

# Taking Myanmar's AMR National Action Plan forward

Pilot research findings from the Myanmar Pig Partnership show increasing antimicrobial resistance (AMR) in pig farming in Yangon Region, Myanmar. They highlight challenges in AMR awareness, antibiotic use and disease prevention relating to farmers, slaughterhouse workers, vets and others in the pig meat supply chain. Decision makers need to consider these challenges at all levels.

## BACKGROUND

The high prevalence of AMR in bacteria in livestock and livestock products is a significant and growing global public health concern. It is additional to the human health burden of infectious disease from these bacteria which is already great, especially in lower- and middle-income countries. Increasing resistance to important antibiotics poses a serious threat to the control of potentially deadly bacterial infections in people. Animal health and producer livelihoods are also at risk.

Data on AMR for Myanmar is scarce, especially on AMR in meat supply chains. Meanwhile Myanmar's economic development has driven consumer demand for meat and intensification of its production, adding to uncertainty around the risk of AMR in the meat supply chains.

Myanmar is implementing a 'National Action Plan (NAP) for containment of antimicrobial resistance' as a core element of its One Health strategy, but progress is unclear given the political environment post-February 2021, adding to AMR uncertainty.

## Research implications

- Increased awareness of AMR is required at all levels, from farmer to consumer to policymaker.
- Building capacity for robust and effective surveillance programmes is key for longterm AMR management.
- Antibiotic stewardship would benefit from a focus on optimising farm healthcare systems, such as access to expert advice, preventive health planning, diagnostics and treatment.
- Review of legislation to manage AMR should consider the entire supply chain, including issues such as labelling and the critical role of community animal health workers.



Image: Hoa T. Ngo



# FINDINGS

## AMR IN THE SUPPLY CHAIN

The project generated data on key measures of AMR at retail, slaughter and farm locations. Retail sampling included 15 supermarkets in Yangon City, 15 retailers at an urban wet market in a peri-urban township (A) and 15 retailers at rural wet markets in two rural townships (B and C) in Yangon Region. Slaughter sampling included a large slaughterhouse taking pigs from a wide supply area including all scales of farm production, and six smaller low-throughput slaughterhouses sourcing pigs from rural townships B and C.

Farm sampling took place in two time windows (2016-17 and 2019-20) and at three scales of production, including two intensive farms (>700 pigs) in the government-designated livestock intensive zone of rural township C; 10 smaller, semi-intensive farms (10-70 pigs) in rural townships B and C; and seven backyard farms (<10 pigs) in peri-urban township A in the first time window, and five in the second. Farms were sampled on three season-based occasions in each time window, (winter, summer and rainy).

To support AMR data generation, the project facilitated bacteriology lab refurbishment at the Livestock Breeding and Veterinary Department's (LBVD) Yangon Veterinary Diagnostic Laboratory, with in-country training. Focusing on the pathogens *Salmonella* and *E. coli*, the project looked for:

- i. Resistance to antibiotics that target extended spectrum beta-lactamase (ESBL). ESBL resistance in foodborne *E. coli* and *Salmonella* is leading to significantly reduced treatment options in people.
- ii. Colistin resistance in *E. coli*. Colistin is an antibiotic 'of last resort' in human medicine, categorised by the World Health Organization (WHO) as a highest priority critically important antibiotic (HPCIA).
- iii. The prevalence of multidrug resistant (MDR) bacteria (resistance to three or more classes of antibiotics).

### 1. Prevalence of ESBL *E. coli* is increasing.

Pork sampling across all three retail settings revealed low prevalence of ESBL *E. coli* (3%, n=135<sup>1</sup>) and ESBL *Salmonella* (2%), but a higher prevalence of ESBL *E. coli* was found in drainage samples at slaughterhouses (29%, n=17). Pooled drainage and faecal boot swab

samples on farms also showed prevalence of ESBL *E. coli* increased during the study (from 20%, n=54, to 73%, n=45) for all farms combined but consistently greatest among samples from intensive farms, rising from 33% positive samples in the first sampling window to 100% in the second (n=6). It was lowest among backyard farms, but increased significantly from 5% to 62% prevalence (n=13-18).

Comparable data from other countries is scarce.

### 2. Colistin resistance is widespread.

At retail, the mean prevalence of samples containing colistin resistant *E. coli* was 95% (n=135) with no significant difference between supermarket, or urban or rural wet markets. Similar findings were reported for slaughter drainage samples (82%, n=17) and for farm pooled samples (96%, n=54, and 98%, n=45, for the two sampling windows, respectively). Between the two sample periods, the proportion of colistin resistant *E. coli* in any given positive sample increased. Studies from other countries suggest these values are high.

### 3. MDR is widespread and increasing.

A consistently high proportion of meat samples across all retail categories tested positive for MDR *E. coli* (84%, n=135). In contrast, MDR *Salmonella* was greatest at urban wet markets (53%, n=45) and supermarkets (47%, n=45) but significantly lower at rural wet markets (24%, n=45). Across all farm types the prevalence of MDR *E. coli* positive samples was very high, and similar in both sampling windows (80%-100%). However the prevalence of MDR *Salmonella* positive samples significantly increased when comparing combined farm data from the first to second sampling window, going from 6% (n=270) to 17% (n=127).

## USE OF ANTIMICROBIALS ON FARMS

### 4. Antibiotic use is high and rising on intensive and semi-intensive farms.

Data was collected on the different antibiotics in use. For intensive and semi-intensive farms, the proportion of visits where antibiotics were reported to be in use increased between the two sampling windows (for intensive farms, 82% v. 100% of six visits in each time window; for semi-intensive farms, from 37% of 26 visits to 52% of 30 visits). There was also an increase in the number of antibiotic classes in use. There was no marked change in the proportion of visits where antibiotics were

1 n = sample size



Image: Naomi Marks

*Keeping antibiotic records is challenging when products labels are brief and not in Myanmar language.*

reported to be in use for backyard farms (10% of 13 visits v. 7% of 18 visits for the second window); and there was a fall in the number of antibiotic classes in use in the backyard sector.

During the study period, commercial pig feed in Myanmar consistently included antibiotics as growth promoters and only one study farm (backyard) reported no commercial feed use. Myanmar introduced legislation in 2020 prohibiting colistin and other critical antibiotics as growth promoters and requiring labelling of included antibiotics in all commercial feeds.

## TALKING TO FARMERS

The project identified factors that influence antimicrobial use (AMU) and contribute to practices related to AMR. These findings are from the social science workstream and evaluation of pilot farmer training.

### 5. AMR awareness is limited.

Farmers spoke positively about a perceived increase in access to drugs over the past decade, linking it to reduced livestock deaths. They sought advice from many sources, including private and government vets, government community animal health workers (CAHWs), local informal providers, drug shop owners and other farmers on social media platforms. Both farmers and vets had experience of antibiotics becoming ineffective to illness in pigs, but farmers could not identify why.

### 6. Legislation restricting antibiotics use to qualified veterinarians is ineffective.

The largest farms had good access to company vets but these may not be technically up to date

or free from business pressure. Semi-intensive and backyard farmers obtained vet treatments from private and government vets but also official CAHWs and, significantly, trusted non-qualified informal 'experts' who purchase antibiotics from veterinary and human suppliers. Products are available with only limited information on dosage, often in non-Myanmar language. Backyard farmers are less likely to pay for vets than farmers on semi-intensive farms and more likely to use traditional plant remedies first.

### 7. Record keeping is poor.

Many farmers failed to record their antibiotics use, possibly due to their insufficient understanding of the significance of AMR and also non-Myanmar language labels on products, limiting drug identification. Legislation limits antibiotic administration to the remit of vets. However widespread informal administration took place, complicating recording. Farmers were often unaware of exactly which drugs external providers administered.

### 8. Farmers have a limited ability to invest in disease prevention and biosecurity.

Farmers on semi-intensive farms had more means and inclination than those on backyard farms to invest in infection prevention measures such as improved pig housing, hygiene and vaccination. However, most farmers interviewed on semi-intensive and backyard farms had tight – at times precarious – household finances which constrained expenses and led to inevitable trade-offs. Antibiotics were seen as a powerful option to prevent animal disease. but cost of drugs and feed was a consideration for use by poorer farmers.

## DISCUSSION

**Findings from the Myanmar Pig Partnership directly support the strategic objectives in the Myanmar National Action Plan for AMR. They provide valuable pointers for ways forward.**

The project increased awareness of AMR (NAP strategic objective 1). Project data has been included in governmental review of Myanmar's NAP. AMR communications can now use these findings to assist further awareness building for producers and consumers, specifically on the reduced effectiveness of antibiotics on farms and the risk of contributing to spread of AMR to people via livestock, drainage run-off and meat. The many providers of animal healthcare, formal and informal, need targeted information on AMR and AMU.

AMR communication messages need to be combined with efforts to address structural and financial barriers which limit farmers' ability to change their practices. Pig farmers would benefit from optimised health systems, with improved access to pig veterinary preventive health advice and support for hygiene and biosecurity, disease investigation and treatment.

The project piloted capacity building for more robust AMR surveillance (NAP strategic objective 2). Taking this forward to include more labs and livestock species will be key to ensuring effective surveillance and prioritisation of resources for the longterm management of AMR.

Finally, the research offers insights to support policy review on regulations around antibiotics and their use on farms, taking in import, manufacture, labelling, distribution, retail, administration and recording controls. Specifically, it provided evidence to support the 2020 legislative developments. Collaborative effort between sectors will be necessary to ensure recent legislative changes deliver the anticipated changes on antibiotics in feed can be implemented. The findings support LBVD's ongoing review of the role of CAHWs (as para-veterinary professionals) in expanding their provision of veterinary treatments, preventive health services and AMR awareness.

This pilot research provides a glimpse of the likely impacts of pig meat production and retail, at different scales and intensity, on AMR prevalence in Myanmar. Further research with larger sample sizes is now needed, along with further exploration of socioeconomic and health system interventions that could improve farming economies, farmer livelihoods and the practices of farmers, vets, retailers and others in the pig supply chain.

## About the research

'An integrated management approach for surveillance and control of zoonoses in emerging livestock systems: Myanmar Pig Partnership' was a five-year (2016-2021) interdisciplinary project exploring disease risk accompanying changing pig production patterns in Yangon Region, Myanmar. The project investigated intensification in the production and supply of pig meat and how related factors, including socioeconomic conditions for farmers and people's understandings and practices, may be impacting the risks for human and animal health. The focus was on zoonotic bacterial infections, dynamics of antibiotic resistance, uptake of preventive health practices and, ultimately, achievement of better livelihoods. Fieldwork was conducted before 2021.

**Find out more at [myanmarpigpartnership.org](http://myanmarpigpartnership.org)**

The project was a collaboration between the University of Cambridge (leading), Myanmar Livestock Breeding and Veterinary Department, Oxford University Clinical Research Unit, Vietnam, and Institute of Development Studies, UK. It was funded by UK Research and Innovation, the UK Foreign, Commonwealth and Development Office, and UK Defence Science and Technology Laboratory under the Zoonoses and Emerging Livestock Systems (ZELS) programme.



## Further reading

This research briefing is best read in conjunction with other research briefings from the Myanmar Pig Partnership:

- Pig meat and food safety in Myanmar: evidence to support practice
- Training paths to improve health and livelihoods for Myanmar pig farmers

Also, the following papers:

- Value chain governance, power and negative externalities: what influences efforts to control pig diseases in Myanmar. A.Ebata *et al.*
- Why behaviours do not change: structural constraints that influence household decisions to control pig diseases in Myanmar. A.Ebata *et al.*

The following are in production (and titles provisional):

- Prevalence, antimicrobial resistance and genomic comparison of non-typhoidal *Salmonella* isolated from pig farms with different levels of intensification in Yangon, Myanmar
- ESBL-producing *E. coli* isolated from pig production chain in Yangon, Myanmar. AMR profile of *E. coli* isolated from farm and slaughterhouse samples.
- Farming practices and antimicrobial usage in different pig farm-scales in a longitudinal study in Myanmar.

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