Responsible prescribing of antimicrobials

*Prescriptions for change*

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With thanks to:
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Jenny Bellini, Friars Moor Veterinary Group

*One Health: Antimicrobial and Anthelmintic Resistance*
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Who am I?
Outline

» Antimicrobial stewardship & responsible use
  • What is it and who’s responsible?
  • What are the challenges?

» Understanding prescribing decisions
  • Why do we prescribe what we prescribe?

» ‘Best-practice’ prescribing
  • Principles & approach
  • Practice-wide
  • A commitment to change
Antimicrobial stewardship & responsible use
Antimicrobial stewardship

What does responsible medicines use mean to you?
### Responsible medicines use

**Views of undergraduate veterinary students**

<table>
<thead>
<tr>
<th>Evidence-based decision making</th>
<th>Diligent prescribing &amp; user compliance</th>
<th>Moral duty &amp; responsibility</th>
</tr>
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<tbody>
<tr>
<td>“Avoiding blanket use without clinical indication”</td>
<td>“Calculating the doses correctly”</td>
<td>“Stewardship”</td>
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<tr>
<td>“Avoid prescribing for viral infections”</td>
<td>“Completing the course”</td>
<td>“Using the correct medication … without being pressured or persuaded by owners or drug companies”</td>
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<tr>
<td>“Use evidence to prescribe a suitable medicine and dose”</td>
<td>“Good communication with owners about why you are doing what you are doing”</td>
<td>“Only use when necessary”</td>
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<tr>
<td>“Respecting the cascade and using licensed medication as first line treatment”</td>
<td>“Don’t use broad-spectrum antibiotics because it is easier”</td>
<td>“Don’t prescribe just to make business”</td>
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Responsible use of antimicrobials in veterinary practice: The 7-point plan

1. Work with clients to avoid need for antimicrobials
   - Inform owners about the benefits of regular pet health checks
   - Use symptomatic relief or topical preparations where appropriate
   - Integrate disease control programmes
   - Animal Health and Welfare Planning
   - Isolate infected animals wherever possible

2. Avoid inappropriate use
   - For example, for uncomplicated viral infections
   - Restrict use to ill or at-risk animals
   - Advise clients on correct administration and storage of products and completion of course
   - Avoid underdosing

3. Choose the right drug for the right bug
   - Identify likely target organisms and predict their susceptibility
   - Create practice-based protocols for common infections based on clinical judgment and up to date knowledge
   - Know how antimicrobials work and their pharmacodynamic properties
   - Use narrow spectrum antimicrobials where possible

4. Monitor antimicrobial sensitivity
   - While clinical diagnosis is often the initial basis for treatment, bacterial culture and sensitivity must be determined where possible so that a change of treatment can be implemented if necessary
   - Monitor bacterial culture and sensitivity trends

5. Minimise use
   - Use only when necessary and evidence that usage reduces mortality and/or morbidity
   - Regularly assess antimicrobial use and develop written protocols for appropriate use
   - Use alongside strict aseptic techniques and written practice guidelines

6. Record and justify deviations from protocols
   - Be able to justify your choice of antimicrobial and dose
   - Keep accurate records of treatment and outcome to help evaluate therapeutic regimens

7. Report suspected treatment failure to the VMD
   - This may be the first indication of resistance
   - Report through the Suspected Adverse Reaction Surveillance Scheme (SARGS)

For the latest detailed guidance visit www.bva.co.uk

For more information about antimicrobial resistance, please visit www.antimicrobial-guardian.org

Higher-risk antimicrobials
Fluoroquinolones, 3rd/4th generation cephalosporins and colistin:

1. Antimicrobials are essential for the treatment and prevention of the spread of infectious and nosocomial bacterial diseases in both animals and humans

2. Every use increases the risk of selection for resistant bacteria

3. Responsible use optimises therapeutic effects while minimising the risk of selection for resistant bacteria

4. Responsible use — correct antimicrobial as little as possible, as much as necessary
Responsible medicines use

Antimicrobials are essential for the treatment and prevention of the spread of infectious and zoonotic bacterial diseases in both animals and humans.

Every use increases the risk of selection for resistant bacteria.

Responsible use optimises therapeutic effects while minimising the risk of selection for resistant bacteria.

Responsible use — correct antimicrobial: as little as possible, as much as necessary.

https://www.bva.co.uk/uploadedFiles/Content/News,_campaigns_and_policies/Policies/Medicines/20170928%20BVA%20Antimicrob%20poster%202017%20v1%20WEB.pdf (accessed 05-11-2019)
What makes an antimicrobial critically important for human medicine?

- Sole / limited number of substances available as therapy for serious human disease
- Pathogens which are zoonotic or where there exists the potential for resistance gene transfer from non-human sources

Critically Important Antimicrobials

<table>
<thead>
<tr>
<th>Antimicrobial class</th>
<th>Example of antimicrobial</th>
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</thead>
<tbody>
<tr>
<td>CRITICALLY IMPORTANT ANTIMicrobials</td>
<td></td>
</tr>
<tr>
<td>Aminoglycosides</td>
<td>gentamicin</td>
</tr>
<tr>
<td>Aminopenicillins</td>
<td>amoxicillin</td>
</tr>
<tr>
<td>Penicillins</td>
<td>ampicillin</td>
</tr>
<tr>
<td>Penicillins (aminopenicillins)</td>
<td>amoxicillin-clavulanic-acid</td>
</tr>
<tr>
<td>Piperazosides</td>
<td>fosfomycin</td>
</tr>
<tr>
<td>Polymyxins</td>
<td>colistin</td>
</tr>
<tr>
<td>Quinolones</td>
<td>ciprofloxacin</td>
</tr>
<tr>
<td>Drugs used solely to treat tuberculosis or other mycobacterial diseases</td>
<td>isoniazid</td>
</tr>
</tbody>
</table>

Responsible medicines use

Higher Priority CIAs

Higher-risk antimicrobials
Fluoroquinolones, 3rd/4th generation cephalosporins and colistin:

1 Reserve these antimicrobials for clinical conditions that respond poorly to other classes of antimicrobials and where bacterial culture and sensitivity has been carried out
2 Do not administer systemically to groups or flocks of animals except in very specific situations and special attention should be given to the risk of antimicrobial resistance as part of the benefit/risk assessment
3 Avoid off-label use whenever possible

Quinolones are known to select for quinolone-resistant *Salmonella* spp. and *E. coli* in animals. At the same time, quinolones are one of few available therapies for serious *Salmonella* spp. and *E. coli* infections. Given the high incidence of human disease due to *Salmonella* spp. and *E. coli*, the absolute number of serious cases is substantial.

Cephalosporins (3rd and higher generation) are known to select for cephalosporin-resistant *Salmonella* spp. and *E. coli* in animals. At the same time, 3rd and higher generation cephalosporins are one of few available therapies for serious *Salmonella* spp. and *E. coli* infections in humans, particularly in children. Given the high incidence of human disease due to *Salmonella* spp. and *E. coli*, the absolute number of serious cases is substantial.

Macrolides and Ketolides are known to select for macrolide-resistant *Campylobacter* spp. in animals, especially *Campylobacter jejuni* in poultry. At the same time, macrolides are one of few available therapies for serious *Campylobacter* infections, particularly in children, for whom quinolones are not recommended for treatment. Given the high incidence of human disease due to *Campylobacter* spp., especially *Campylobacter jejuni*, the absolute number of serious cases is substantial.

Glycopeptides are known to select for glycopeptide-resistant *Enterococcus* spp. in food animals (e.g. when avoparcin was used as a growth promoter, vancomycin-resistant enterococci (VRE) developed in food animals and were transmitted to people). At the same time, glycopeptides are one of the few available therapies for serious enterococcal infections. Given the high number of cases, the previously documented occurrence of transmission of VRE to people from food animals, and the very serious consequences of treatment failures in such cases, glycopeptides are classified as being of the highest priority.

Polymyxins (e.g. colistin) are known to select for plasmid mediated polymyxin-resistant *E. coli* in food animals. At the same time, intravenous polymyxins are one of few available therapies for serious *Enterobacteriaceae* and *Pseudomonas aeruginosa* multi-resistant infections in people in healthcare settings in many countries, especially in seriously ill patients in critical care. Given the high incidence of human disease due to *Enterobacteriaceae*, the absolute number of serious cases where colistin is needed can be considered substantial.

[https://www.bva.co.uk/uploadedFiles/Content/News,_campaigns_and_policies/Policies/Medicines/20170928%20BVA%20Antimicrob%20poster%202017%20v1%20WEB.pdf](https://www.bva.co.uk/uploadedFiles/Content/News,_campaigns_and_policies/Policies/Medicines/20170928%20BVA%20Antimicrob%20poster%202017%20v1%20WEB.pdf) (Accessed Nov 2019)

Responsible medicines use

What are the challenges?

What are the challenges to achieving responsible medicines use on farm?
Responsible medicines use on farm

What are the challenges?

Ownership of responsibility
- Vets are the gate-keepers; farmers main users
- Prescription, dispensing & administration

Food chain protection
- MRLs and withhold times
- Zero milk withhold products

Evidence-based prescribing
- Motivation, knowledge and experience
- Empirical vs C&S
- Available evidence

Critically important AM use
- Availability
- Licensed “first-line” use
- Evidence base

User compliance
- Course completion¹
- Accurate dosing
- Medicines storage

Herd health management & husbandry
- Preventative medicine
- Farm environment
- Prophylaxis, metaphylaxis & group treatment

Economic factors
- Treatment Vs prevention
- Withhold periods
- Competition

Understanding prescribing decisions
A common habit

» Prescribing antibiotics featured in 35.1 – 48.5% of consultations

Antibacterial prescribing patterns in small animal veterinary practice identified via SAVSNET: the small animal veterinary surveillance network


In this study, data from veterinary clinical records were collected via the small animal veterinary surveillance network (SAVSNET). Over a three-month period, data were obtained from 22,859 consultations at 16 small animal practices in England and Wales: 69 per cent from dogs, 24 per cent from cats, 3 per cent from rabbits and 4 per cent from miscellaneous species. The proportion of consuls where prescribing of antibacterials was identified was 35.1 per cent for dogs, 48.5 per cent for cats and 36.6 per cent for rabbits. Within this population, 76 per cent of antibacterials prescribed were β-lactams, including the most common group of clavulanic acid-potentiated amoxicillin making up 36 per cent of the antibacterials prescribed. Other classes included lincosamides (9 per cent), fluoroquinolones and quinolones (6 per cent) and nitroimidazoles (4 per cent). Vancomycin and teicoplanin (glycopeptide class), and imipenem and meropenem (β-lactam class) prescribing was not identified. Prescribing behaviour varied between practices. For dogs and cats, the proportion of consultations associated with the prescription of antibacterials ranged from 0.26 to 0.55 and 0.41 to 0.73, respectively.

Why do we prescribe what we prescribe?

What questions do you ask yourself before deciding to prescribe an antibiotic?
What questions do you ask yourself before deciding to prescribe?
What influences our prescribing decisions?

**Extrinsic Factors**
- Practice culture
- Client Expectations
- Reputational risk
- Time pressure
- Economics

**Clinical findings & patient factors**
- Licensed use
- Prescribing cascade
- Withhold times

**Intrinsic Factors**
- Clinical experience
- Confidence
- Attitude to risk
- Discomfort with uncertainty
- Prescribing habits
- Values & beliefs

 Shall I prescribe?
AMS: Behavioural drivers and barriers

» AM prescribing behaviour
  • Inappropriate, unnecessary or defensive

» Client interactions
  • Expectation and pressure
  • Insufficient time

» Practice culture

» Infection control practices

» Use of diagnostic tests

Expert consensus regarding drivers of antimicrobial stewardship in companion animal veterinary practice: a Delphi study

Kay Currie,1 Caroline King,1 Tim Nuttall,2 Matt Smith,1 Paul Flowers1

Abstract
Antimicrobial resistance (AMR) is a global challenge facing both human and animal healthcare professionals; an effective response to this threat requires a ‘One-Health’ approach to antimicrobial stewardship (AMS) to preserve important antibiotics for urgent clinical need. However, understanding of barriers and enablers to effective AMS behaviour in companion animal veterinary practice is currently limited. We conducted a Delphi study of 16 nationally recognised experts from UK-based veterinary policymakers, university academics and leaders of professional bodies. This Delphi study sought to identify veterinary behaviours which experts believe contribute to AMR and form vital aspects of AMS. Analysis of Delphi findings indicated a perceived hierarchy of behaviours, the most influential being antibiotic prescribing behaviours and interactions with clients. Other veterinary behaviours perceived as being important related to interactions with veterinary colleagues; infection control practices; and the use of diagnostic tests to confirm infection. Key barriers and enablers to AMS within each of these behavioural domains were identified. Specific interventions to address important barriers and enablers are recommended. To the authors’ knowledge, this is the first study to establish expert consensus at a national level about which ‘behaviours’ (aspects of veterinarian practice) should be targeted in relation to AMR and AMS in companion animal veterinary practice.

Individual GP prescribing behaviour had a greater influence on AM prescription than the clinical picture.
Patient, condition or protocol

» Patient characteristics had a limited effect on compliance

» Compliance varied with infection type (e.g. LRTIs > Sepsis)

» Narrowing of AM spectrum in light of C&S was rare

» Defensive prescribing

» Perceived Tx efficacy prioritised over ↓ AMR risk

Defensive prescribing

» Giving antimicrobials “just in case”

» Discomfort with uncertainty
  • Diagnosis & prognosis
  • Appropriate therapy & likely presence of AMR
  • Anticipated treatment efficacy, recovery time & client expectations
  • Managing internal / external pressures
Prescribing decisions and AMR

Correlation between veterinary antimicrobial use and antimicrobial resistance in food-producing animals: a report on seven countries

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Objectives: To evaluate correlations between antimicrobial use and the prevalence of resistance in commensal Escherchia coli isolates from pigs, poultry and cattle, using data from publicly available national or international reports from seven European countries.

Methods: The link between the quantities of different classes of antimicrobials administered to food-producing animals per country (expressed as a population correction unit) and the prevalence of resistance to the different antimicrobial classes (interpreted by EUCAST epidemiological cut-off values) in E. coli isolates (4831 isolates in total) was assessed by means of polynomial regression analysis and determination of Spearman rank correlation coefficient.

Results: A quadratic regression best fitted the antimicrobial use and antimicrobial resistance data. The coefficient of determination was, in decreasing order, 0.99 for fluoroquinolones and amphenicols, 0.94 for third-generation cephalosporins and sulphonamides, 0.93 for amoxicillin, 0.86 for fluoroquinolones, 0.83 for streptomycin and 0.80 for gentamicin and tetracycline. Spearman’s rank correlation coefficient was 1 for amphenicols, 0.96 for sulphonamides, 0.93 for streptomycin and tetracycline, 0.89 for amoxicillin, 0.71 for gentamicin and 0.70 for third-generation cephalosporins.

Conclusions: These remarkably high coefficients indicate that, at a national level, the level of use of specific antimicrobials strongly correlates to the level of resistance towards these agents in commensal E. coli isolates in pigs, poultry and cattle. However, data restraints reveal the need for further detail in collection and harmonization of antimicrobial resistance and use data in Europe.

Spearman’s rank correlation coefficient between average antimicrobial use ranking (lowest=1 to highest=7) of country and average antimicrobial resistance ranking (lowest=1 to highest=7) of indicator Escherichia coli isolates for all antimicrobial agents tested except amphenicols (not all countries provided usage data), for food-producing animals. Each symbol represents the data from a single country. A linear trend line is shown.
“The mechanisms which lead to antimicrobial resistance are biological. However, the conditions promoting, or mitigating against, these biological mechanisms are **profoundly social**.”

Professor Dame Sally Macintyre, University of Glasgow
AMS: ‘Best-practice’ prescribing
Rank the following in terms of the importance of antimicrobial treatment as part of their management

Caesarean section
Calf pneumonia
Calf scour
Digital dermatitis
Interdigital necrobacillosis
LDA Surgery
Toxic mastitis
Suggested ranking...

*Rank the following in terms of the importance of antimicrobial treatment as part of their management*

1. Interdigital necrobacillosis
2. Calf pneumonia
3. Metritis
4. Caesarean section
5. LDA surgery
6. Digital dermatitis
7. Toxic mastitis
8. Sole Ulcer
9. Calf scour
Evidence-based prescribing

https://bestbetsforvets.org/
AMS: ‘Best-practice’ prescribing

General principles

» Preventative healthcare
» Use first-line treatments; Avoid HP-CIAs
» Make use of culture and susceptibility testing
» Prioritise therapeutic appropriateness over convenience / withhold times
» Early & appropriate treatment, delayed treatment & de-escalation
» Avoid group treatments (i.e. metaphylaxis & prophylaxis)
» Adopt a practice-wide approach
AMS: ‘Best-practice’ prescribing

Approach

1. What is the most likely diagnosis?
2. Is antimicrobial treatment indicated: will it improve the prognosis?
3. What are the likely bacteria?
4. Is AMR likely to be a factor?
5. What is the narrowest spectrum antimicrobial that is likely to be effective?
6. Other therapeutic considerations
Antimicrobial Stewardship

A practice-wide approach

Ceasing the use of the highest priority critically important antimicrobials does not adversely affect production, health or welfare parameters in dairy cows

Andrea Turner, David Tisdall, David C Barrett, Sarah Wood, Andrew Dowsey, Kristen K Reyher

Due to scientific, public and political concern regarding antimicrobial resistance (AMR), several EU countries have already taken steps to reduce antimicrobial (AM) usage in production animal medicine, particularly that of the highest priority critically important AMs (HP-CIAs). While veterinarians are aware of issues surrounding AMR, potential barriers to change such as concerns of reduced animal health, welfare or production may inhibit progress towards more responsible AM prescribing. Farmers from seven dairy farms in South West England engaged in changing AM use through an active process of education and herd health planning meetings. Prescribing data were collected from veterinary sales records; production and health data were accessed via milk recording and farm-recorded data. This study demonstrates that cattle health and welfare—as measured by production parameters, fertility, udder health and mobility data and culling rates—can be maintained and even improved alongside a complete cessation in the use of HP-CIAs as well as an overall reduction of AM use on dairy farms. This study also identified the need to consider different metrics when analysing AM use data, including dose-based metrics as well as those of total quantities to allow better representation of the direction and magnitude of changes in AM use.

Taking action

Major changes in AM use policy

**Fluoroquinolone use stopped**
- 1\textsuperscript{st} line treatment approaches reinforced

**Intramammary use**
- 4\textsuperscript{th} gen cephs substituted with penicillins and aminoglycoside combinations

**Systemic use**
- 3\textsuperscript{rd} gen cephs substituted with 1\textsuperscript{st} gen or aminopenicillins

**Calf pneumonia**
- Oxytetracycline or florfenicol, replace the longer-acting macrolides
Evaluate

Critically important antimicrobials

- 82% reduction in the total use of CIAs
- 91% reduction in systemic use of CIAs
- 100% reduction in intra-mammary use of CIAs
- No perceived or actual reduction in treatment outcomes or farm animal health
What do farmers’ think?

» Farm clients remain **consistently positive** about tackling the issues of responsible medicines use and AMR **in partnership**.

» Informal feedback suggests they found measures which express antimicrobial use in terms of doses, courses or economics most useful.
Conclusions

» Working in partnership works
  • Participatory & collaborative
  • Engaging the whole practice & farm team

» Monitoring use is an essential part of good antimicrobial stewardship
  • This must include treatment outcomes
  • Picking the right measures matters

» Medicines auditing goes hand in hand with improved HHM

» It is possible to achieve marked reductions in CIA use whilst…
  • Keeping farmers on board
  • Improving animal health and welfare

» The use of CIAs as first line treatments cannot be justified.
How will you commit to improving antimicrobial stewardship within your local context?
“Nobody made a greater mistake than he who did nothing because he could only do a little!”

Edmund Burke (1729 – 1797)
Further reading

Achieving responsible antimicrobial use: communicating with farmers

Kirsten K. Reyher, David C. Barrett, David A. Tidball

Communicating with farmers is key to achieving responsible antimicrobial use on the farm. With the farmer and vet working together and using their individual knowledge and expertise, the change in antimicrobial use can be sustained and work for both parties. This article discusses the tenets of adopting an evidence-based approach to therapeutic decision making, and monitoring patterns of medicine use to identify opportunities for intervention and measure impact, while at the same time partnering with farmers to improve herd health management. This article discusses how such a multifaceted, collaborative approach, which involves the whole practice team working in partnership with farm staff, can be highly successful in achieving and sustaining more responsible medicines use on farm and improving animal health.

Achieving responsible medicines use at practice and farm level

David A. Tidball, Kirsten K. Reyher, David C. Barrett

Medicines use in farm animals and the potential for antimicrobial resistance development and transfer to humans is of increasing concern. Veterinary surgeons must take the lead in driving change, challenging the currently accepted norms of prescribing and administration. This article discusses the tenets of adopting an evidence-based approach to therapeutic decision making, and monitoring patterns of medicine use to identify opportunities for intervention and measure impact, while at the same time partnering with farmers to improve herd health management. This article discusses how such a multifaceted, collaborative approach, which involves the whole practice team working in partnership with farm staff, can be highly successful in achieving and sustaining more responsible medicines use on farm and improving animal health.
Online course in Health & Psychology

Antimicrobial Stewardship in Veterinary Practice

How can good antimicrobial stewardship prevent antimicrobial resistance (AMR) in veterinary practices? Find out on this course.

https://www.futurelearn.com/courses/antimicrobial-stewardship-in-veterinary-practice
Any questions?