

The Norwegian livestock industry's joint action plan on antimicrobial resistance

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Translation from Norwegian to English: Hannah J. Jørgensen

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“Healthy animals don’t need antimicrobials”

INTRODUCTION

Effective antimicrobials are key to successful treatment of infections and for preventing infections in humans undergoing surgery, transplantations and cancer treatment. They are also important for treating diseased animals and maintaining animal welfare.

The increasing occurrence of antimicrobial resistance has triggered great public concern and debate both among politicians and in academia. In an extensive report published in 2014, EFSA (European Food Safety Authority) and ECDC (European Centre for Disease Prevention and Control) warn against the increasing occurrence of antimicrobial resistance in the EU (EFSA, 2014). The greatest challenges, however, are faced in Asia and in Africa. Today, about 700.000 humans die every year as a consequence of antimicrobial resistance. If the trend is not turned, the number is estimated to increase to 10 million people in 2050. In that case, infections that do not respond to antimicrobials will become the most important cause of death in humans globally, with substantial socioeconomic implications.

In May 2015, the WHO (World Health Organization) agreed on a ‘Global Action plan on Antimicrobial resistance’ (WHO, 2015). This plan has been followed up with plans by the OIE (World Organization for Animal Health) and FAO (Food and Agriculture Organization of the United Nations). The action plan from WHO requires all countries to prepare a national action plan within May 2017. The WHO action plan has five strategic objectives:



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1. Improve awareness and understanding of antimicrobial resistance through effective communication, education and training
2. Strengthen the knowledge and evidence base through surveillance and research
3. Reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures
4. Optimize the use of antimicrobial medicines in human and animal health
5. Develop the economic case for sustainable investment that takes account of the needs of all countries, and increase investment in new medicines, diagnostic tools, vaccines and other interventions

The EU has a similar action plan based on seven strategic objectives that include surveillance and collaborative efforts to prevent international spread (EU, 2016).

In June 2015, the Norwegian government released a strategy against antimicrobial resistance in Norway, and in April 2016 the Ministry of Agriculture and Food published an action plan covering the area of production animals and pets (LMD, 2016) to follow up on the global plan from the WHO and OIE. The Ministry of Health and Care Services also has an action plan for the health services (HOD, 2015).

Public administration within the area of animal health in Norway has traditionally been based on close cooperation and mutual trust between the stakeholders and the authorities. This has contributed to a beneficial situation with respect to animal health in Norway. It is important, therefore, that the model is maintained, strengthened and expanded into a more sector wide approach.

The Norwegian livestock industry, including poultry, engages in preventive veterinary medicine and organized disease control and eradication through their different animal health services. The livestock industries have collaborated to develop this action plan to prevent spread and development of antimicrobial resistance in microorganisms, often abbreviated AMR (AntiMicrobial Resistance). This plan is limited to antimicrobial resistance in bacteria, is in agreement with the global action plans of the WHO and OIE, and brings together the priorities and measures suggested by the livestock industry to further reduce the risk of development and spread of antimicrobial resistance. The measures will be adapted to fit the different animal species and will be incorporated into and described in greater detail in action plans on health and welfare for the individual animal species.

It is more than twenty years since the project Healthier Animals and Reduced Antibiotic Usage was launched. A considerable effort was made to improve the health of production animals and to reduce the use of antimicrobials between 1995 and 1998. Today, Norway is in a beneficial situation with respect to antimicrobial usage – both with regard to the amount and type used, and the occurrence of antimicrobial resistance. In a report from the European Medicines Agency (EMA, 2014) Norway is listed, together with Sweden and Island, among the countries in Europe that have the lowest antimicrobial usage per unit of biomass produced in their animal production. The livestock industry wishes to build on this foundation to ensure continued good animal health and a low risk for development of antimicrobial resistance.

This is the first version of the livestock industry's joint action plan and covers the cattle, pig, sheep, goat and poultry industry. The plan was developed by a working group with members from the different livestock organizations in Norway (chapter 7). In addition to laying out aims and measures it also includes a short introduction. The Norwegian version also includes an extensive background description of the situation in livestock in Norway in a national and international perspective.

02 | Antimicrobial agents and antimicrobial resistance

Antimicrobial agents and antimicrobial resistance play an integral part in the natural interplay between microorganisms, such as bacteria and fungi, and other forms of life. Penicillin is an example of an antibiotic produced by a fungus for protection against bacteria. Bacteria can be naturally resistant or may acquire new forms of resistance. Resistance is encoded in the genetic makeup of the microorganisms (see Facts). In this English version of the action plan we use the term antimicrobial resistance, as opposed to the Norwegian version of the plan where the term antibiotic resistance is used.

The connection between antimicrobial usage and development of antimicrobial resistance is well documented, but many of the mechanisms are still not fully understood (FAO, 2016). In order to prevent development of resistance it is important to focus on measures that support a limited use of antimicrobials. The most fundamental defence against infection lies in the body's own immune system – antimicrobials should be perceived as a support of and not a replacement of the immune system. If the immune system is dysfunctional, the effect of antimicrobials will also be compromised. In such situations, a large use of antimicrobials will select for resistant bacteria. It is also essential to choose the correct type and dosage of antimicrobials relative to the diagnosis, in addition to correct timing.

FACTS

- *Antibiotics*: are natural substances produced by microorganisms such as fungi or bacteria. Antibiotics have the ability to kill or inhibit growth of bacteria.
- *Antimicrobial agents*: includes antibiotics, but also other substances (chemotherapeutic agents) that have the ability to kill or inhibit growth of bacteria and other microorganisms such as virus, fungi and parasites.
- *Narrow spectrum antimicrobials*: Work against a small spectrum of bacteria e.g. penicillin and do not drive development of resistance to the same extent as broad spectrum antimicrobials.
- *Broad spectrum antimicrobials*: Work against a broad spectrum of bacteria and often constitute a stronger drive of antimicrobial resistance. Include antimicrobials defined as critically important within human- and veterinary medicine.
- *Antimicrobial resistance*: natural or acquired trait that partly or completely reduces the effect of antimicrobials.
- *Chromosomal resistance*: the genes encoding resistance are situated in the bacterial chromosome and are inherited vertically, i.e. from parent to progeny.
- *Plasmid encoded resistance*: the resistance genes are situated on plasmids, which are small, often transmissible genetic elements. These can spread horizontally between different bacterial cells.
- *Multi-drug resistance*: when one bacterium is resistant to several different types of antimicrobials. This often results from horizontal transmission of genes between bacteria, for example plasmids that encode several resistance genes.
- *Selection pressures*: When exposed to antimicrobials the resistant bacteria are more likely to survive than those that are sensitive. Hence, the resistant bacteria will have an ecological advantage.
- *Disease causing bacteria (pathogens)*: Bacteria that have greater ability to cause disease in humans or animals, e.g. salmonella and mycobacteria.
- *Indicator bacteria*: Bacteria that are present in the environment and are easily available for investigation. Can be tested for antimicrobial resistance and used in surveillance of antimicrobial resistance in specific populations or environments. *Escherichia coli*, a normal inhabitant of the intestinal tract of humans and animals, is an example of a frequently used indicator bacteria.
- *Antimicrobial growth promoters*: low concentrations of antimicrobials added to feed in order to increase growth of healthy animals. This has been forbidden in the EU since 2006. Excludes adding therapeutic levels of antimicrobials to feed to treat diseased animals.

03 | Brief introduction to antimicrobial usage and resistance in Norwegian animal production

With respect to resistance, the situation in Norwegian livestock production stands out positively compared to most other European countries. Results from surveillance are published in annual reports both nationally (NORM-VET) and internationally (EFSA, 2014).

For many years, preventive veterinary medicine has been emphasized in Norway, including biosecurity measures and vaccination. Norway has a long-standing tradition in controlling and eradicating infectious diseases in animals. Among others, Norway is free of bovine viral diarrhoea (BVD), bovine tuberculosis and porcine enzootic pneumonia. Through various eradication programs caeseous lymphadenitis, caprine arthritis encephalitis (CAE) and paratuberculosis in goats, and ovine footrot are under control. The latter was introduced to Norway after import of live sheep. Eradication of viral infections reduces the problem of secondary bacterial infections. An overview of animal diseases that Norway is free of is included in the background section of the Norwegian version of this action plan. In addition, the Norwegian breeding programs have prioritized and targeted healthier animals. Based on data from the Norwegian Cattle Herd Recording System back to 1975, the breeding program has resulted in a significant reduction in bovine mastitis. Another factor relevant to the Norwegian situation is a national regulation that forbids veterinarians to profit from selling antimicrobials and other drugs (decoupling). Hence, there is no economic incentive to prescribe antimicrobials like there may be in other countries. These, and other factors, are fundamental to the low use of antimicrobials in Norway and the Nordic countries compared to other countries in Europe (figure 1).

For a long time, the attitude of Norwegian veterinarians, farmers, the livestock industry and the authorities has been to restrict the use of antimicrobials, especially after 1995 when the project Healthier Animals and Reduced Antibiotic Usage was started. A united livestock industry managed to reduce the use of antimicrobials by almost 40 % between 1996 and 2001. This is estimated from figures from the sale of veterinary pharmaceuticals from wholesalers. The project also led to a shift towards more narrow spectrum antimicrobials with a lower potential as drivers of antibacterial resistance.

In Norway, antimicrobials are not used as growth promoters (feed additives) or for routine prevention of infection in any of the animal productions. With the exception of avoparcin for poultry, which the industry itself phased out in 1994 and which became prohibited in 1995, addition of antimicrobials to feed as growth promoters has been forbidden for many years. The industry also decided to phase out the use of zink-bacitracin for swine and virginomycin for poultry in the mid 90s. The use of antimicrobials as growth promoters became prohibited in the EU from 1.1.2006.

Blanket treatment of flocks or herds with antimicrobials is only used in special circumstances to prevent or treat disease when parts of the herd/flock are affected (metafylactic use according to FAO, 2016). The exception to this is poultry, where blanket treatment is standard practice when treating infections, but the frequency of such treatment is very low.

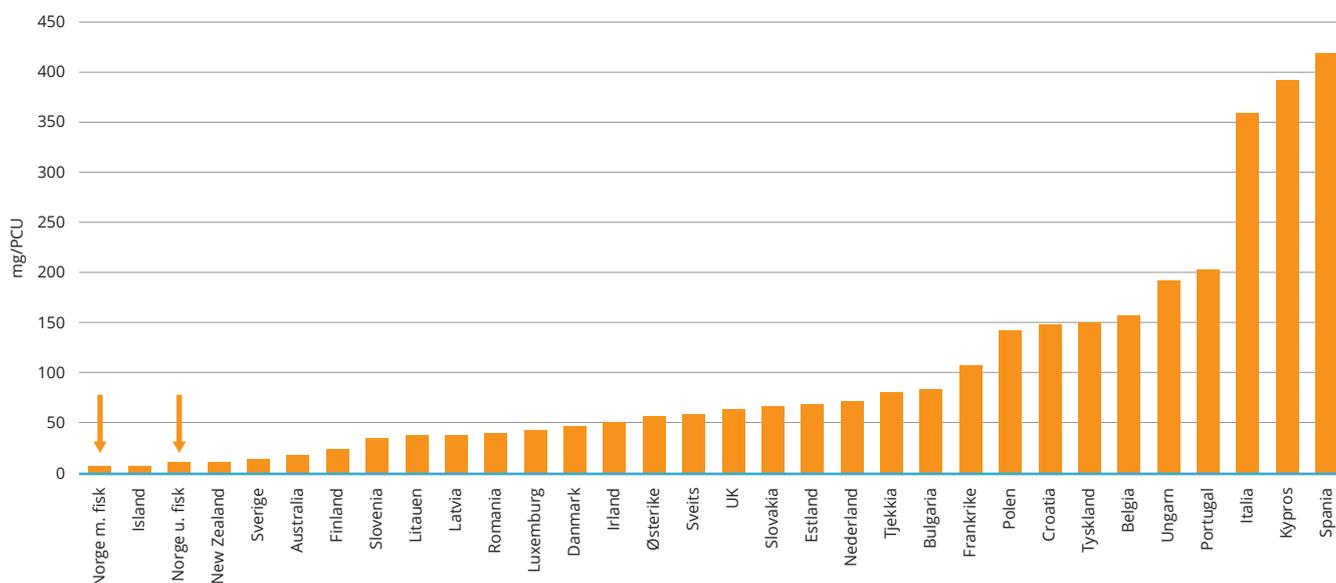


Figure 1. The sale of antimicrobials to food producing animals in 2014, including horses, in 29 European countries and New Zealand and Australia. NOTE: In the EMA report fish are also included; and the reported sale for Norway is 3,1 mg/PCU. In this figure the consumption of antimicrobials in Norway is also shown with fish excluded and constitutes 9,9 mg/PCU. Source: EMA, 2014, NORM-VET 2015 and R. Condron, IDF Summit Rotterdam, 2016.

The poultry industry has had its own action plan on antimicrobial resistance since 2014. The measures laid down in this plan have led to a reduced occurrence of ESBL (extended spectrum betalactamase) in *E. coli* and have provided a knowledge base for achieving further reductions. Since 2013, Norwegian authorities have implemented measures to eradicate MRSA (methicillin-resistant *Staphylococcus aureus*) in swine herds. More moderate measures have been implemented when MRSA is detected in ruminants. The swine industry has collaborated closely with the authorities and has laid down significant resources in order to support affected farmers.

Good animal welfare and a sustainable economy in Norwegian animal production are dependent on continued use of antimicrobials for treatment of sick animals, when necessary. At the same time, development and spread of antimicrobial resistance must be prevented by ensuring optimal antimicrobial usage, as described in the action plan of the WHO. For a more extensive description of diseases, antimicrobial usage and resistance in Norwegian animal production – and its impact on public health – see background section of the Norwegian version of this plan.

04 | Main aim

The Norwegian livestock industry will continue its work to prevent development and spread of antimicrobial resistance in cattle, pigs, sheep, goats and poultry through a joint action plan.

MAIN AIM

The Norwegian livestock industry will work to prevent the occurrence of antimicrobial resistant bacteria in Norwegian livestock, by actively engaging in preventive veterinary medicine, organised control and eradication of infectious disease and prudent and correct treatment of diseased animals.

05 | Principles, main measures and areas for improvement

Important principles that are fundamental to present day practice and this plan:

- Healthy animals do not need antimicrobials
- Antimicrobials shall not be used for prevention
- Treatment should be based on a diagnosis
- Diseased animals deserve optimal treatment
- Critically important antimicrobials must be used exclusively for defined conditions
- Agents with antibacterial effect should not be used for non-infectious conditions
- Veterinarians should not benefit economically from the sale of pharmaceuticals (decoupling)

The most important measure is the continued work to maintain and improve the health of Norwegian livestock to avoid unnecessary use of antimicrobials and development of antimicrobial resistance. Preventive veterinary medicine and targeted breeding are key factors for achieving this.

Areas for improvement include reliable and complete documentation of antimicrobial usage in animal production with respect to species and diagnosis. Digital data entry to the Animal Health Recording System enables the industry to document and report on health status and treatments in Norwegian livestock. Further, the data can be used to evaluate and advise on treatment regimes. Improved reporting is a prioritized aim.

MASTITIS AS AN EXAMPLE OF DOCUMENTATION FOR OPTIMAL USE OF ANTIMICROBIALS.

Data from the Norwegian Cattle Herd Recording System (Kukontrollen) and Animal Health Recording System (Dyrehelseportalen) show that mastitis treatments, and thus antimicrobial usage, was reduced by 70 % between 1994 and 2015. This is estimated to be equivalent to a reduction of active substance for clinical mastitis from 2.534 kg to 760 kg in the 20-year period. Based on existing data in the Animal Health Recording System it has also been estimated, that it is possible to reduce the usage by a further 30 % by adjusting advised dosages to the lowest possible. Furthermore, it should be possible to eliminate completely the use of dihydrostreptomycin, oxytetracycline and enrofloxacin in addition to amoxicillin.

Biosecurity is another important area that can be improved. The animal health situation in Norway is good, and the use of antimicrobials and prevalence of resistance are low. Therefore, the introduction of new diseases or antimicrobial resistance from humans or animals to the Norwegian livestock is a greater threat than development of resistance through high use of antimicrobials. Hence, biosecurity measures on the national level and within farms need to be prioritized.

HOW THE INDUSTRY WORKS TO IMPROVE BIOSECURITY.

KOORIMP is the Norwegian Livestock Industry's Biosecurity Unit. The purpose is to prevent transmissible animal diseases or zoonoses through import of live animals, semen or embryos. In addition, KOORIMP works to improve biosecurity at the farm level.

KIF (Kontrollutvalget for import av fjørfe) is part of KOORIMP and is responsible for coordinating biosecurity measures associated with import in the poultry industry.

The main responsibility of the farm animal health service for cattle, swine, sheep, goats and poultry respectively, is to collaborate with the respective industries within preventive veterinary medicine and organised disease control and eradication.

A third area for improvement is to ensure that when treatment with antimicrobials is needed, the correct antimicrobial is used at the correct dosage. An important measure is to update the therapy guidelines to reduce the use of antimicrobials in general and in particular antimicrobials that are critically important or that have a high potential as drivers of resistance. Optimal treatment of diseased animals is, however, important for animal welfare and a sustainable animal production.

06 | Sub-goals and measures

The measures described in this plan are carried out in collaborations between the relevant organisations of the industry. Mainly, it is the farm animal health services and KOORIMP/KIF that follow up the measures on behalf of the different organisations. In cases where other parties have responsibilities it is noted in the plan. Many of the measures are already running, while for others the deadlines for initiation are specified in the action plans of the relevant health services.

The action plan of The Ministry of Agriculture and Food aims to lead to a reduction of the use of antimicrobials by 10 % between 2013 and 2020. The livestock industry will focus on enhancing prudent and correct treatment of diseased animals, and on further improving animal health in general in order to prevent development of resistance. The industry expects that the collected measures of this plan will lead to a reduction of antimicrobial usage by at least 10 %, in accordance with the target of the Ministry.

Another aspect to be considered is that the documentation of antimicrobial usage is based on figures from wholesale of pharmaceuticals. These figures have been stable for the last 15 years despite a significant reduction in use of antimicrobials, for example for mastitis in cattle. The figures also indicate that in the last five years the sale of antimicrobial paste for horses has increased by 20 %, a use which amounts to approximately one fifth of all antimicrobials for terrestrial production animals. Most pharmaceutical products are, however, used for more than one animal species, and the fraction used for other animals than cattle, swine, small ruminants and poultry is not known. An important sub-goal is therefore to properly document antimicrobial usage through the Animal Health Recording System. This web based registration system is well on its way to becoming a useful tool, but will not be able to measure the change in prescription practicing dating back to 2013.

Sub-goal 1: Maintain a good national biosecurity level and prevent import of disease and resistant bacteria to Norway

Measure 1.1: Provide guidance in connection with import of animals, breeding materials and contaminated agricultural equipment

- Continue KOORIMP and KIF to ensure:
 - A limited number of animal imports and a limited number of imported animals.
 - Targeted investigations for selected infectious agents and resistant microbes when animals, semen, embryonated eggs and embryo are imported.
 - Provide information on risk for infection and the necessary biosecurity measures in connection with import from other countries of used equipment such as automatic milking robots, equipment for handling of manure etc.

Sub-goal 2: Improve biosecurity between animal holdings and at the farm level

Measure 2.1: Advise farmers and persons involved in Norwegian food animal production about:

- Routines to reduce the risk of introducing infectious agents and/or resistant bacteria:
 - Establish biosecurity plans in animal holdings.
 - Routines for visitors and equipment, especially establishment of an entrance with biosecurity barriers.
 - Improve general measures in relation to movement of personnel and implementing specific measures to prevent introduction of defined agents.
 - Adhere to the quarantine time following visits to animal holdings abroad – the 48- hours rule.
 - Update information material for foreign labourers – update the document Biosecure (Smittesikker).
- Reduce the risks associated with trade of and transport of animals including:
 - Provide advice regarding purchase of live animals and other contact with live animals e.g. by developing industry guidelines for trade of live swine and cattle.
 - Use the industry's own systems to document health, including the use of health certificates in relation to live animal trade.
 - Use of quarantine.
 - Establish purposeful facilities for delivery and collection of animals.
- Targeted information to non-commercial animal holdings.
- Improved biosecurity within animal holdings, including:
 - Correct handling of acute and chronically infected animals.
 - Increased usage of farrowing batches, sectioning and «all inn – all out».
 - Effective routines for cleaning and disinfection of buildings/rooms for animals and for equipment.

Sub-goal 3: Reduce the occurrence of disease in Norwegian livestock

Measure 3.1: Prevent infectious diseases by:

- Communicating information about preventive measures for infectious diseases.
- Communicate the importance of good vaccination routines and evaluate the need for introducing new vaccines and vaccine strategies.

Measure 3.2: Control and eliminate specified contagious diseases by:

- Encourage the Norwegian Food Safety Authority to list contagious diseases that do not occur in Norway, as notifiable. First and foremost, these include *Mycoplasma bovis* and *Mycoplasma hyopneumoniae*.

- Surveillance and control of:
 - Enzootic pneumonia in pigs (*Mycoplasma hyopneumoniae*).
 - Caseous lymphadenitis (*Corynebacterium pseudotuberculosis*) in dairy goats.
- Act as a driving force for continuation of programs led by the Authorities for surveillance, control and eradication of contagious diseases (until recently led by the industry):
 - Footrot in small ruminants caused by virulent *Dichelobacter nodosus*.
 - CAE (caprine arthritis and encephalitis) and paratuberculosis/Johnes disease (*Mycobacterium avium* subsp. *Paratuberculosis*) in goats.
- Continue and/or initiate new measures to control:
 - Bovine respiratory syncytialvirus (BRSV) and Bovine coronavirus (BCoV) in cattle.
 - Bovine digital dermatitis (BDD) in cattle.
 - Contagious mastitis (*Streptococcus agalactiae*) in cattle.
- The most pathogen serotypes of *Actinobacillus pleuropneumoniae* (APP) causing pleuropneumonia in pigs.
- Continuously evaluate the need for control or eradication of other infectious diseases in animals using available knowledge and a risk-based approach.

Measure 3.3: Breeding for healthier animals

- Cattle: continue emphasising health in breeding programs. Mastitis has been included in the breeding program of the Norwegian Red (NRF) since 1978, and this has contributed to significant improvement in their resistance against mastitis. Both clinical and subclinical (cell count) mastitis is emphasised in the udder health index. Other diseases and claw health is also included in the NRF breeding targets. Health traits constitute 26 % of the total merit index for NRF. Responsible: Geno.
- Swine: breeding to reduce mortality of piglets before three weeks of age as well as breeding for uniform sized and large piglets. With respect to sows, breeding is focussed on reducing the occurrence of shoulder ulcers, improving body condition at weaning and longevity. The breeding goal also includes leg confirmation traits related to longevity. In addition, there are a number of projects with the final goal of developing properties that will increase resistance to disease in various environments, with respect to possible implementing these traits in the in the breeding value estimation. Responsible: Norsvin.
- Sheep: Breeding for improved health is maintained through individual farmers' recruitment of breeding stock from healthy parents. The Norwegian Sheep and Goat Breeders Association (NSG) aims to use the health registries and culling data for estimating breeding indexes for mastitis and bring this into the total merit index. This is being tested at present.
- Goats: Breeding for improved health is maintained by the individual goat farmers through recruitment of breeding stock from healthy parents. NSG estimates a breeding

index for cell count in milk. The trait is included in a total merit index and improved cell counts through breeding can be documented. Health registries and culling data will be tested when the records hold sufficient quality.

- Poultry: Breeding of poultry is maintained by international breeding companies. Balanced breeding targets combined with research and development have greatly improved animal health. Efforts to improve health through breeding will continue. New technology and methodology will contribute to develop breeding programs to ensure optimal selection. Responsible: importers.

Sub-goal 4: Correct and documented use of antimicrobials

Measure 4.1: Revise and communicate advice on antimicrobial usage

- Request that the Norwegian Medicines Agency performs a revision of the therapeutic guidelines for use of antimicrobials. If possible, therapeutic guidelines should be coordinated among the Nordic countries.
- Initiate establishment of criteria for use of critically important antimicrobials and antimicrobials that are particularly strong drivers of resistance e.g. fluorquinolones, macrolides, florfenicol and possibly tetracyclines.
- Help ensure that revised guidelines and criteria are adhered to by veterinarians.
- Request pharmaceutical companies to alter size of packaging and selection of antimicrobials available so that these are in line with therapeutic guidelines.
- Promote regulations that enhance prudent and documented use of antimicrobials.

Measure 4.2: Prohibited use of certain antimicrobials

- Request that the authorities prohibit the use of certain pharmaceuticals that are not used in the livestock industry at present and that are unwanted – including colistin and 3rd and 4th generation cephalosporins.

Measure 4.3: Promote the Animal Health Recording System as the main site for entry of all diagnoses and all use of pharmaceuticals by:

- Develop a plan for improving the Animal Health Recording System to increase its usefulness for producers/farmers and veterinarians including implementations of functions as:
 - Reports to individual veterinarians enabling them to compare their own practice with the collected results for veterinarians at the county- and country level.
 - Feedback to individual veterinarians that highlights prescription practices of antimicrobials not in line with the therapeutic guidelines.
 - Reports showing what treatments (pharmaceutical agent and dosage) are used for different diseases in different

age groups within each animal species.

- Contribute to improving coordination of data from wholesalers and from pharmacies with data from the Animal Health Recording System to better document antimicrobial usage in food producing animals.

Measure 4.4: Improved control and revision

- Request that the Norwegian Food Safety Authority establishes a system to identify veterinarians who fail to report antimicrobial usage or who have a prescription practice that deviates from current guidelines.
- Use the quality assurance system in agriculture (KSL) to actively ensure that producers/farmers use antimicrobials in accordance with the veterinarian's intentions and in accordance with what was agreed.

Sub-goal 5: A documented low level, and additionally lowered levels of specific forms of antimicrobial resistance

Measure 5.1: Surveillance and action against specific forms of antimicrobial resistance

- Continue the work on the poultry industry's action plan against antimicrobial resistance.
- Support the Government's work to reduce the risk of MRSA becoming established in the Norwegian livestock population.
- Continue, and consider extending, the livestock industry's ongoing surveillance on antimicrobial resistance in routine diagnostics, for example *Staphylococcus* spp. from mastitis and other disease causing or indicator bacteria.
- Be up-to-date on the occurrence of antimicrobial resistance and continually consider the need of new measures.

Sub-goal 6: To generate new knowledge through research and development

Measure 6.1: Conduct research within preventive veterinary medicine

- Continue work to find causal factors and preventive measures against infectious diseases of importance to the livestock industry.
 - Examples are on-going projects to prevent tick-borne infections in sheep, necrotic enteritis in turkeys, bovine respiratory syncytial virus (BRSV), and bovine coronavirus in cattle.
 - The following projects were granted in 2016: Respiratory diseases in swine, and bovine digital dermatitis.
- Consider the need for, initiate and apply for funding for relevant issues.

Measure 6.2: Find reasons for and preventive measures against antimicrobial resistance

- Initiate and contribute to on-going research projects with the aim to understand the underlying mechanisms driving antibacterial resistance. An on-going project is QREC-MaP: Quinolone resistance despite low antimicrobial usage – mechanisms and possible preventive measures.
- Consider the need for, initiate and apply for funding for relevant issues.

Sub-goal 7: Enhanced collaboration between the authorities, R&D-institutions and other stakeholders.

Measure 7.1: Convey the livestock industry's expectations to other parties to ensure:

- Increased predictability on policy and financial issues regarding the control and combat of severe contagious diseases and certain forms of antimicrobial resistance.
- Coordinated overall risk communication aimed at the public.
- Up-to-date knowledge regarding the livestock industry among students of veterinary medicine through collaboration in research and teaching at the Norwegian University of Life Sciences (NMBU).
- A veterinary education that ensures up-to-date knowledge on the correct use of antimicrobials, and focuses on criteria that are important driving factors for antimicrobial resistance.
- Good, precise, and economically feasible diagnostics, and a public diagnostic service.
- Arenas for discussions and dialog on animal health and antimicrobial resistance, including the current Strategic Forum for Animal Health and Resistance.
- Through a dialog with veterinary practitioners, and a collaboration with the Norwegian Veterinary Association, ensure compliance with the therapeutic guidelines and other actions for the optimal use of antimicrobials.

Measure 7.2: Dissemination of knowledge nationally and internationally

- Take part in the discussion regarding preventive veterinary medicine and the use of pharmaceuticals on an international level, and give voice to how animal diseases are controlled and eradicated in Norway.
- Gather knowledge, inspiration and corrective feedback based on a dialog with people in other countries and their knowledge and experiences.

07 | Members of the working group

The members of the working group are employees of the respective animal health services and their owners:

Synnøve Vatn, Animalia, Norwegian Meat and Poultry Research Centre, Head of working group

Olav Østerås, TINE Advisory Services

Ingrid Melkild, Nortura

Guro Alderslyst, Norwegian Beefbreeders Association (TYR)

Peer Ola Hofmo, Norsvin

Lars Erik Wallin, The Norwegian Sheep and Goat Breeders Association (NSG)

Ylva Freed, The Norwegian Poultry Association

Thorbjørn Refsum, Animalia, Poultry Health Service

Lisbeth Hektoen/Tore Tollersrud, Animalia, Sheep Health Service

Stine Gulliksen, Animalia, Pig Health Service

In addition, Anja Fyksen Lillehaug, Norwegian Farmers' Union, Ida Mathisen, The Norwegian Confederation of Meat and Poultry (KLF), and Helga Odden, Animalia, have contributed to the action plan.

Trond Braseth from Norwegian Production Animal Veterinary Association (PVF) in The Norwegian Veterinary Association (DNV) has also given input to the plan.

The action plan will be reviewed annually by the respective animal health services and KOORIMP/KIF, and as new knowledge emerges the plan will be adjusted accordingly.

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NORGES BONDELAG



NORSK BONDE- OG SMÅBRUKARLAG

