

A baseline (◆) for the

## **Good Veterinary Practice of Antimicrobials for drinking water use in domestic poultry.**

- Good Veterinary Practice of antimicrobial products can be defined as a rational antibacterial therapy which is based on a combination of
  - clinical judgement,
  - laboratory diagnosis,
  - medical knowledge,
  - epidemiological background, and
  - husbandry informationabout the flock to be treated.
- The usage of antimicrobials should not replace fundamental shortcomings in husbandry, biosecurity measures and prophylactic hygiene. The administration of antimicrobial products in disease situations is supportive to good farm management and properly-designed immunization programs.
- The usage of antimicrobials should meet the requirements of a valid veterinarian-client-patient relationship
  - The veterinarian assumes the responsibility for initiation of antimicrobial therapy and the client agrees to follow his instructions.
  - The veterinarian is acquainted to the client, the farm and the flock(s) by regular visits.
  - The veterinarian is available for follow-up evaluation and emergency coverage.
- Unless the clinical picture (signs, gross lesions) is pathognomonic, a flock diagnosis should be confirmed by laboratory testing. In urgent situations a lab confirmation cannot be awaited before an antibacterial therapy is put in place. The veterinarian will be guided by his professional knowledge and previous experience in similar situations.
- Sensitivity testing of the causative microorganisms in a representative bird sample (typically ill subjects, recent deaths), prior to or concurrently with the onset of medication, is state of the art in poultry medicine.
- The veterinarian or veterinary service department should collate historical and current information related to the pathology, epidemiology and in-vitro susceptibility of microbial diseases on distinct farms of a poultry company or poultry integration.
- In contrast to the usage of antimicrobials in individual human patients (often less immunocompetent elderly people or children) the avian medicine

profession needs antimicrobials in most instances for total flock medication of young growing birds, mainly in the incubatory stage of disease.

- Although a diseased flock consists partially of sick or lethargic birds with varying degrees of reduced water (and feed) intake, it is important to treat the flock as a whole to lower the infection pressure for in-contact pen mates.
  - The use of antimicrobials as soon as premonitory disease signs appear and in case of imminent disease hazard (birds likely to be infected), is appropriate to control the appearance and further spread of the disease.
  - By placing the antimicrobial therapy at a carefully chosen time, the veterinarian aims to sustain animal welfare, to avoid major disease damage and to minimise the spread of disease to adjacent flocks and neighbouring farms. Medication in anticipation of rising mortality and major disease damage is justifiable under conditions of good farm management, timely availability of flock health information, adequate diagnostic support and professional veterinary supervision.
  - In addition to group medication, treatment of individual birds with oral or parenteral can be lifesaving and is to be encouraged, particularly in breeder and turkey stock.
  - The careful use of antimicrobials to anticipate developing disease in a flock should not be confused with, or serve as a pretext for, the unjudicious use in clinically healthy flocks.
- Antimicrobial products should be administered according to the label directions established by the manufacturer and approved by the regulatory authority. Label directions encompass indications (claims) and dosage (dose, duration).
  - If the appropriate antimicrobial has not been chosen (spectrum, kinetics), therapy failures are to be expected.
  - If the duration of medication is not long enough, relapses may occur.
  - Severe treatment failures will occur if the duration of treatment as well as the dose was too low.
  - An unsatisfactory clinical outcome can also be triggered by immune suppressive factors, concurrent metabolic or viral diseases or too high infection pressure (overwhelming infections).
- Any additional measure to enhance the general immune response of the bird will enhance a favourable clinical outcome of an antimicrobial medication.

- For water treatment the antimicrobial product is commonly administered via bulk water tanks under low pressure or via water proportioners that meter the active ingredient into the water system at the appropriate dosage. Fresh solutions should be prepared every day.
- Proper antimicrobial therapy in the drinking water requires an adequate dosage, encompassing the „dose“ and the „duration“ of treatment. The dose of an antimicrobial can be expressed either as concentration of the active ingredient (ppm) or, more accurately, as active units (usually mg) per kg of body weight (BW). Administering antimicrobial compounds based on a straightforward concentration of active ingredient in the drinking water whilst ignoring physiological, pathological and husbandry factors can lead to highly inaccurate dosing.
  - Water consumption, regardless of health status, varies widely according to bird species, age and ambient temperature.
    - Relative water consumption (daily water volume intake in proportion to BW) is about twice as high in chickens than in turkeys.
    - Relative water consumption and subsequent intake of the drug decrease with age, being about half of the quantity in adults compared to young birds.
    - Within the temperature comfort zone (15-25 °C) water consumption per body weight mass and the ratio water/feed intake remain fairly stable but increase abruptly once the heat stress threshold (27 °C) is exceeded. Under tropical climates the drug dose (mg/kg BW) can be two to three fold higher than under moderate conditions, at a given ppm dosage in water.
  - Lighting schedules, feeding programmes and disease strongly influence water consumption patterns. Morbidity affects water consumption less than appetite.
    - Broilers in windowless houses, given continuous light, eat and drink intermittently with little or no difference between diurnal cycles.
    - Laying hens consume two-thirds of their total water and feed during 4 to 6 hours preceding the dark period.
    - Maximal water intake in replacements under feed restriction occurs during a few hours following feeding.
- The total daily amount of the antimicrobial product required to medicate is calculated by multiplying the average BW with the number of birds in the flock (=total live mass).

- The average BW is best determined by weighing a bird sample. Alternatively the regular standard BW found in the manual guide can be used.
  - As growth is usually linear, the actual BW can be intrapolated between weekly weights.
- In well-managed farms that have water flow measuring devices the total daily water consumption can be assessed precisely.
- The total daily amount of drinking water needed by a flock can also be derived from the daily total feed intake and the ratio water/feed intake. For chickens and turkeys the ratio water to feed consumption is 1.8 to 2 in the temperature comfort zone.
- An appropriate antimicrobial should be chosen in a given situation. It is comforting for the veterinary profession that the availability of a variety of antimicrobial compound classes allows to select efficacious products for specific microbial diseases.
- The first consideration is to select an appropriate antimicrobial class, e.g. beta-lactams, tetracyclines, aminoglycosides, macrolides, quinolones, ... etc.
  - The next step is to apply a specific compound thought to be the most appropriate for the disease condition to be medicated.
  - Treating a bacterial infection routinely with the same drug of first choice will inevitably impose too much antimicrobial resistance selection pressure on the causative microorganism.
  - All in all, drug selection is based on
    - the severity and nature [etiological agent(s)] of the disease,
    - the value of the poultry stock (e.g. broilers vs turkeys, breeders vs breeder progeny),
    - the pharmacodynamic/pharmacokinetic properties of the antimicrobial,
    - the time gap between the end of medication and the expected processing of the flock (drug withdrawal compliance),
    - the antimicrobial susceptibility at the farm/site, and
    - the expected cost-effectiveness.
  - During antibacterial treatment the body defense mechanisms interact with the bacteria at the site of infection and resistance selection concomitant with therapy is a predictable event. Hence the isolation of bacterial clones resistant in vitro during or following a therapy is not necessarily indicative of clinical failure. However, in case of therapy failure or relapse, the chance to select resistant microorganisms is increased.
  - If clinical cure is not satisfactory and concurrently drug resistance is shown, the therapy should be switched to an antimicrobial product of a separate chemical class.

- During and after therapeutic intervention, the flock should be carefully monitored as to the clinical outcome of treatment.
  - The main criterion to monitor success of medication is the reduction of mortality. However, other important conspicuous parameters should be enrolled in the evaluation, e.g. the return to regular feed intake.
  - Particularly with bacteriostatic compounds, the lag time between commencement of treatment and visible flock health improvement may expand to 1 or 2 days.
  - Even when the mortality returns to normal very rapidly, medication must be maintained sufficiently long, not exceeding the maximum recommended duration, in order to avoid disease relapse.
  - For historical and future reference accurate records should be maintained on antimicrobial drug use (including veterinary prescriptions) and on treatment outcomes. Records should also be kept on the batch numbers of the antimicrobial drugs administered.
  
- Unless preliminary testing in-vitro has shown satisfactory susceptibility of the microorganisms involved, consecutive use of the same compound category for the same indication (e.g. respiratory, intestinal, systemic) within the same production cycle is to be avoided. Antimicrobial products belonging to the same compound class generally share overlapping cross-resistance.
  
- „Rotation programs“ in an integrated poultry company in order to safeguard long-term effectiveness and to prevent resistance selection pressure, are recommendable.
  
- Antimicrobial use should not conflict with HACCP systems. A Hazard Analysis Critical Control Point System is a structured approach to identify, assess and control hazards associated with food production and handling.
  
- As a rule of thumb, flocks should not be medicated simultaneously with 2 or more antimicrobials belonging to a different compound category in order to avoid emergence of multiple drug resistance and to avoid drug antagonism.
  - In general terms and under in-vitro conditions combinations of bacteriostatic and bacteriocidal compounds are antagonistic whereas associations of either bacteriocidal or bacteriostatic substances are not.
  - Bacteriocidal agents of different compound categories can act synergistically.
  
- It is important to monitor the sensitivity profile of bacterial pathogens in the field.

- From an epidemiological point of view it is mandatory to relate in vitro susceptibility figures in direct relationship with the individual farm. Resistance figures measured on a national or regional basis are informative but have little predictive value for the veterinarian prescribing a particular antimicrobial product on a specific farm.

- Meat and eggs must be withheld from human consumption until residues are depleted below the tolerance limits set the competent authorities. Comply to the approved withdrawal times. Remind that increasing the dose may prolong the tissue depletion kinetics in animals.

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(♦) The information collated in this document was retrieved from following sources:

- ♦ „Responsible use of antimicrobials to control disease in farm animals.“ In: The medical impact of the use of antimicrobials in food animals. Report and proceedings of a WHO meeting, pp. 271-274, Berlin, Germany, October 1997. WHO/EMC/ZOO/97.4
- ♦ „Antimicrobial medication in domestic poultry.“ In: Poultry Diseases, 4th edition, W.B. Saunders Company Ltd., pp. 484-494, 1995.
- ♦ „The use of antibiotics in farm animals.“ In: Report on microbial antibiotic resistance in relation to food safety. Advisory committee on the microbiological safety of food, pp.144-157. Crown Copyright, UK. 1999.
- ♦ „Responsible use of antimicrobials in poultry production.“ Responsible Use of Medicines in Agriculture Alliance, 1999. [www.ruma.org.uk](http://www.ruma.org.uk)
- ♦ „Guidelines to judicious therapeutic use of antimicrobials in poultry.“ The American Veterinary Medical Association, 2000. [www.avma.org](http://www.avma.org)