

Summary of recommendations				
Subject	Chapter	Paragraph	Recommendation	Immediate (Imm) or medium/long-term (M/L) effect
<i>Patterns of antibiotic resistance in bacteria isolated from food animals</i>	3	3.134	The Government should initiate studies to identify the key factors that lead to the emergence and disappearance of multiresistant clones of <i>Salmonella typhimurium</i> .	M/L
		3.135	The Government should ensure that isolates of salmonellas from animals in England and Wales, Scotland and Northern Ireland are compared, using appropriate methodologies, to see whether there are any regional differences in antibiotic susceptibilities.	M/L
		3.136	The Government should consider how the monitoring of pathogens in food animals could be improved, with a view to obtaining data on the prevalence, subtypes and antibiotic resistance of important foodborne pathogens, and publishing this information on a regular basis. Reference laboratories should establish the relationship between antibiotic resistance and subtype of animal isolates of <i>Campylobacter</i> , to aid further studies aimed at identifying the sources of antibiotic-resistant strains. Government should ensure that those organisations directing or undertaking surveillance of organisms isolated from animals should work together with organisations monitoring resistance in bacteria from food and humans to produce an annual UK report summarising antibiotic resistance in the food chain. Surveys of UK veterinary laboratories should be carried out to ascertain current practices with regard to antibiotic resistance testing of microorganisms important in the food chain, with a view to improving comparability between animal, food and human data.	M/L
		3.137	The Veterinary Laboratories Agency should consider including <i>Escherichia coli</i> in any surveillance of antibiotic resistance in "healthy" food animals.	M/L
		3.138	The Veterinary Laboratories Agency should collate and publish its data on resistance in anaerobes at the earliest opportunity.	M/L
<i>Patterns of antibiotic resistance in bacteria isolated from foodstuffs</i>	4	4.67	There should be enhanced national and international surveillance for antibiotic resistance of microorganisms isolated from foods. Surveys should be conducted where the primary aim is to gather information on antibiotic resistance and, in planning future food microbiological surveys, consideration should be given to the screening of foodborne pathogens and other microorganisms for antibiotic resistance using appropriate methodologies.	M/L

MICROBIAL ANTIBIOTIC RESISTANCE IN RELATION TO FOOD SAFETY

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<i>Patterns of antibiotic resistance in bacteria isolated from foodstuffs</i>	4	4.68	Studies should be carried out to : <ul style="list-style-type: none"> • gather further information on antibiotic resistance in campylobacters in the UK; and • explore the variability in the isolation of resistant campylobacters from retail poultry observed in several studies. 	M/L
		4.69	All microbiological reference laboratories for enteric pathogens in the UK should consider screening these and other microorganisms isolated from routine food samples for antibiotic resistance and publishing their data on a regular basis.	M/L
		4.70	Reference laboratories should carefully examine the relationship between antibiotic resistance and subtype of food isolates of <i>Campylobacter</i> to aid further studies aimed at identifying the sources of antibiotic-resistant strains. Government should ensure that those organisations directing or undertaking surveillance of organisms isolated from food should work together with organisations monitoring resistance in bacteria from animals and humans to produce an annual UK report summarising antibiotic resistance in the food chain. Surveys should be carried out of UK food laboratories to ascertain current practices with regard to antibiotic resistance testing of microorganisms important in the food chain with a view to improving comparability between animal, food and human data.	M/L
		4.71	Research funding organisations should undertake studies to assess the effect of food processing, storage conditions and food preparation on the antibiotic-resistant microflora of foods and the transfer of resistance between food bacteria.	M/L
		4.72	Using appropriate methodologies, <i>Escherichia coli</i> isolates from foodstuffs should be screened for antibiotic resistance to provide a more sensitive indication of differences between food commodities and changes in resistance over time.	M/L
<i>Human infections associated with antibiotic-resistant foodborne pathogens</i>	5	5.80	Funding organisations should commission research to establish why certain <i>Salmonella</i> serotypes (eg. <i>S. hadar</i> , <i>S. typhimurium</i> , <i>S. virchow</i>) develop antibiotic resistance and multiresistance, whereas others (eg. <i>S. enteritidis</i>) have remained largely sensitive.	M/L
	5	5.81	The Government should investigate the basis for regional differences in fluoroquinolone (eg. ciprofloxacin) resistance in salmonellas in the UK.	M/L

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<i>Human infections associated with antibiotic-resistant foodborne pathogens</i>		5.82	<p>The reference laboratories should carefully examine the relationship between antibiotic resistance and subtype of human isolates of <i>Campylobacter</i> to aid further studies aimed at identifying the sources of antibiotic-resistant strains.</p> <p>The Government should take steps to ensure that those organisations directing or undertaking surveillance of organisms isolated from humans should work together with organisations monitoring resistance in bacteria from animals and food to produce an annual UK report summarising antibiotic resistance in the food chain.</p> <p>Surveys of UK clinical laboratories should be carried out to ascertain current practices with regard to antibiotic resistance testing of microorganisms important in the food chain, with a view to improving comparability between animal, food and human data.</p>	M/L
		5.83	The Government should seek ways of achieving further standardisation of antibiotic resistance testing across Europe and internationally.	M/L
	6	6.120	We endorse the recommendation made by the House of Lords in their report on resistance to antibiotics that the veterinary profession must address the problem of the over-use of fluoroquinolones and feel that targeted codes of practice on prescribing should be introduced as soon as possible.	Imm
<i>Evidence of the food chain contributing to human infections with antibiotic-resistant micro-organisms</i>		6.121	The relative contribution of meats, dairy products, raw vegetables and fruits as vehicles for antibiotic-resistant enterococci should be clarified.	M/L
		6.122	There should be continual surveillance and assessment of the risks to humans associated with the use of those growth promoters still authorised in the EU and we make appropriate recommendations in Chapter 10.	M/L
<i>Approval, prescribing and control measures relating to veterinary medicines</i>	7	7.22	The Government, in association with the other Member States of the European Union, should require applicants applying for marketing authorisations for antibiotics for veterinary use to supply data derived from the testing of the antibiotic concerned for microbial resistance in target animal species under intended conditions of use. Such data should be made publicly available in support of licensing decisions.	Imm

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<i>Approval, prescribing and control measures relating to veterinary medicines</i>	7	7.23	The Government should discuss with the veterinary profession and the pharmaceutical industry ways in which the information gathered as part of post-marketing surveillance, including that on the incidence and prevalence of resistance, could best be made available to the veterinary and medical professions. It is important that the regulatory authorities give a high degree of attention to the question of microbial antibiotic resistance, both in the initial licensing process and subsequently at the 5 year licence review stage.	Imm
		7.24	The Government should take steps to establish the amounts of antibiotics given to food animals. This information should be published at regular intervals by the Veterinary Medicines Directorate and should, at the very least, be so structured as to provide a breakdown by compound, class, medical equivalent (where appropriate) and target species.	Imm
<i>Use of antibiotics in farm animals</i>	8	8.47	The Government should coordinate the development of a coherent strategy aimed at reducing the veterinary use of antibiotics.	Imm
		8.48	More specifically, the Government should take all possible measures to ensure that :- <ul style="list-style-type: none"> • all antibiotics used for purposes other than growth promotion are prescription only medicines (POM); • all prescribing by veterinarians is for animals under their care; and • detailed written justification is provided by veterinarians using cascade medicines. 	Imm
		8.49	The Government should bring together the relevant bodies to produce and publish without delay:- <ul style="list-style-type: none"> • Codes of Practice aimed at reducing the use of antibiotics; • appropriate dosage strategies; • detailed preventative medicine programmes for all livestock-based food production enterprises covering routine medication (including the use of anticoccidials and growth promoters), the length of treatment regimes, competitive exclusion and probiotic treatments and vaccines; and • policies and protocols for the use, storage and disposal of antibiotics. 	Imm
		8.50	The BVA and the other relevant professional representative bodies, in cooperation with the veterinary schools and colleges, the farming industry and others, should develop appropriate courses to better inform veterinary prescribing and use of antibiotics and to draw attention to the potential dangers of resistance.	Imm

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<i>Use of antibiotics in farm animals</i>	8	8.51	The veterinary schools and colleges should review their existing courses to ensure that microbial antibiotic resistance is given a suitably high profile in undergraduate training.	Imm
		8.52	The Government should mount regular campaigns to remind the livestock industry of its statutory obligations in respect of the maintenance of farm medication records, to improve enforcement, and to greatly enhance current performance levels.	Imm
		8.53	The Government should carry out regular, statistically-robust, compliance surveys and should review existing arrangements to ensure that effective follow up action can be taken where non-compliance is identified	M/L
		8.54	The Government should encourage the use of HACCP principles as a tool for improving farm practice and as a means of ensuring the responsible use of antibiotics, thus tackling the problem of microbial antibiotic resistance.	Imm
		8.55	The Government should encourage regular veterinary visits to all livestock farms or production units to audit animal disease profiles and general performance indicators, to accumulate and scrutinise mortality, morbidity and general health data, and to record antibiotic resistance patterns so that antibiotic prescribing can be adjusted accordingly.	Imm
<i>Medicated animal feedingstuffs</i>	9	9.23	The Government should:- <ul style="list-style-type: none"> • require regular, on-going surveillance of a representative cross-section of commercial feed compounders, integrated poultry producers and on-farm mixers to test compliance with the law and to oversee the guidelines for ensuring that medicated animal feeds intended for food animals are manufactured, stored and distributed in a safe and professional manner; and • review the adequacy of the current frequency of inspections by the enforcement bodies. 	Imm
		9.24	On-farm mixers using medicinal additives and intermediate medicated feedingstuffs in any manner should be required to register with the RPSGB or DANL.	Imm
		9.25	Manufacturers who fail to comply with UKASTA's Feed Assurance Scheme should not be regarded as suitable for registration by the enforcement authorities. In addition, all those engaged in the manufacture of medicated animal feedingstuffs are strongly encouraged to apply Hazard Analysis Critical Control Point (HACCP) principles to their operations. This means not only commercial feed compounders and the integrated poultry producers but the on-farm mixers too.	Imm

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<i>Medicated animal feedingstuffs</i>	9	9.26	The Government should review the arrangements under which discarded and surplus medicinal additives may be re-used in medicated feed and medicated pre-mixes, with a view to phasing out this practice in favour of appropriate disposal as waste material at the earliest opportunity.	Imm
<i>Use of antibiotics as growth promoters in food animal production</i>	10	10.25	The use of spiramycin, tylosin phosphate and virginiamycin as growth promoters should be phased out at the earliest opportunity.	Imm
		10.26	The use of those antibiotics where there is currently no medical equivalent, or where their medical use is rare - avilamycin, bambamycin, bacitracin zinc, monensin sodium and salinomycin - should be kept under close review, and if any evidence becomes available of medical equivalents being developed for clinical use, then their use as growth promoters should be phased out. We are particularly concerned about possible developments in the use of avilamycin and bacitracin zinc for clinical use.	Imm
		10.27	No new growth promoters should be developed which utilise substances which have possible applications in human clinical treatment.	Imm
<i>Aquaculture</i>	11	11.17	The Government should licence the use of antibiotics in new fish species being developed for aquaculture for as short a period as is feasible and equitable.	Imm
		11.18	The Government should issue public advice warning of the potential risk of the transfer of antibiotic resistant bacteria through direct contact exposure to ornamental fish.	M/L
<i>Research on microbial antibiotic resistance in relation to food safety</i>	12	12.33	Research should be funded to:- <ul style="list-style-type: none"> • undertake integrated local surveillance studies to examine the prevalence of antibiotic resistance associated with <i>Campylobacter</i>, <i>Salmonella</i> and commensal bacteria in red meat and poultry throughout slaughter and processing; • assess the prevalence of antibiotic resistance in wild animals, including birds, and food animals on farms in relation to the usage of antibiotics, particularly a) growth promoters and, b) fluoroquinolones. 	M/L
		12.34	Research should be funded to:- <ul style="list-style-type: none"> • identify risk factors for acquiring an infection with an antibiotic resistant foodborne pathogen. Such studies need to be conducted both in humans and, where appropriate, animals; 	M/L

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<i>Research on microbial antibiotic resistance in relation to food safety</i>	12	12.34 (cont)	<ul style="list-style-type: none"> • assess the extent of infection in travellers caused by antibiotic-resistant strains and the contribution these make to the burden of IID and antibiotic resistance in the UK; • assess the importance of imported food and animal feed as a source of antibiotic-resistant bacteria; • determine the contribution made by microorganisms of human origin to microbial antibiotic resistance in animals and food; • model current patterns and predict future trends in antibiotic resistance of foodborne pathogens in humans and animals; • determine the socio-economic costs attributable to antibiotic-resistant foodborne pathogens in humans, above the costs attributable to antibiotic-sensitive foodborne pathogens. 	M/L
		12.35	<p>Research should be funded to develop methods which will characterise the origins of resistance in foodborne pathogens and commensal microorganisms, so as to improve identification of the sources and routes of transfer of resistant organisms from the farm through food to humans.</p>	M/L
		12.36	<p>In relation to microbiological risk assessment (MRA), research should be funded to :-</p> <ul style="list-style-type: none"> • undertake structured MRA to assess the risk of infectious intestinal disease from antibiotic-resistant foodborne pathogens and commensal bacteria in food animals, foods and the environment; • use MRA to quantify the magnitude of the key pathways by which microbial antibiotic resistance can transfer from food animals to humans via the food chain and the environment; • undertake MRA to assess the links between a) use of growth promoters and b) fluoroquinolones in food animals and the development of antibiotic-resistant infections in humans. 	M/L
		12.37	<p>To facilitate a reduction in the usage of antibiotics, research should be funded to :-</p> <ul style="list-style-type: none"> • underpin effective antibiotic management policies in animals, aimed at optimising administration practices to minimise the risk of development of resistance. This will include investigations of the persistence of antibiotic-resistant bacteria in the gastrointestinal tract of food animals after antibiotic withdrawal; • further investigate how particular hygiene practices and interventions can bring about a reduction in the need for antibiotics in food animal production, without jeopardising animal welfare; 	M/L

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<i>Research on microbial antibiotic resistance in relation to food safety</i>	12	12.37 (cont)	<ul style="list-style-type: none"> • evaluate the potential of vaccines, probiotics and competitive exclusion to reduce the usage of antibiotics and the level of resistance in microorganisms in food animals. 	
		12.38	<p>Research should be conducted to :-</p> <ul style="list-style-type: none"> • determine the relationship between antibiotic resistance and virulence in foodborne pathogens in humans and, where appropriate, animals; • review the clinical picture (duration, severity, treatment and outcome) of cases of IID involving antibiotic-resistant foodborne pathogens, as opposed to cases infected with sensitive isolates, and assess whether there are any longer-term consequences of these infections for the patient. 	M/L
		12.39	<p>Research should be funded to :-</p> <ul style="list-style-type: none"> • examine antibiotic-resistant pathogens and commensal organisms from animals and humans to determine their survival characteristics in the environment, compared to non-resistant strains; • examine the effect of antibiotic selection pressure on the survival and persistence of antibiotic-resistant strains, both <i>in vitro</i> and <i>in vivo</i>; • examine the transfer of resistance determinants between foodborne pathogens and the commensal flora of humans and animals in a) foods and b) the environment. 	M/L