocs/zoonosescomsumrep.htm
In Italy, a comprehensive and harmonized collection of information needed to evaluate trends and sources of AMR has been guaranteed until 2013, from isolates of Salmonella spp. derived from samples of the National Plan for Control of salmonella in poultry, under Regulation (EC) No 2160/2003, available at the following link:
http://www.salute.gov.it/portale/news/p3_2_1_1_1.jsp?lingua=italiano&menu=notizie&p=dalministero&id=1897.
It applies throughout the country, in all groups of the following species and production sectors, except for family farmers:

- *Gallus gallus*;
- *Gallus gallus* hens;
- *Gallus gallus* broilers;
- Breeding turkeys;
- Turkeys for fattening.

The objective is to reduce, over the previous year, the prevalence of relevant serotypes 1% in breeding flocks of Gallus gallus, broilers and turkeys for breeding and fattening and 10% in laying hens.
Relevant serotypes refers to:

- *Salmonella Enteritidis and Typhimurium*, including monophasic variant with antigenic formula 1,4 [5], 12: i:-., Virchow, Infantis, Hadar (for breeding flocks of Gallus gallus);
- *Salmonella Enteritidis and Typhimurium*, including monophasic variant with antigenic formula 1,4 [5], 12: i:- (for groups of hens, broilers, turkeys for breeding and fattening).

The PNC provides veterinary supervision on farms under the program, in order to evaluate the application of biosecurity measures and other actions foreseen by the self-control plans of the companies, in addition to official sampling and sampling at the initiative of the farmer (so-called "self-control").
Table 1 shows a summary of results obtained from official controls carried out in implementation of the PNC on salmonellosis in poultry in 2014, only for the species and production sectors of interest for this report (broilers and turkeys for fattening).
The official sampling of 2014 was higher than the minimum number of 74.7% (622 vs 356) for broilers and 35.2% (407 vs 301) for turkeys for fattening.
No. 1 group of broilers and no. 6 groups of fattening turkeys were found positive to *Salmonella* relevant serotype (prevalence of 0.16% and 1.47%, respectively), percentages that attest the achievement of the target set by the European standard. As regard to the flocks found positive to *Salmonella spp.*, the laboratories (IIZZSS and private) that perform the isolation, identification and serotyping, must be send to CRN-AR at least one isolate for each serotype found within each group.
The monitoring of other livestock production, in fact, is based on a voluntary system and connected to the experience and the information available in each Member State. In Italy, for example, it was based on data produced on isolates obtained from samples examined by the network of IIZZSS, as a result of different laboratory activities, of the diagnostic type (animals) or microbiology (food), and sent to the CRN-AR for AMR monitoring.

Table 1 – Overview Summary of official activities for the implementation of the National Plan Control for salmonellosis in poultry - Year 2014

Species/Product Types	Broilers	Turkeys for meat production
Number of groups surveyed	26.431*	5.578*
Minimum number groups to be sampled	356	301
n. groups sampled	622	407
n. positive groups in serotypes	**1**	**6**
n. groups positive for Salmonella spp	**92**	**42**
Percentage implementation	**74,7%**	**35,2%**

2. Monitoring of antimicrobial resistance of zoonotic bacteria and commensals

The Decision 2013/652/EU which establishes new procedures for harmonized monitoring and reporting on antimicrobial resistance of zoonotic bacteria and commensals, has strengthened the harmonized system of official control allowing a more extensive and representative comparability of the information received at European level through data originated from major chains of animal origin: poultry, cattle and pig.
The new regulations, applicable since 1 January 2014, has defined detailed rules for the preparation and implementation of the plan that is prepared annually by the Ministry of Health- DGSAF- in collaboration with the CRN-AR.
In particular:

2.a. Bacterial Species

Mandatory - *Salmonella spp., Campylobacter jejuni, Escherichia coli* (indicator commensal) and *Salmonella spp.* and *Escherichia coli* producing extended

spectrum beta-lactamase (ESBL) and AmpC type or carbapenemases;
Voluntary - *Campylobacter coli, Enterocuccus faecalis, Enterococcus faecium*.
The inclusion of the monitoring of commensal bacteria that can sometimes become pathogens, such as E. coli and Enterococcus spp., derives from their specific role in the development, exchange and dissemination of resistance determinants to other antimicrobial agents, especially in the intestines of animals of zootecnic interest.

2.b. Populations of food-producing animals / food categories and sample rate

A system of annual rotation allows to test:
- laying hens, broilers and their fresh meat, turkeys for fattening in the years 2014, 2016, 2018 and 2020;
- fattening pigs, cattle under one year, fresh meat of pigs and cattle in the years 2015, 2017, 2019.

2.c. Origin of isolates and sampling sites

Isolates, as well as coming from official samples taken by the competent authority in the implementation of this plan, originate from specimens obtained from:
- national programs to control salmonella and other specific zoonotic agents in foods, in accordance with Regulation (EC) No. 2160/2003;
- checks and verification of compliance with the rules and process hygiene criteria in accordance with Regulation (EC) No. 2073/2005 on microbiological criteria for foodstuffs

Table 2 shows the diagram of the sampling of bacterial species whose monitoring is required, in combination with the type of animal populations / categories of foods / sampling site / material to be taken.
If the number of isolates is not sufficient to obtain the minimum number of blocks to be subjected to antimicrobial susceptibility testing required under the regulations, because of a low prevalence of bacteria or a low number of epidemiological units, it is possible to use the isolates obtained from food business operators, on condition that they have been produced in accordance with the standards mentioned above.

Table 2 – Sampling scheme of bacterial species whose monitoring is voluntary, in combination with the type of animal populations / food categories / sampling seat / material to be taken

Bacterial species	Animal population	Stage of food chain	Material taken	Regulatory Status
Salmonella spp.	Laying hens	Breeding	faeces	reg. (CE) n. 2160/2003
	Broilers	Breeding	faeces	reg. (CE) n. 2160/2003 reg. (CE) n. 2073/2005
	Fattening turkeys	Slaughterhouse	carcasses	reg. (CE) n. 2160/2003 reg. (CE) n. 2073/2005
	Fattening pigs	Breeding	faeces	reg. (CE) n. 2073/2005
	Cattle aged less than 1 year	Slaughterhouse	carcasses	reg. (CE) n. 2073/2005
C. jejuni	Broilers	Slaughterhouse	carcasses	dec. 2013/652/UE
	Fattening turkeys	Slaughterhouse	carcasses	dec. 2013/652/UE
E. coli	Broilers	Slaughterhouse	cecum	dec. 2013/652/UE
	Fattening turkeys	Slaughterhouse	cecum	dec. 2013/652/UE
	Fattening pigs	Slaughterhouse	cecum	dec. 2013/652/UE
	Cattle aged less than 1 year	Slaughterhouse	Cecum	dec. 2013/652/UE
E. coli ***produttore ESBL o AmpC o carbapenemasi****	Broilers	Slaughterhouse	cecum	dec. 2013/652/UE
	Fattening turkeys	Slaughterhouse	cecum	dec. 2013/652/UE
	Fattening pigs	Slaughterhouse	cecum	dec. 2013/652/UE
	Cattle aged less than 1 year	Retail	fresh meat	dec. 2013/652/UE
	pigs	Retail	cecum	dec. 2013/652/UE
	cattle	Retail	cecum	dec. 2013/652/UE
C. coli	broilers	Slaughterhouse	Cecum	dec. 2013/652/UE
	Fattening pigs	Slaughterhouse	Cecum	dec. 2013/652/UE
E. faecalis ***E. faecium***	broilers	Slaughterhouse	Cecum	dec. 2013/652/UE
	Fattening turkeys	Slaughterhouse	Cecum	dec. 2013/652/UE
	Fattening pigs	Slaughterhouse	Cecum	dec. 2013/652/UE
	Cattle aged less than 1 year	Slaughterhouse	Cecum	dec. 2013/652/UE

**Not mandatory, for the year 2014, in broilers and their fresh meat and turkeys for fattening*

It is important to underline that for 2014, the Decision 2013/652/EU has not indicated as mandatory the monitoring of E. coli ESBL or AmpC or carbapenemases in broilers and their fresh meat and turkeys for fattening.

2.d Minimum number of samples, minimum level of isolates, and region of the samples taking

For the year 2014, the European Commission has indicated in n. 850 the number of samples of cecum to be taken to the slaughterhouse for each category of animals involved (broilers and turkeys for fattening). This as a function of the minimum expected number of isolates to be subjected to antimicrobial susceptibility testing (n. 170 for each combination of bacterial species and type of samples of animal population or food category).
Each isolate comes from a single epidemiological unit at random (random sampling) and sampled only once this year. Thus, the requirement *"Not more than one isolate per bacterial species from the same epidemiological unit per year shall be included in the monitoring"* is met, considering that, in this case, the epidemiological unit (avian species) means the group.
The samples are divided among the Regions with the highest vocation poultry, according to the criterion

Table 3 – Regional distribution of samples of cecum

Broilers	
Regions	n. caecal samples
Abruzzo	72
Emilia Romagna	162
Lombardia	112
Marche	85
Piemonte	40
Veneto	379
TOTAL	**850**

Fattening turkeys	
Regioni	n. caecal samples
Emilia Romagna	216
Lombardia	86
Toscana	55
Veneto	494
TOTAL	**851**

"the taking of sampling shall be carried out in the slaughterhouses which convert at least 60% of the specific national animal population, starting from slaughterhouses with the highest performance" (Table 3).
Each Region, in implementing this Plan, plans the activities to be carried out on the competent territory by distributing the samples assigned between the AUSL in view of local production, ensuring a sampling uniformly distributed throughout the year.

2.e Antimicrobial susceptibility testing

All samples of cecum are sent to CNR-AR for the subsequent isolation, identification, typing and analysis of the resistance profiles.
Samples from other activities as listed in section (2.c), are analyzed by the IZS with territorial competence and the isolates sent to CRN-AR for the analysis of resistance profiles.
The antimicrobial susceptibility testing of isolates are carried out in accordance with the requirements of the Annex of Decision 2013/652 / EU, part A, point 3.

2.f Results

Table 4 shows the activity of taking samples of cecum for the implementation of this plan.

Table 4– Activities of taking samples of cecum - Year 2014

Regions	Animal category	n. of samples run	n. of samples suitable for the analysis
Abruzzo	chicken	28	28
	turkey	4	4
Emilia-Romagna	chicken	86	86
	turkey	133	129
Lombardia	chicken	114	114
	turkey	84	84
Marche	chicken	85	85
Piemonte	chicken	40	40
Toscana	turkey	55	55
Veneto	chicken	356	356
	turkey	286	286
Total	**chicken**	**709**	**709**
	turkey	**562**	**558**
TOTAL		**1.271**	**1.267**

- ***Salmonella spp.***

Table 5 shows the number of samples of caecum examined for Salmonella spp., for region sampling, and the number of samples in which it was isolated. These figures are based on cross-sectional study, carried out on a voluntary basis (it is not mandatory indeed, the monitoring of Salmonella spp. in caecal samples from the slaughterhouse in accordance with Decision

2013/652/EC), in order to allow the comparison with the results obtained by the PNC of salmonella in poultry and estimate, thus, the prevalence and trends of AMR. Overall, **18,63%** of samples analyzed for Salmonella spp were evaluated positive with the following subdivision:

- broilers, **12,69%**, equal to 90 positive samples out of 709 analyzed;
- turkeys for fattening, **26,16%**, equal to 146 positive samples out of 558 analyzed.

For broilers, 89 isolates were subjected to antimicrobial susceptibility testing, with the following results: *only 12.36% of the isolates showed sensitivity to all the antimicrobial substances provided in the monitoring of AMR (defined "fully susceptible"). 78,65% of isolates showed MR. Resistance to tetracycline, which represent the best-selling class of antimicrobials in Italy (Report ESVAC - 2013), was of 82,02%, while that to aminopenicillin (prototype: ampicillin) of 57.30%. Regarding the molecules of critical importance to humans (CIAs), 83,15% showed microbiological resistance to fluoroquinolones (of which 3.37% showed values in the range of resistances clinics) and 3.37% to cephalosporins of 3rd and 4th generation. A pattern of multiple resistance was frequently identified for trimethoprim, tetracycline, fluoroquinolones and ampicillins (44.94%).*
No resistance was detected for colistin, an antibiotic prototype of the class of polymyxin. 100% of the isolates presented a Minimum Inhibitory Concentration (MIC) of 2048 mg/L to sulfonamides (prototype: sulfamethoxazole). A resistance to tigecycline was detected in 8,99% of the isolates (8/89) with a MIC above Ecoff (2 mg / L), always found in isolates with high resistance to tetracycline (MIC = 64 mg /L). There were no resistance to carbapenems.

Table 5 – Number of samples of caecum examined for Salmonella spp

Sampling region	Animal category	n. samples suitable for the analysis	n. samples tested for spp. Salmonella	n. samples positive for Salmonella spp.	% positivity
Abruzzo	Chicken	28	28	4	14,29
	Turkey	4	4	0	0,00
Emilia-Romagna	Chicken	86	86	3	3,49
	Turkey	129	129	24	18,60
Lombardia	Chicken	114	114	10	8,77
	Turkey	84	84	22	26,19
Marche	Chicken	85	85	4	4,71
Piemonte	Turkey	40	40	0	0,00
Toscana	Turkey	55	55	7	12,73
Veneto	Chicken	356	356	69	19,38
	Tukey	286	286	93	35,52
Total	**Chicken**	**709**	**709**	**90**	**12,69**
	Turkey	**558**	**558**	**146**	**26,16**
TOTAL		**1.267**	**1.267**	**236**	**18,63**

For turkeys for fattening, 145 isolates were tested for antimicrobial susceptibility testing, with the following results: *Only 6.21% of the isolates showed sensitivity to all antimicrobial substances provided in the monitoring of AMR. The 68,97% of the isolates showed MR. The tetracycline resistance was of 90.34%, while 71.72% of the aminopenicillinII* . With regard to the molecules critical to humans (CIAs), *the 47,59% showed resistance to fluoroquinolones microbiological (of which 8.62% showed values in the range of clinical resistance). The resistance to colistin, belonging to the class of polymyxins, reached values of 8.28%. Co-resistance was observed for some CIAs, or between fluoroquinolones and colistin (5.52%). The 66,90% of the isolates presented a MIC of 2048 mg/L to sulfonamides (prototype: sulfamethoxazole). There were no resistance to tigecycline and carbapenems.*
With regard to the results obtained from samples (eg. Feces or environmental samples) taken in implementation of the PNC of salmonellosis (Regulation (EC) no. 2160/2003), 66 isolates of Salmonella spp. from broilers tested for antimicrobial susceptibility arrived at the CRN-AR: *40,91% of the isolates showed sensitivity to all antimicrobial substances provided in the monitoring of AMR (defined "fullysusceptible"). 48,48% of the isolates showed MR. The most common pattern of resistance was found to trimethoprim, tetracycline, fluoroquinolones and extended-spectrum cephalosporins (18/66, 27.27%) and in all isolates with MIC> 1024 mg / L for sulfametossazolo. Resistance to fluoroquinolones was of 54.54% (36/66, MIC range 0.125-1.0 mg / L, no isolated in the range of RC) with > 90% FQ-R that have proven also multiresistant. Resistance to cephalosporins of the 3rd and 4th generation was of 27.27% (18/66), always found in isolated multi-resistant, and also resistant to fluoroquinolones.*

The figure for 2014 confirms what has been found in the previous two years: the relevant proportion of resistance to cephalosporins of the 3rd and 4th generation in isolates resulting from PNC. Finally, 6.06% of the isolates were resistant to tigecycline, while there have been no resistance to carbapenems.
36 isolates of Salmonella spp. turkeys for fattening, were tested for antimicrobial susceptibility by CRN-AR, with the following results: only 16.67% of the isolates showed sensitivity to all antimicrobial substances provided in the monitoring of AMR (defined "fullysusceptible"), but 52,78% showed MR,, with a pattern frequently identified

by tetracycline, aminopenicillin , fluoroquinolones (25%) and gentamicin, tetracyclines, ampicillins and fluoroquinolones (13.88%). With regard to the CIAs, the 27,78% showed resistance to fluoroquinolones, with co-resistance to colistin (2.78%), which, inter alia, has shown resistance of 11,11% of isolates.
Resistance to cephalosporins of 3rd and 4th generation has not been detected. The 61,11% of the isolates presented a MIC> 1024 mg/L to sulfonamides (prototype: sulfametossazolo6).
30.56% of the isolates were resistant to gentamicin. No isolates were found resistant to tigecycline and carbapenems. Except for the emergence of resistance phenotypes colistin in this livestock production, the picture is almost similar to that of the previous years.

- ***Campylobacter spp.***

Table 6 shows the number of selected samples for the detection of *Campylobacter spp.* and the number of samples in which it was isolated *Campylobacter coli* and *C. jejuni.*
In general terms, **79,40%** of the samples analyzed resulted positive to *Campylobacter spp*., as follows:

- broilers, 72.92%, equal to 517 positive samples out of 709 analyzed. 34,98% (248 of 709) of the samples analyzed were positive for *Campylobacter coli* and 40,34% (286 of 709) for *Campylobacter jejuni*;
- turkeys for fattening, 87.63%, equal to 489 positive samples out of 558 analyzed. 72.58% (405 of 558) of the samples analyzed were positive for Campylobacter coli and 27,96% (156 of 558) for Campylobacter jejuni.

For broilers, a total of **261** isolates were randomly selected for antimicrobial susceptibility testing with the following results: *Only 6.51% of the isolates showed sensitivity to all antimicrobial substances provided in the monitoring of AMR, while 5.36% showed MR. The tetracycline resistance was of 78.93% and the resistance to fluoroquinolones has been widespread, reaching percentages of 90.04%. 3.07% of the isolates showed resistance to macrolides (erythromycin). A pattern of co-resistance to fluoroquinolones and tetracyclines was detected in 76.63% of isolates. Co-resistance to fluoroquinolones, macrolides and tetracyclines, was observed in 2.68% of the isolates.*

For turkeys for fattening, a total of **153** isolates were subjected to antimicrobial susceptibility testing with the following results: *Only 7.84% of the isolates showed sensitivity to all antimicrobial substances provided in the monitoring of AMR, while 9.15% showed MR. The tetracycline resistance was of 78.43% and the resistance to fluoroquinolones has been widespread, reaching percentages of 86.27%. 5.88% of the isolates showed resistance to macrolides (erythromycin). A pattern of co-resistance to fluoroquinolones and tetracyclines was detected in 72.54% of isolates. Co-resistance to fluoroquinolones, macrolides and tetracyclines, was*

Table 6 – Isolation of Campylobacter spp. and identification of Campylobacter jejuni and coli - Year 2014

Region	Animal category	n. suitable samples	n. samples positive for Campylobacter spp.	n. samples positive for Campylobacter jejuni	% samples positive for Campylobacter jejuni	n. samples positive for Campylobacter	% samples positive for Campylobacter coli
Abruzzo	Chicken	28	14	8	28,57	6	21,43
	Turkey	4	3	0	0,00	3	75,00
Emilia-Romagna	Chicken	86	55	34	39,53	21	24,42
	Turkey	129	116	48	37,21	90	69,77
Lombardia	Chicken	114	78	50	43,86	31	27,19
	Turkey	84	73	15	17,86	68	80,95
Marche	Chicken	85	60	29	34,12	32	37,65
Piemonte	Chicken	40	28	12	30,00	17	42,50
Toscana	Turkey	55	48	23	41,82	37	67,27
Veneto	Chicken	356	282	153	42,98	141	39,61
	Turkey	286	249	70	24,48	207	72,38
Total	**Chicken**	**709**	**517**	**286**	**40,34**	**248**	**34,98**
	Turkey	**558**	**489**	**156**	**27,96**	**405**	**72,58**
TOTAL		**1.267**	**1.006**	**442**	**34,89**	**653**	**51,54**

observed in 5.88% of the isolates.

- ***Escherichia coli***

Table 7 shows the number of selected samples for the detection of Escherichia coli and the number of samples in which it was isolated.
94,71% of the samples analyzed were positive for Escherichia coli, as distribute:

- broilers, 95.40%, equal to 332 positive samples out of 348 analyzed;
- turkeys for fattening, 93,95%, equal to 295 positive samples out of 314 analyzed.

It is important to underline that E.coli, as commensal, is usually a non-pathogenic microorganism, component of the normal bacterial flora of the intestine of man and animals. However in the dynamics between host and bacterial agents and in certain conditions, it may become an opportunistic pathogen.

For broilers, *a total of n. 170 isolates were randomly selected for antimicrobial susceptibility testing with the following results: Only 7.06% of the isolates showed sensitivity to all antimicrobial substances provided in the monitoring of AMR. 80,59% of the isolates showed MR.*

Table 7 – Isolation of Escherichia coli – year 2014

Region	Animal category	n. suitable samples	n. samples analyzed for E.coli	n. samples positive for E. coli	% positivity
Abruzzo	Chicken	28	15	13	86,67
	Turkey	4	2	2	100,00
Emilia-Romagna	Chicken	86	35	32	91,43
	Turkey	129	68	62	91,18
Lombardia	Chicken	114	59	58	98,31
	Turkey	84	49	48	97,96
Marche	Chicken	85	50	46	92,00
Piemonte	Chicken	40	20	19	95,00
Toscana	Turkey	55	38	37	97,37
Veneto	Chicken	356	169	164	97,04
	Turkey	286	157	146	92,99
Total	**Chicken**	**709**	**348**	**332**	**95,40**
	Turkey	**558**	**314**	**295**	**93,95**
TOTAL		**1.267**	**662**	**627**	**94,71**

The tetracycline resistance was of 73.53%, while that to aminopenicillin of 86,47% and sulfonamides of 77.65%. With regard to the CIAs, 67,65% showed resistance to fluoroquinolones microbiological (of which 24.71% showed values in the range of resistances clinics) and 6.47% to cephalosporins of the 3rd and 4th generation. 5.29% showed resistance to colistin (polymyxin). Co-resistance to CIAs (fluoroquinolones + colistin) has been observed in 5.29% of the isolates. There were no resistance to tigecycline or carbapenems.

For turkeys for fattening, a total of n. 170 isolates were randomly selected for antimicrobial susceptibility testing with the following results*: Only 11.18% of the isolates showed sensitivity to all antimicrobial substances provided in the monitoring of AMR. 75.88% of the isolates showed MR. Resistance to tetracycline, was of 77.65%, while that to aminopenicillin was of 78.82% and 62.35% of the sulfonamides. With regard to the CIAs, 60,00% showed resistance to fluoroquinolones microbiological (of which 27, 06% showed values in the range of resistances clinics) and 1.18% to cephalosporins of the 3rd and 4th generation. Co-resistance to CIAs has been observed (fluoroquinolones + colistin) in 16:46%. There were no resistance to tigecycline or carbapenems.*

- ***Escherichia coli producing ESBL, AmpC, or carbapenemases***

These agents are a cause of concern to public health, both for their capacity to transmit the determinants of resistance to main zoonotic agents (Salmonella) and for their potentiality as opportunistic human pathogens.

For broilers, seeking selectively ESBL or AmpC producing, the data obtained is extremely high: 81,33% of the groups of broilers tested (244/300) host sub-populations of E. coli that in a large part are also MR (95,08%), with 64.34% of them with MR at 5 or more different classes of antimicrobials.
High levels of co-resistance to other CIAs have been observed in these sub-populations of E. coli ESBL- or AmpC positive: 75.41% were co-resistant to fluoroquinolones, and 5.33% were co-resistant to colistin (Micrange 4-32 mg / L, fashion 4 mg / L). 4.92% of the isolates finally presents a pattern of co-resistance to fluoroquinolones, colsitin and extended-spectrum cephalosporins. Very high levels of co-resistance to tetracycline (80,74%) and sulfonamide (91.80%) have been registered. None of the isolates showed resistance to carbapenems. Resistance to tigecycline has been observed in one isolate MR.
Also for **turkeys for fattening**, the data obtained is very high, accounting for 74.67% (224/300) of groups of turkeys monitored that show these sub-populations of E. coli with an MR of 90.18%, with 69.64% with MR at 5 or

more different antimicrobials.
High levels of co-resistance to other CIAs have been observed in these subpopulations of E. coli ESBL- or AmpC-positive: 77.68% of them were co-resistant to fluoroquinolones and 25.89% to colistin. 22,77% of the isolates finally presented a pattern of co-resistance to fluoroquinolones, colistina and extended-spectrum cephalosporins. Very high also the co-resistance to tetracycline (86.16%) and sulfonamide (81.70%). None of the isolates presented resistance to carbapenems. Resistance to tigecycline has been observed in one isolate MR. In turkeys, the levels of co-resistance to gentamicin (aminoglycoside) were of 17,86%.
On the other hand, specific monitoring for E. coli producing carbapenemases, made in Italy on a voluntary basis, was negative in both categories of animals tested (0/300 0.00%).

2.g Reporting of results

The Annex, Part A, of Decision 2013/652 / EU lays down detailed rules for the reporting of the results obtained from European Commission, through EFSA.
The EU Reports and National Reports over the years are made available by the European Agencies (EFSA, ECDC) at the following link: http://www.efsa.europa.eu/en/zoonosesscdocs/zoonosescomsumrep.htm
This activity is supported by CNR-AR.

Passive

It is the execution of antimicrobial susceptibility testing of isolates of different origin from that of the national programs.

- ***Poultry meat***

In 2014, 32 isolates of Salmonella spp. subject to antimicrobial susceptibility testing arrived at the CNR-AR . 18.75% of them, accounting for 6 isolates out of 32, were resistant to cephalosporins of 3rd and 4th generation, all MR (co-resistant to trimethoprim, sulfonamides, and teracicline) and even with all microbiological resistance to fluoroquinolones.

Data collection sales of antimicrobial agents veterinary

Strengthening the mechanisms for collecting data consumption of antimicrobial agents, both in the field of human and veterinary medicine, it is a fundamental condition for the fight against antimicrobial resistance.
For this reason, the European Commission requested to EMA the development of a harmonized system of collection and reporting of sales data of veterinary antimicrobial agents in a harmonized way among the Member States. This project called "*The European Surveillance of Veterinary Antimicrobial Consumption"* (ESVAC), sees the participation of Italy since 2010.
An annual report is available at the following link http://www.ema.europa.eu/docs/en_GB/document_library/Report/2014/10/WC500175671.pdf and allows evaluating the reduction targets set by each Member State in consideration of the actions implemented. Special attention is paid to the CIAs.
IReports ESVAC see Italy among the first places for the amount of antimicrobial agents sold, especially tetracyclines, penicillins, macrolides and sulfonamides which, taken together, account for about 75% of sales in the national veterinary field, with a downward trend of 29% in 2013 (20% in 2012 and 13% in 2011), a sign of the effectiveness of national policies so far implemented. However, the ESVAC datum shows only the total quantities of antimicrobial agents sold and gives no details about the sales for production lines and the actual use in the zootechnical productions, such as for example, the poultry and pig ones, for the execution of "group" treatments, through feed or drinking water.
Therefore, the Directorate General for Animal Health and Veterinary Medicines is committed to improve the information management and to ensure the traceability of the medicinal products, by starting two projects, on a voluntary basis, which, in addition to the increase of the protection of human health, aim to reduce also the burden on the companies.

1. **Traceability of veterinary medicine**
   In collaboration with the General Directorate of the Information System and Statistical Health, it is now extended to the veterinary drugs, on an experimental and voluntary basis, the possibility to power the central database, operating since 2005, with the aim of detecting the movements of packaging of veterinary medicinal products along the production and distribution chain.
   The application is available through registration and **tracks the commercialization from the producer to the final recipient (breeder, veterinary clinic, etc.).**
   The information for the access are available on the website of the Ministry, at the following link: http://www.salute.gov.it/portale/temi/p2_6.jsp?lingua=italiano&id=3737&area=tracciabilita%20farmaco&menu=vuoto.

2. **Electronic prescription.**
   The model of the electronic veterinary prescription to use for the prescription and purchase of the veterinary drugs has been implemented, in collaboration with IZS Abruzzo and Molise. This system will be interoperable with the central drugs database and the National Zootecnic Register and will meet the sales data with those of the prescription of veterinary medicines. This will improve the effectiveness of the drug surveillance and allow having a better picture on real consumption of antimicrobial agents, particularly with respect to the breeding of food-producing animals, becoming an essential tool for combating the phenomenon of antimicrobial resistance.

Considerations and conclusions

A holistic multi-sectoral approach is required to contrast antimicrobial resistance, involving many different fields (medicine, veterinary medicine, research, breeding, agriculture, environment, trade and communication). Only acting together in all areas, it will be possible to limit the further spread of resistance and maintain the effectiveness of antimicrobials.

This holistic approach aims to make better use of existing data and then to strengthen the monitoring systems for the coordination of consumption of antimicrobials and antimicrobial resistance in human and veterinary medicine and to enable policy makers to decide the best way to face antimicrobial resistance in humans and animals.

The surveillance of AMR at focused intervals as well as the ongoing monitoring of the prevalence of resistance in bacteria of animal, food, environment and man origin, are a fundamental part of the strategy of "One Health" (animal health, food safety and health human) aimed at limiting the spread of AMR and optimizing the choices of antimicrobial agents used in therapy.

In veterinary public health, the Directive 2003/99/EC requires Member States to take all measures necessary to ensure *"the effective and continuous cooperation based on an exchange of general information and, where necessary, of specific data among competent authorities "in:*

a) Animal health;
b) feed;
c) food hygiene;
d) other authorities and organizations involved

This report aims to summarize the results obtained from the first year of the implementation of the harmonized system of official control on antimicrobial resistance, drawn up in accordance with Decision 2013/652/EU that, providing for the compulsory monitoring of the main zoonotic agents and commensals, has made the monitoring of antimicrobial resistance, in primary production and in the food chain, more representative and reliable than the previous years.

In 2014, 1.271 samples of cecum have been taken.

The total number of samples of cecum collected, was 31.3% lower compared to the total number planned by the writer Ministry **(n. 1851)** and 25.2% lower than that recommended by the European Commission **(n. 1700)**. Nevertheless, it was enough to get the minimum expected number of isolates to be tested **(n.170)** for antimicrobial susceptibility for broilers and an assessment of the prevalence of AMR, with sufficient accuracy, for turkeys for fattening **(n. 156)**.

1.267 samples of cecum subjected to isolation resulted able for analysis as follows:

- broilers (n. 709 samples) - **12.69% positive to Salmonella spp., 40,34% positive to Campylobacter jejuni, 34.98% positive to *Campylobacter coli* 95.40% positive for *E.coli*[1];**
- turkeys for fattening (n. 558 samples) - **26.16% positive to Salmonella spp., 27,96% positive to *Campylobacter jejuni*, 72.58% positive to *Campylobacter coli* in, 93.95% positive to *E.coli*;**
- **High *E. coli* contamination from ESBL/AmpC producing** (81,33% of samples from groups of broilers tested and 74,67% of the turkeys for fattening).

From the analysis of the results of antimicrobial susceptibility testing, results:

Salmonella spp. in broilers: in the cross-sectional study to the slaughterhouse (cecal contents), the rates of resistance to cephalosporins of the 3rd and 4th generation were around 3.4%:

This finding could result in apparent contrast with the percentage results of resistance to ESC in isolates of Salmonella originated from samples taken in accordance with the PNC in broilers, even if with a similar pattern of multiple resistance. In fact, in 2014 the percentage of resistance to ESC in Salmonella spp. were approximately of 27.3%. Similar rates have been also recorded in the previous two years and would seem, probably, **associated with the typical pyramid structure of this livestock production.**

The discrepancy is due to the differences between the two types of monitoring, that does not allow a comparison between them. However, both two types of information are very useful for the evaluation of AMR trend in this main zoonotic pathogen.

Common features in the two types of monitoring activities, such as elevated MICs to tigecycline in less than 10% of the isolates have been identified; all of them detected in MR isolates and show high MIC to tetracycline, and no resistance to colistin and carbapenems.

- ***Salmonella spp.* turkeys**: a similar picture to that obtained in the PNC of salmonella in poultry has been observed, with a high rate of multi-resistance (approximately 69%) and only 6% of isolates

[1] *Escherichia coli as commensal, is usually a non-pathogenic microorganism, component of normal bacterial flora of the intestine of humans and animals. However, in the dynamics between host and pathogen, and in certain conditions, it can become an opportunistic pathogen.*

susceptible to all antimicrobials ("fully susceptible "). Common features were highlighted in the two types of monitoring activities, such as a very low resistance to cephalosporins of the 3rd and 4th generation, no resistance to tigecycline and colistin with carbapenem resistance and, in some cases, co-resistance fluoroquinolone

- ***E. coli:*** **resistance to fluoroquinolones in isolates of E. coli is found to be higher than those of Salmonella spp**. In fact, high levels of multidrug resistance in commensals Escherichia coli result in both broilers and turkeys (75% and 80%, respectively) with a low prevalence of isolated "fully susceptible." High percentage of microbiological resistance to fluoroquinolones (67% in broilers and 60% in turkeys), with about 25% and 27% of isolates, respectively, in the range of "resistances clinics. The most frequent pattern of MR is observed for tetracycline, beta-lactams, trimethoprim and aminoglycosides, with MIC values much higher to sulfonamides. The rates of MR also appear higher in the subpopulation of E. coli ESBL / AmpC;
- ***E. coli*** **producing ESBL/AmpC**: In a specific monitoring, a high prevalence of positivity for *E. coli,* included those producing ESBL/AmpC, resistant to cephalosporins of the 3rd and 4th generation was found in both livestock production. Pattern of multiple resistance has been observed including very often co-resistance to some CIAs such as fluoroquinolones and colistin (eg. simultaneous microbiological resistance to fluoroquinolones in over 75% of the isolates, including 31% in broilers and turkeys about 50% even in the range of clinical resistance. Furthermore, the phenotype of RM to ESC, fluoroquinolones and colistin reaches about 5% in broilers and turkeys about 16%).
- ***Campylobacter jejuni***: High levels of RM were observed, especially for clinical resistance to fluoroquinolones detected in Campylobacter jejuni, with high levels of co-resistance to tetracyclines. In a small proportion, it was found coexisting with macrolides. These levels are even higher than those recorded in the previous study carried out in 2008 in accordance with Decision 2007/516/EC.

Overall, the monitoring of antimicrobial resistance in the primary production poultry showed high rates of multi-resistance in both *E. coli* and *Salmonella* isolates but no resistance to carbapenems, important antimicrolial agents in human health field used in critical cases.

In the livestock and poultry production, the use of oral antibiotics in feed or drinking water is a well-known risk factor of the onset and spread of resistance phenomena. For example, both the route of administration and the clinical condition of the animal, can lead to an under or over-dosing of the pharmacologically active substances and/or their active metabolites, as well as a "cross-contamination" (carry-over) of equipment for manufacturing, processing and use, such as silos, drinking troughs and mangers, favoring the selective pressure.

To mitigate this risk, specific indications of use have been provided in the Summaries of Product Characteristics (SPC) of the authorized veterinary medicinal products, such as "*the presence of the disease in the livestock must be ascertained before starting the treatment ; the use of the product should be based on susceptibility testing of the bacteria isolated from the animal or, where not possible, on medical history and epidemiological information; prolonged or repeated use should be avoided by improving management practices in the company, particularly in terms of hygiene, ventilation etc.*"; determine the body weight as accurately as possible etc.".

In addition, at national level, in July 2015, DGSAF released the National Plan for the responsible use of veterinary drug and for the fight against AMR, on a voluntary basis, developed in collaboration with the National Union of the meat and egg agri-food sectors (UNAITALIA).

Starting from a datum about the consumption of antimicrobials, calculated in the period 2011-2013 of about 18% of national sales compared to ESVAC figure, the plan aims to implement all the tools to develop and consolidate a preventive approach to reduce the use of antimicrobial therapies through compliance with biosecurity, animal welfare, continuing education and training programs for the workers of the supply chain (farmers, feed producers, veterinarians) and vaccination campaigns,

The goal is to reduce the total consumption of antimicrobials by **15% in 2015 and 40%** in the next three years.

An integrated supply chain such as the poultry one, from breeding to distribution and sale, through reproduction (incubation) and the feed manufacturers, will allow the application of the guidelines and decisions contained in the Plan, obtaining visible results in the fight to 'AMR.

At EU level, the two new proposals for a Regulation on medicinal products and the medicated feed, currently under discussion, pay special attention to the fight against the development of antimicrobial resistance in animals and humans. They aim to provide the tools necessary to reduce the development and spread of antimicrobial resistance by providing, for example, a restriction of the use of certain antimicrobial, reserved for the treatment of human infections in animals, prohibiting the use of medicated feeds containing antimicrobials as a preventive measure, imposing limits on the carry-over, etc.

From the analysis of the data presented so far, is necessary to strengthen the measures already in place and undertake new initiatives to further reduce the selection pressure exerted by the use of various antimicrobial agents and contain, therefore, the increasing risk of resistance.

Therefore, it would be necessary:

- integrate the surveillance/monitoring with data coming from the feed controls;
- strengthen the monitoring of bacteria from the animal food taken at different stages of the food chain (slaughterhouse, detail);
- improve the cooperation with the authorities/ bodies responsible for animal health in order to share strategies to reduce the use of antimicrobial agents, including the improvement of health and animal welfare (prophylaxis and hygiene protocols, biosecurity measures);
- Monitor the consumption of antimicrobial veterinarian agents throughout the chain.

The Directorate General for Animal Health and Veterinary Medicine (DGSAF) has already taken and/or planned a series of actions aimed to:

a) Promote a "correct and rational use" of antimicrobial agents;
b) Improve animal health through a proper livestock health management and the implementation of biosecurity measures, on the basis of the principle that " Prevention is better than cure";
c) Strengthen the monitoring of consumption of veterinary medicinal products through the use of informatics tools in the different steps of distribution and use of the veterinary drug in zootechnical field;
d) Identify and collect useful indicators for the categorization of farms depending on the level of risk (health, animal welfare and veterinary drug consumption) for a better effectiveness of planning controls;
e) Supervise and monitor the antimicrobial resistance;
f) Raising awareness and informing people and professionals on AMR and the importance of the appropriate use of antimicrobial agents.

In 2012, the Manual ***"Biosafety and correct and rational use of antibiotics in zootechnics"*** was distributed to all the stakeholders, in different ways, with the purpose of deepening problems arising from an improper use of antibiotics in zootechnics and providing specific information, for certain animal species (pigs, poultry and rabbits) aimed at containing the spread of antimicrobial resistance on livestock.

The Manual describes the principles of good practice in the use of antimicrobial agents such as: use of antimicrobial agents exclusively in demonstrated cases of clinically ill animals; use of microbial agents determined by the results of the **antibiogram** and aimed at molecules not in use in human medicine; preference of molecules with a narrow spectrum and with higher efficacy against the bacterial species identified; prohibition of extended and repeated use, and of empirical combinations; compliance with the instructions given in the package leaflet; etc

Furthermore, the Manual is completed by general indications about good farming practices, mainly biosecurity and hygiene measures, in order to reduce the incidence of the infective diseases.

In 2012, the "Guidelines for the preparation, execution and management of the controls on the distribution and use of veterinary medicinal products", intended for the official authorities, have been prepared. They contain operational instructions, specific also for antimicrobials, aimed at achieving a scheduling and implementation of harmonized controls throughout the country based on the categorization of the risk of all facilities subject to verification of pharmacosurveillance.

In line with the process started, the document ***"Guidelines for the correct management of livestock in order to reduce the prescriptions of antibiotics and prevent the risk of antibiotics resistance"*** is currently under preparation. The draft will be available by the end of 2015, as result of the strategic objective "Strengthening of the epidemiological surveillance", under the General Directive of the administrative activity of the Ministry of Health (Year 2015).

These guidelines promote a holistic, cross-sectoral, collaborative and multidisciplinary approach, involving different offices responsible for animal health, animal welfare, animal feed and veterinary drugs. Furthermore, they aim to identify and propose specific indicators of biosecurity, animal welfare, conscious and rational use of antimicrobial agents, even through their use in feed and drinking water.

The ***"Working Group for the monitoring, surveillance and containment of antimicrobial resistance of zoonotic bacteria and commensal"*** has been established in the Directorate General for Animal Health and Veterinary Medicine, with the purpose of supporting the Directorate in the assessment of antimicrobial resistance and the planning of appropriate national and international policies. This group should assist as well the representative of DGSAF in the "Working Group on antimicrobial resistance", set up at the Directorate-General for Health Prevention, which has the task of drawing up the guidelines for the prevention and control of AMR.

Regarding the monitoring of the consumption of veterinary drugs, in addition to the commitment of DGSAF in the ESVAC project , as previously described, the Ministry announced, by press n. 161 of 4 September last, the start of a testing phase for the use of electronic veterinary prescription in Abruzzo and Lombardia.

This trial aims to computerize the management of veterinary drugs, from their prescription by the veterinarian to the administration to the animals and it is part of a larger project of digitization and traceability of the entire chain of veterinary medicines, already started by the Ministry of Health and officialized in 2013, with the ***traceability system "TRACCIAVET". This system***

traces the sales of the veterinary medicinal products from the producer to the final recipient (breeder, veterinary clinic, etc.).

The crossing of information so obtained will guarantee a more effective pharmacovigilance system and an accurate picture of the consumption of the antimicrobial agents. This system represents therefore, an essential tool for combating the phenomenon of antibiotic resistance and allows as well evaluating the effectiveness of potential interventions adopted for reducing an inappropriate use of it.

The participation in both systems is currently voluntary and experimental but the introduction of computerization in this area has been included in the Agenda for Simplification 2015 – 2017 (paragraph 5.11 " Focused actions in veterinary health and food safety through digitization") which expressly refers also to the electronic prescription and computerized traceability of medicinal products with the purpose of reducing the burdens for businesses and optimizing the official control procedures for the protection of users.

The Directorate General for Animal Health and Veterinary Medicine has financed another important multidisciplinary project since 2013. This project connects the categorization of the risk levels of farms (health and animal welfare) with the use of antimicrobial agents and, consequently, with the risk of developing antimicrobial resistance. The selected companies are monitored, evaluated and entered into a computer database that consists of several data (cattle registry, issues related to farming practices, historical and current health status, use of the drug and its pertinence, animal welfare, biosecurity). Then the companies are associated with the results of the inspections carried out on the carcasses in the slaughterhouses

This project allows having immediate and direct information about the biosafety, the consumption of veterinary medicinal products, animal welfare and the health status of the final product (meat). This will enable the Competent Authorities to evaluate the adopted policies for reducing the use of veterinary medicinal products and, as a result, combating the phenomenon of antimicrobial resistance.

Finally, this Directorate is engaged in constant and continuous training activities for professionals, doctors, veterinarians and pharmacists, in view of their important role in communicating correct messages about the use of antibiotics in the various sectors involved. These activities are also addressed to the associations of farmers for their mission in transmitting the message that *"good sanitation practices are more effective than the indiscriminate use of antibiotics, in terms of animal health but also in the protection of human health."*

Furthermore this Directorate carries out constant activities training on AMR for professionals, supports the associations in the preparation of voluntary plans for the responsible use of veterinary drugs and for the fight against antimicrobial resistance in cuniculture and aviculture and organizes educational campaigns through the publication of brochures available on the Ministry web site.