

CALL FOR GOOD PRACTICES

AMR STAKEHOLDER NETWORK

MARCH 2022



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NETWORK



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About the AMR Stakeholder Network

The AMR Stakeholder Network brings together more than 60 leading organisations and individuals committed to tackling Antimicrobial Resistance (AMR) at national, regional and European level, covering all dimensions of the 'One Health' approach. Established in 2017, under the auspices of the European Commission's Health Policy Platform, the network, led by EPHA, aims to ensure that AMR remains high on the EU agenda during the new Commission's mandate, advocating for well-coordinated and resourced actions at EU level and in the Member States, aligned with the global work led by the World Health Organization, UN agencies and other actors.

See more here: <https://epha.org/amr-stakeholder-network/>

The Selection Committee Members and Co-authors responsible for the assembling of this report and their individual affiliations are listed at the end of this report.

Disclaimer: the opinions – including any possible policy recommendations – expressed in the 'Good Practices To Tackle AMR' section of this report, are those of their original authors and do not necessarily represent the views or opinions of the Selection Committee Members and Co-authors or of the AMR Stakeholder Network. The mere appearance of articles on the AMR Stakeholder Network webpage does not mean an endorsement by AMR Stakeholder Network of the articles. Any research results presented in this report might have been disseminated previously and AMR Stakeholder Network cannot be held to account in the case of any breach of publication agreements between the original authors and other parties.

Special mention of all received submissions

Whilst, practically, only so many good practices could be selected, every submission holds value and adds to the fight against AMR. In appreciation of their contribution, these good practices included, in summarised form: raising awareness campaigns, incorporating multidisciplinary specialists in decision making processes and medical approaches, improving hygiene practices and inspections, updating treatment protocols, continuing professional development, creating empowering digital health tools for professionals and patients, tailoring animal feed, developing animal husbandry techniques.

Introduction: Why a Call for Good Practices?

Actual action, pragmatic interventions and implemented practices have the clear potential to reduce or slow down the development of resistant bacteria. Local circumstances, promising national policies and individual initiatives could lead to significant improvements in the field.

Therefore, collecting those existing practices, bringing them to light and giving them large visibility at European level was identified by the **AMR Stakeholder Network** (AMR SN) as an action through which the principles laid out in its **Roadmap for action on antimicrobial resistance** (AMR) could become more tangible. This would then fuel further advocacy efforts aimed at making the practices known, recognised, and implemented throughout Europe.

In this context, the AMR SN prepared and launched a call for good practices, which aimed both to raise the profile of AMR on the political agenda and to offer practical solutions.

Sharing of knowledge, innovation, new methods, and models are indispensable in slowing down the spread of AMR but there is also immense potential in existing knowledge and good practices already in place. As stakeholders learn from each other, these practices can be replicated, adapted, improved upon, or scaled up. The AMR SN call for good practices and the resulting report aims to support and be a part of this effort.



Good Practices to Tackle Antimicrobial Resistance (AMR)

Good Practice Implementation: Human, Animal and Environmental Health

Virtual Exhibition on Resistant Pathogens in Humans, Animals, and the Environment by *BUKO Pharma-Kampagne*

Roadmap Areas: Set targets and performance indicators; Help countries mobilise resources for better implementation of national AMR policies; Close the existing collaboration gap between civil society and EU policy-makers; Put prevention at the heart of AMR policymaking.

Description: The project involved and brought together different stakeholders from civil society in Germany, developing case studies which explain the existing problems in the areas of human health, animal health and the environment in Germany, India, South Africa and Tanzania. The educational project included a street theatre tour on public places and in schools in Germany. Moreover, a virtual exhibition on the global dimension of antibiotic resistance in the areas of human health, animal health and the environment was produced. Short articles and videos highlighted the needs for action. They showed positive examples, local policies and solutions and presented the perspectives of different stakeholders (doctors, farmers, politicians, scientists...). Moreover the project offered special to do lists for physicians, veterinarians, farmers and consumers.

Implementation: This was an educational project in Germany coordinated by BUKO Pharma-Kampagne, an NGO based in Germany with its work focusing on global health for the past 40 years. The project was run in cooperation with other civil society groups in the four countries mentioned above. It was funded by the Federal Ministry for Economic Cooperation and Development (Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung, BMZ), the North Rhine-Westphalian Foundation for the Environment and Development and BUKO Pharma-Kampagne's own resources.

The virtual exhibition is accessible on their website and **all material** can be downloaded for free.

Achievements: The street theatre tour reached more than 2.000 people in September 2020, including several hundred scholars. The virtual exhibition was published online in November and has reached an audience of more than 1.500 users at the time of writing. The material has also been used in courses for public health students at several German universities. The project brought together German civil society groups and stakeholders working in the three different areas mentioned above and brokered dialogue on joint political strategies.

Unique Contribution: Showing the global interconnections and social determinants of antibiotic resistance, revealing that a Health-in-All-Policies (HiAP) approach is needed to solve the problem.

For more information visit https://bukopharma.de/images/english_espaniol/Pharmabrief_Spezial_Antib_eng.pdf or contact Claudia Jenkes at cj@bukopharma.de

Antibiotic Resistance Symbol and Micro-Combat Game App by EU-JAMRAI

Roadmap Areas: Close the existing collaboration gap between civil society and EU policymakers; Put prevention at the heart of AMR policy-making.

Antibiotic Resistance Symbol

Description: The Antibiotic Resistance Symbol Contest was organised by the European Union Joint Action on Antimicrobial Resistance and Healthcare-Associated Infections (EU-JAMRAI), and called to action individuals from across the world to find the first global symbol that represents the threat of antibiotic resistance. The symbol needed to be tangible, easy to craft, unique and submitted by individuals. The objectives went beyond just finding a great symbol; EU-JAMRAI also wanted to use the contest as a vehicle to raise awareness of this health threat.

Implementation: To get the word out and promote the contest, EU-JAMRAI developed a series of **materials**: social media postcards and gifs, videos, posters and a press release, translated into sixteen languages. They also involved EU-JAMRAI stakeholders in the dissemination process, with the European Centre for Disease Prevention and Control (ECDC) as their greatest supporter.

The winning global Antibiotic Resistance Symbol was launched on the occasion of the 2020 European Antibiotic Awareness Day (18h November), and the 2020 World Antimicrobial Awareness Week (18-24 November). In order to promote the winning symbol, they developed a **dedicated page** and uploaded all the information about the symbol, a promo video and a media kit with useful materials. The launch was supported by a digital campaign on EU-JAMRAI's social networks under the theme "Be a changemaker: craft your own symbol, wear it with pride and raise awareness about antibiotic resistance".

Although the goal was that everyone hand-made their own symbol, they needed representatives of key institutions to join the symbol campaign, to obtain a wider impact. Consequently, EU-JAMRAI's Communications team sent out some copies to high-level representatives of different international organisations, as well to EU-JAMRAI's work packages leaders, partners and stakeholders, and influencers who could help them to spread the word.

Achievements: Almost 600 applications from 44 countries were submitted. Additionally, the campaign was supported by relevant members of governments and institutions, such as the French and Spanish Health Ministers, Olivier Véran and Salvador Illa; the British Minister at the Foreign, Commonwealth & Development Office, Wendy Morton; the Regional Adviser Control of Antimicrobial Resistance WHO Europe, Danilo Lo Fo Wong; OECD Secretary-General, Angel Gurría; EFSA Executive Director, Bernhard Url; or Tiemo Wölken, Member of the European Parliament, among others.

Unique Contribution: Icons are powerful tools to convey a message and to enhance social behaviour change, such as happened with the AIDS red ribbon. EU-JAMRAI felt that a global Antibiotic Resistance Symbol was needed to highlight the issue and that citizens needed to be involved in the exciting process of finding it, making them feel part of the solution.

Micro-Combat Game App

Description: EU-JAMRAI launched the Micro-Combat game app with the aim of making the youngest generations aware of the antibiotic resistance problem.

This is a cooperative game designed for players aged 10 years and older, with an approximate duration of 15 minutes per each play, for use in the classroom or elsewhere. The game introduces, among other concepts, what types of pathogens we are exposed to, how we can prevent the spread of infectious diseases, how much more effective prevention is than the subsequent treatment of diseases, and what antimicrobial resistance is. The game is available on iOS and Android, in 19 languages.

Implementation: In order to facilitate children's learning experience, EU-JAMRAI prepared a **video tutorial** explaining all the phases and rounds of the game and its main characteristics.

Three different spots and promo materials were designed to promote the Micro-Combat App. Each material was adapted for the specifications of each social media platform (Facebook, Twitter, Instagram and TikTok) and with a very detailed segmentation strategy to cover a wide audience, through a paid media campaign. Additionally, two different websites were developed to launch the App – the **official game website** and a **page within the EU-JAMRAI website**.

Achievements: In two months, more than 2.800 people from 50 different countries downloaded the app, with social media coverage reaching 2.245.244 people.

In order to monitor players' knowledge evolution, EU-JAMRAI incorporated a 5 question quiz that appears for the first time before playing, and then after the fifth game. With the data collected so far, it has been observed that in the first test only 47% of the people answered the 5 questions correctly. After having played 5 games, this maximum number of correct answers increased to 70% of the users.

Unique Contribution: Given the complexity of introducing antibiotic resistance in the curricular program of schools and high schools, EU-JAMRAI decided to develop this tool to facilitate engagement with this topic from teachers and students, promoting information, awareness and behavioural change in the youngest generations. The Micro-Combat App aims to be a new way to learn while having fun.

Modulating the Microbiome as a 360-degree Strategy to Tight AMR by *the University of Ferrara*

Roadmap Areas: Set targets and performance indicators; Put prevention at the heart of AMR policy-making; Tackle the environmental dimension of AMR in the framework of the European Green Deal.

Description: This good practice tackles AMR by stably modulating the environmental microbiome through biologically-based sanitation procedures, to obtain significant and stable decrease of potentially harmful human and animal pathogens. It can be applied to any type of environment (built environment, healthcare settings, public transportation, animal farms, agriculture). Several reports show that conventional chemical-based sanitation/disinfection has a temporary action, a high environmental impact, and can contribute to the worsening of levels of AMR. Conversely, the proposed good practice was reported to significantly ameliorate AMR, to be safe for humans and animals, have no adverse environmental impact and to be economically highly sustainable. The proposed good practice may importantly contribute to reduce AMR-associated risks and costs, without impacting on costs and on the environment.

Implementation: The good practice was implemented in several Italian hospitals as a standard sanitation procedure, called PCHS (Probiotic Cleaning Hygiene System, Copma srl, Ferrara, Italy). The system was based on the use of eco-sustainable detergents containing selected probiotics strains of the *Bacillus* genus. *Bacillus* spores have a long history of safe use in humans, including food preparation, agriculture, animal farms, and human therapy of the gut. The procedure was optimized and studied at the University of Ferrara, which developed and performed the studies in collaboration with other Italian universities. The system application did not need special requirements, except for training cleaning staff, and was applied on a daily basis, similarly to what was performed with conventional sanitation.

Achievements: This practice involved multicentre studies performed in Italian and EU hospitals, and was published in international peer-reviewed journals. The hospital environment was chosen as one of the most affected by the presence of AMR. The results showed that the biologically-based sanitation induced: 1) a stable reduction of the microbial contamination by ESKAPE-group pathogens with 83% decrease compared to conventional sanitation methods; 2) a stable decrease of AMR, up to 99.99% compared to conventional sanitation; 3) the decrease of pathogen contamination and AMR was associated with a >50% reduction of the incidence of the related healthcare-associated infections contracted by hospitalized patients during the study (approximately 12.000 patients were observed); additionally, the consumption of antimicrobial drugs and the related costs were reduced by approximately 60% and 75%, respectively.

Unique Contribution: The most important result achieved was the possibility to stably reduce AMR and associated infections, without extra costs of application. This system would be easily applicable to different types of environment, preserving the microbiome that is beneficial to AMR prevention in humans, animals, and vegetables.

Good Practice Implementation: Animal and Environmental Health

A Natural Solution to Reduce AGP in Feed: Nor-Spice AB by *Nor-Feed*

Roadmap Areas: Set targets and performance indicators; Tackle the environmental dimension of AMR in the framework of the European Green Deal.

Description: Antimicrobial Growth Promoters (AGPs) have been banned in the European Union (EU) since 2006. But some farms still use antimicrobials in feed in a preventive or systematic way. Prebiotics are molecules which help the intestinal microflora to better develop and bring several advantages (nutrient optimization, avoid pathogen colonisation, stimulate the immune system, promote general bodily health). The use of a 100% natural prebiotic made from plant extract helps animals to develop a suitable and healthy gut microflora, to avoid the use of antimicrobials, and provide a natural solution that is as efficient as chemical and medical alternatives.

Implementation: It may seem easy to manage the microflora with a natural solution but in fact it is a long-term effort. Nor-Spice AB was developed two decades ago and is still continuously improving. The selection of precise molecules from citrus extract makes the Nor-Spice AB an efficient product, while the standardization of the active molecules makes this natural prebiotic a reliable product. Today, a full-time doctoral student continues to work at Nor-Feed to better understand the mode of action of each molecule on bacteria, on the modulation of the microflora, immunity, etc. The product has also been implemented outside Europe, with some Asian countries finding it to be an effective way to prevent the use of antibiotics and to anticipate their ban.

Achievements: After 2006, there was a rising concern in the EU regarding the need to stop using AGPs in livestock feed. Since then, the Nor-Spice AB have stood as an AGP replacer by promoting gut microflora, to enhance feed valorisation. Today the Nor-Spice AB is used in either conventional or organic farms in order to manage the intestine microflora of all monogastric species. It has been proven that a good microflora helps animals get a better intestinal health that leads to several advantages: a better nutrient valorisation (better growth and less ammonia release), a stronger microflora which is resistant to pathogens, and an overall improved immunity. The latter two advantages decrease the likelihood of illness requiring medical intervention, namely antimicrobials. Moreover, up to 90% of antimicrobials ingested by animals are released in their faeces. By promoting preventive natural treatments, the usage of antibiotics decreases, and less residues are to be found in manure, and ultimately in the environment, reducing the likelihood of AMR.

Unique Contribution: Whilst the fight against AMR is a global challenge with no silver bullet, improving animal husbandry is one way to reduce the problem, and animal nutrition a route to do so. Nor-Feed decided to use its own expertise and knowledge in the utility of plant extracts to tackle this problem, believing that plant molecules are a possible solution to tackle AMR and promoting animal health. The gut microbiota is a complex “organ” still not fully understood, but Nor-Feed believes its role in health should be better managed. Nor-Spice AB therefore is a solution combining these two beliefs for the health of animals and for the environment.

For more information visit [https://www.researchgate.net/publication/5543869_Effect_of_a_citrus_extract_\(NOR-SPICE_AB\)_on_broiler_performances](https://www.researchgate.net/publication/5543869_Effect_of_a_citrus_extract_(NOR-SPICE_AB)_on_broiler_performances) or contact Vianney ROLLAND at vianney.rolland@norfeed.net and Sekhou CISSE at sekhoul.cisse@norfeed.net

Good Practice Implementation: Human and Animal Health

Value of partnerships and communication in rational antibiotic use and fighting antimicrobial resistance: Case of One Health advocacy by *Studiorum think-tank*

Roadmap Areas: Help countries mobilise resources for better implementation of national AMR policies; Close the existing collaboration gap between civil society and EU policymakers; Put prevention at the heart of AMR policymaking.

Description: Successful advocacy necessitates gathering evidence and having open dialogues through collaborative efforts, public engagement and political commitment toward a joint goal. These were employed in North Macedonia to address the growing public health threat of AMR. The One Health approach involved three phases: initiating interest among professional and expert communities, gaining momentum of the endorsed AMR strategy, and institutionalisation of antimicrobial stewardship.

Implementation: In 2008, a group of clinicians, microbiologists, pharmacists and civil society representatives joined their expertise to address the issue of antibiotic overconsumption and misuse in North Macedonia. Their main objective was to gather global and local evidence, analyse policy options and advocate for placing AMR higher on the political agenda. The dominant paradigm was to use the whole-of-society approach through fostering partnerships and multi-stakeholder involvement. The circle of experts has expanded every year since, in size and in diversity of sectors, creating a critical mass that would support and further expand the advocacy efforts – ahead of today's widely promoted One Health approach. As a result, the new Strategy to fight AMR includes activities and responsibilities for all sectors in promoting rational antimicrobial use and containment of AMR.

Achievements: Collaborative efforts between government, academia and civil society, over more than a decade, resulted in the creation of a multisectoral committee and joint endorsement of a strategy to fight AMR. The active involvement of professionals, policy and decision makers, international experts and a donor community, civil society and citizens in awareness-raising, joint action and improved communication and coordination in fighting AMR was crucial for successfully setting a pathway towards the establishment of sustainable systems for rational antibiotic use and AMR containment, including a long-term government-supported initiative.

Unique Contribution: This good practice demonstrates the benefit of multi-stakeholder partnerships on AMR, which resulted in the creation of a National Multi-stakeholder Committee in 2011, structured on the principles of One Health with mandatory seats for civil society groups. This committee was mandated to develop the first strategy to fight AMR for 2012-2016 and the second **Strategy for 2019-2023**. Both were adopted by the Government and have been effectively implemented. A whole-of-society approach and multi-stakeholder involvement are key in ensuring the appropriate antimicrobial use and containment of AMR. This case was also recognized as a valuable advocacy practice and was accepted for publication in the World Federation of Public Health Associations' (WFPHA) Casebook on Advocacy in Public Health.

Good Practice Implementation: Animal Health

HyCare by *The Schippers Group*

Roadmap Areas: Set targets and performance indicators.

Description: The Schippers Group started working on an integrative health management concept for pig farms ten years ago, in order to reduce antibiotic use in pigs, thereby combating AMR. Since receiving a gold medal award at Eurotie – one of the world's largest exhibitions on livestock farming, they have continued to develop the concept. This has resulted in a unique combination of biosecurity programmes that have been adopted on European farms.

Implementation: In joint collaboration with policymakers, the animal protection agency, retailers and research institutes, The Schippers Group have encouraged farmers (first pigs, then poultry, and finally dairy) to implement the HyCare – hygiene and care – concept. Biosecurity measures were included in animal welfare programmes and retailers have set up a financial bonus for farmers who reduce antibiotic use by adopting the HyCare concept. The Schippers Group have also set up knowledge exchanges between hygiene advisors for livestock farms and infection prevention specialists in hospitals. They equipped three demonstration farms for pigs, poultry, and dairy to show the best practices for managing biosecurity and preventing infections. For advisors and international contacts, a course was developed and delivered in collaboration with Wageningen University. Finally, The Schippers Group has initiated a research chair (Healthy Farming) at HAS University of Applied Sciences to further investigate biosecurity at the farm level.

Achievements: More than 40 pig farms have adopted the full HyCare concept, many others have implemented several biosecurity pillars. Antibiotic use decreased by >80% on HyCare farms and technical results have also improved. Salmonella infections were completely eradicated, and as a result an improvement in Salmonella scoring has been included as a guarantee.

The first eight HyCare poultry farms have commenced and the full concept has just begun to be implemented on dairy farms. Nonetheless, more than 100 poultry and 250 dairy farms are already implementing multiple HyCare programmes.

Unique Contribution: The unique character of this good practice is that it has stimulated a change in behaviour amongst farmers, its target group. There appears to be no easy solution for reducing antibiotic use in livestock production, but a combination of biosecurity programmes have been very successful. This requires, however, the perseverance of farmers, adequate training and coaching by HyCare specialists and close collaboration with various stakeholders - veterinarians, government, retailers, researchers. A combination of technical solutions, knowledge transfers, demonstrations and close follow-ups have been instrumental in bringing this HyCare concept to the farmyard.

Good Practice Implementation: Human Health

i-4 -1-Health Project by 3M

Roadmap Area: Help countries mobilise resources for better implementation of national AMR policies.

Description: The objective of this study was to determine the level of environmental contamination in hospitals in the Dutch-Belgian border area, using adenosine triphosphate (ATP) measurements.

Implementation: As part of a multicentre One-Health project in the Dutch-Belgian border area, the i-4-1-Health project, standardised ATP measurements were conducted in nine hospitals (three Belgian university hospitals, one Dutch university hospital, three Dutch teaching hospitals and two Dutch general hospitals). Methods: Standardized ATP measurements were conducted in nine hospitals, on 32 hospital wards. 30 predefined surfaces per hospital ward were measured with the 3M Clean Trace NG luminometer. Results are displayed in relative light units (RLU). An RLU value of > 1.000 was considered as “not clean.” Differences in RLU values were compared between countries, hospitals, fomite groups, and medical specialties.

Achievements: A total of 960 ATP measurements were performed, ranging from 60 up to 120 per hospital. The median RLU value was 568 (range: 3 – 277.586) and 37.7% of the measurements were rated as not clean (RLU >1000). There were significant differences between countries, hospitals and fomite groups. Within this study significant differences in environmental contamination were also found between countries, hospitals and fomite groups. In addition, a high percentage of “not clean” (RLU of >1.000) surfaces or fomites were found.

Results can be used to improve cleanliness by defining best practices and implementing them. For instance, analysing cleaning regimes (cleaning method, cleaning staff, products used for cleaning and disinfection, standard disinfection during hospital stay and/or after discharge, etc.) in the hospitals with a lower level of environmental contamination can help to improve cleaning regimes in hospitals with higher levels of environmental contamination. Also, by analysing different fomites and fomite groups, cleaning can be improved by focusing on the most contaminated fomites.

Unique Contribution: ATP measurements can be used as a more objective approach to determine the level of environmental contamination in hospitals. Significant differences in ATP levels were found between hospitals and between countries. Also, substantial differences were found between different fomite groups. These findings offer potential targets for improvement of cleanliness in healthcare facilities.

Categorize Antimicrobials Effect to Inform Clinical Utility by *BEAM Alliance*

Roadmap Areas: Other (Support innovation to curb the AMR threat)

Description: The good practice deals with the categorization of the antimicrobial effect to pave the way towards modified regulatory requirements for the approval of new antibiotics to improve the quality of prescriptions of antibiotics, and ultimately to improve clinical outcomes in patients. We propose a categorization of the main antimicrobial strategies, based on the infectious pathogenesis cycle. To exemplify the concept, the 140+ products of the BEAM pipeline were categorized accordingly. The categorization underlined the lack of criteria to evaluate the performance of AMR products in most strategies. Although attempts to do so are available, there is a pressing need to validate their usefulness/robustness and translate them into regulatory guidelines for AMR drug development. One particular strategy (namely “Avoid metabolic evasion”) was chosen and a literature search analysing the assays that could be used to evaluate the performance of products claiming an impact in that field was performed. Finally, a decision tree to help proper patient management by clinicians was designed to support clinical practice facing a putative case of infection with a pathogen prone to metabolic evasion.

Implementation: Microbiology experts from different BEAM members gathered to work on the setup of the categorization, the literature search and the design of the clinical decision tree. Meetings with the Steering Committee of the European Committee on Antimicrobial Susceptibility Testing (EUCAST) and the European Medicines Agency (EMA) were organized, allowing for the establishment of systematic exchanges and further interaction.

Achievements: Contacts were established with the EUCAST Steering Committee and the EMA; both acknowledged the relevance of the approach. The Innovation Task Force of the EMA offered to support us in the definition of new differentiation criteria through the drafting of a Qualification Procedure. However, the COVID-19 pandemic put on hold all interactions with EMA.

Unique Contribution: The goal of the initiative was to raise awareness on the problem that innovators and regulators should join forces to tackle the issue of appropriate evaluation criteria, otherwise the development of a whole list of innovative products will stall in the regulatory path and never reach the patients, leaving the current antimicrobial armamentarium unable to cope with new resistant pathogens.

For more information view the related publication:

Tasse J. et al., Improving the ability of antimicrobial susceptibility tests to predict clinical outcome accurately: Adding metabolic evasion to the equation, *Drug Discovery Today*, 26(9), 2021, Pages 2182-2189,

visit [beam-alliance-a-new-vision-to-support-amr-innovation.pdf](#),
or contact Frederic Peyrane at frederic.peyrane@beam-alliance.eu

The P.E.A.N.U.T. Method by *The Department for Dietetics and Integrative Medicine at the Faculty of Health Sciences (ETK), University of Pécs*

Roadmap Area: Put prevention at the heart of AMR policymaking.

Description: P.E.A.N.U.T. is a multimodal method developed in 2013 in Hungary, to reduce antibiotic use and need for surgical interventions in Chronic Otitis Media with Effusion (COME) and Adenoid Hypertrophy (AH) in childhood. The method is efficient, safe, cost-effective, and easy to perform in different clinical settings. It involves the following six elements: Pneumatization exercises; Education of patients and parents; an Antiallergic diet; Nasal hygiene; Useful constitutional therapy; and Thermal interventions (P.E.A.N.U.T.).

Implementation: The five doctors involved in the initial research promoted the method to other physicians working in different medical settings. In Hungary, currently around twenty medical doctors working in hospitals and outpatient clinics are actively prescribing this method completely or in part to their patients suffering from COME and AH.

Achievements: A significant reduction of antibiotic use and need for surgical intervention in the treatment of COME and AH in childhood in the study population. In the primary study conducted in 2015, the need for antibiotic treatments was significantly lower in patients treated with the integrative P.E.A.N.U.T. method (17% of the patients) in comparison to the conventional setting (83%). The use of antibiotics per patient per year was also reduced from 1.5 to 0.5 treatments. The follow-up study in 2020 confirmed this data.

Unique Contribution: The use of the P.E.A.N.U.T. method in the treatment of COME and AH reduces the need for antibiotics, analgesics, and surgical interventions in multi-centred outpatient settings over a long period of time.

Although there are clinical cases where conventional interventions may represent the best approach for treatment, overall this method presents a low-cost, safe, and effective treatment that is easy to apply in any healthcare system. This could be especially important to the generally observed increase in antibiotic resistance.

Work Towards Primary Care and Population & the Strama Network by *Strama Stockholm*

Roadmap Areas: Set targets and performance indicators, Help countries mobilise resources for better implementation of national AMR policies; Put prevention at the heart of AMR policymaking.

Work towards primary care and population

Description: Primary Health Care providers in Sweden were prescribing too many antibiotics, with the Stockholm region identified as one of the highest prescribing regions. In response, a national goal of 250 prescriptions per 1000 inhabitants per year has been in place since 2009. Strama Stockholm (AMR-fighting department of the regional office in Stockholm) worked with the primary health care providers and with the public to reach that target.

Implementation: Each healthcare centre has a doctor and a nurse responsible for keeping in touch with Strama Stockholm and the Regional Centre for Infection Control. Strama Stockholm visits all healthcare centres annually, showing them their antibiotic prescribing data, statistics on how they are doing compared to their neighbours, and talking about current treatment recommendations. Additionally, healthcare centres can perform a 'Self-declaration' every year, with staff discussing a fictional case from the Strama Stockholm website and then review ten of their own patient journals and identify what has been done correctly and what could be improved upon. For this they get a bonus of 4 SEK per listed patient from the regional office. Strama Stockholm also directly engages the public via advertising campaigns, children's books and annual seminars for day-care and preschool teachers.

Achievements: Better compliance with treatment recommendations, fewer antibiotic prescriptions prescribed. In 2009, 430 prescriptions/1000 inhabitants were written in the Stockholm region, in January 2021 that number was 221. With this, the Stockholm region has improved its position in the regional rating system for prescribing antibiotics, going from last place – highest prescribing – (21st out of 21 regions) to 14th.

The Strama Network

Unique Contribution: To work on all levels, prescribers, other healthcare staff and population.

Description: The main goal is to ensure the lowest possible levels of AMR by restricting antibiotic use and prescriptions by informing health care workers, mainly doctors and nurses, of current national guidelines and the reason why it is important to follow them.

Implementation: Regional efforts have made these guidelines work in practice by information meetings in clinics, along with using reliable statistics of the unit's own prescriptions, which can be followed continuously, and linked with actual diagnosis.

Achievements: The regional and national Strama networks have many goals and methods to interact with doctors and nurses to supply them with information about a sustainable and wise antibiotic prescription. Over the last ten years, they have been successful in reducing the use of antibiotics.

Unique Contribution: Information meetings at open care clinics and hospitals have been of great impact as they enable a reflective and open dialogue about prescription data linked to specific diagnoses. As the Stockholm region is the biggest in Sweden, there are difficulties in reaching everyone, therefore this work has been completed using web-education methods, for example a 'driver's licence' for antibiotic prescription.

Keeping the Promise: Product Development Partnership's Role in the New Age of Health Research and Product Development by TB Alliance

Roadmap Areas: Set targets and performance indicators; Put prevention at the heart of AMR policymaking.

Description: This case study describes how the product development partnership model has tackled market failure in bringing new products to the AMR space.

Implementation: It was implemented through the collective efforts of a group of product development partnerships, especially those focused on infectious disease diagnostics and therapeutics.

Product Development Partnerships (PDPs) develop new products for people suffering from diseases and health threats underserved by traditional markets. This is accomplished by building partnerships between the public, private, academic, and philanthropic sectors.

Achievements: Development and introduction of 66 new health technologies, including treatments, vaccines, diagnostics, vector controls and devices. These products have reached more than 2.4 billion people, mostly in low- and middle-income countries (LMICs). Highlights of these innovations include the first ever drug approved for treatment of highly drug-resistant forms of tuberculosis (TB), a single dose treatment to prevent relapse of *P. vivax* malaria, and the first all-oral cure for all stages of sleeping sickness.

The PDPs in this coalition have more than 375 potential new technologies in their pipelines, with approximately 25% of those products in late-stage development. These efforts are driven significantly by partnerships across various sectors and geographies. Moreover, the products that PDPs develop provide tremendous value for money and a strong return on investment. PDPs are consistently able to develop products at costs below that of the private sector.

Unique Contribution: The coalition focuses on the specific bottleneck of lack of market incentive to bring therapeutics and diagnostics to market in affordable and accessible ways.

Market-driven incentives do not drive the development of lifesaving technology for these diseases that kill millions per year; PDPs, funders, and collaborating institutions achieve critical innovation and solutions that would otherwise not exist.

Hygiene Heroes, Preventing UTIs & Oral Care by *The Danish Committee for Health Education*

Roadmap Areas: Set targets and performance indicators; Help countries mobilise resources for better implementation of national AMR policies; Close the existing collaboration gap between civil society and EU policymakers; Put prevention at the heart of AMR policymaking; Tackle the environmental dimension of AMR in the framework of the European Green Deal.

Public Education on Antibiotics/Hygiene – Hygiene Heroes

Description: This project uses heroes and mythology as a pathway to educate children and families about hygiene and infection prevention, reaching the target audience with an encouraging and empowering approach.

Implementation: Development of graphic material by the international animation school in Viborg, collaborating with infection control nurses in the municipality and the Danish Council for Better Hygiene. The 7.500 copies of the materials (booklet, stickers) were shared as part of the international (Nordic) Hygiene Week in September 2020, with additional information and a game being made available online. Public health nurses all found the material helpful in establishing local dialogue.

Achievements: This resulted in enhanced awareness and discussions about hygiene as method and path to reduce infections as well as a better understanding of transmission methods in the general population, and increased psychological safety in navigating advice about infectious diseases.

Unique Contribution: This learning platform engages the children's imagination, creating a better way to reach and educate the new generation of Hygiene Heroes.

Eldercare: Preventing Urinary Tract Infections

Description: Urinary tract infections (UTIs) are the most common form of bacterial infection among elderly citizens and are the most frequently reported infection in the primary care sector – approximately 95% of the reported cases concern nursing homes and 5% are from home care. Most of these infections can be prevented, while at the same time preventing the unnecessary use of antibiotics as well as of hospitalisation.

Implementation:

1. Stricter hygiene standards for assisting with toilet needs. Examples: Use of disposable towels and aprons, consistent separation of what is clean and unclean, wiping washbasin and table with disinfectant wet wipes after use, more frequent diaper changes (at least three times daily).
2. Knowledge sharing and skill development. Examples: Training courses and materials for key people who in turn instruct the rest of the staff, a daily team meeting with a review of hygiene routines and experiences, use of board meetings, check-schedules and improvement boards (Plan-Do-Study-Act (PDSA) model), and a data-driven model for monitoring and improving hygiene routines.
3. Attention to fluid balance. Examples: Fluid accounting - residents should drink at least 1500 ml a day, and varied offers of cold drinks.
4. More frequent toilet visits and fixed toilet times. Assist in toilet visits 5-7 times a day.

Achievements: The Danish Committee for Health Education found a significant increase in levels of knowledge of those employees who have undergone competence development, a reduction in the number of UTIs reported and consequent consumption of antibiotics, and an increase in elderly people's daily fluid intake.

Unique Contribution: By introducing new workflows with a strong hygiene focus, it was possible to lower UTIs in several elderly homes in Denmark. One elderly home presented a decrease of UTIs by 82%. This project won an award at the Global Forum On Incontinence Conference in Rome in 2018.

Hospital Intervention – Oral Hygiene

Description: Hospital acquired infections remain a challenge across the globe. In Denmark the prevalence remains at approximately 9% for all patients despite several initiatives and policies. Efforts to innovate processes, technology, design, and practices are recommended – including a revisit and integration of traditional oral hygiene. A study at Aalborg University Hospital in a thoracic surgery ward evaluated whether the number of patients who needed to be treated with antibiotics postoperatively would be reduced when pre-operative oral hygiene recommendations were followed, and indeed they were by 50%.

Implementation: A quasi-experimental design with a control and an intervention group was used. Information on adherence to the recommendation was collected at admission. All medical information and prescriptions of antibiotics were obtained from the medical records of patients. Data was reported as intention to treat.

Achievements: 972 patients (506 controls and 466 interventions) were included in the study. Of the intervention group, 405 patients (86.9%) reported that they had adhered to the oral hygiene recommendation. 64 (12.6%) patients in the control group and 36 (7.7%) in the intervention group ($p=0.015$) were treated with antibiotics post-operatively.

Unique contribution: Pre-operative oral hygiene recommendations before open-heart surgery was associated with a reduction of infections by 50% in the patients treated with antibiotics post-operatively. This study highlights the importance of good oral hygiene in tackling AMR.

AMR Stakeholder Network Call for Good Practices: Rationale and Process

Launching the Call

The case study collection was organised, coordinated, and implemented by the AMR SN collectively, with the additional individual support of its members. The aim of the project was to collect examples of good practices falling under the scope of the 5 key areas of action of the Roadmap, which were then to be presented and given visibility to a European audience. In order to ensure efficiency and transparency, the selection was coordinated by a group of experts.

Designing the Call

The AMR SN opened a call for submission of applications describing good practices. Each application was to take into consideration the following two essential requirements.

Firstly, as the case study collection exercise was an implementing action of the Roadmap, submitted cases were required to fall within one of the 5 key areas covered by the Roadmap:

1. Set targets and performance indicators;
2. Help countries mobilise resources for better implementation of national AMR policies;
3. Close the existing collaboration gap between civil society and EU policy-makers;
4. Put prevention at the heart of AMR policy-making;
5. Tackle the environmental dimension of AMR in the framework of the European Green Deal.

If a submitted case study did not fall within the scope of the Roadmap, the applicant was asked to present the reasons justifying the submission. Based on this information, the Selection Committee could then decide whether to still consider the submission.

Secondly, reflecting the multitude of aspects that need to be considered when tackling AMR, the One Health concept stands at the heart of the AMR SN, which presents a diverse network of stakeholders. Therefore, submissions of good practices from various areas, namely **(1) human health, (2) animal health, and (3) environmental health**, were encouraged.

The other questions in the submission form offered applicants the opportunity to describe their practice in more detail, including implementation, achievements, their unique contribution, or the number of individuals reached. Applicants were asked to provide additional background information and documentation to assist the assessment of the selection committee.

The call was then published on the AMR SN webpage, as well as on the AMR SN group on the EU Health Policy Platform. Network members were encouraged to disseminate the call further through their social media channels, newsletters and other communications. Understanding that many Network members may be aware or be implementing such practices themselves, they were welcome to share their projects as well.

Timeline and Submissions

The call was launched on 18 November 2020, to mark the European Antimicrobial Awareness Day.

As it happened, the study was running during the time that pandemic evolved. Given the unprecedented circumstances under which the call took place, and in particular the exceptionally high burden placed on medical professionals during that time, the call deadline was extended from the end of January to the end of March. At the same time, the pandemic as such revealed the systemic weakness in our ability to respond to cross border threats. Many health professionals have signalled this observation along with the negative impact of COVID-19 on our fight against AMR. This call resulted in 41 submissions (Table 1). On a case-by-case basis, the secretariat contacted applicants who had sent incorrect links, materials in languages other than English or whose submissions had other formal issues, to provide further clarification.

Table 1: Presentation of received submissions per category.

Human Health, Animal Health, Environmental Health	Human Health, Animal Health	Animal Health, Environmental Health	Human Health	Animal Health	Total
5	4	2	26	4	41

The Work of the Selection Committee

Selection Committee Members

In order to ensure the quality of the work and the unbiased evaluation of the applications, a Selection Committee was set up to undertake the assessment of the applications. Both institutional and individual AMR SN members were encouraged to apply to become members of the selection committee. The AMR SN approved a selection committee consisting of seven individuals, having significant expertise in AMR. Diversity, gender balance and multiple expertise covering the various One Health areas was ensured while making the selection.

The Selection Committee was set up at the beginning of 2021. The core activity of members of the Selection Committee was to read the applications and to grade them. Their work was supported by the AMR SN Secretariat, including e-mail exchanges and basic information sharing, updates about the applications, organising the meetings, providing the evaluation framework, and facilitating the conversation among members.

The Committee scored the submissions individually, taking into account the following:

I. Potential Conflicts of Interest

Conflict of interest rules ensured that there was no conflict between submitting a case study and being part of the selection panel. In cases where a Selection Committee member may be in conflict of assessing an application, especially for application coming from the AMR SN, the member in question would signal the situation, refrain from scoring the submission and defer to the expertise of the other members.

II. Transparency

The committee worked on one common online table, where each member of the Selection Committee had the possibility to insert their scores and comments on separate tables of the same spreadsheet. Six calls were organised by the Secretariat, which were complemented by email communications throughout the selection period.

III. Methodology: Eligibility and Selection Criteria

As the call highlighted two essential requirements, and the Committee members agreed that these criteria are of particular importance, the scoring table was divided into two categories: eligibility and selection criteria. Eligible applications were then assessed against the selection criteria on a 0 to 3 scale: 0 - criterion not met, 1 - partially met, 2 - fully met, 3 - exceeded is what we had.

IV. Challenges

The calls organised by the Secretariat also served to offer an opportunity for Committee members to be in sync with their scoring process and communicate and resolve any problems or concerns that arose during the process.

The first challenge encountered was multiple submissions of similar projects from one organisation. As the different applications described practices which were linked and integrated into a broader coherent approach, the Committee decided to merge and consider them as one single submission.

Some submissions presented general information on the topic rather than describing an actual case study; these were disqualified.

The term *vulnerable groups* needed to be clarified among Committee members in order to have a common definition when assessed. A *vulnerable group* could be a patient or a sick animal, could be a human population, e.g. elderly people, children or people in remote areas, such as farmers, etc. Depending on the approach different scoring was proposed. Finally, the Selection Committee decided to follow the definitions employed by the **United Nations Development Programme** (UNDP) ("populations that live in poverty without access to safe housing, water, sanitation and nutrition and those who are stigmatized, discriminated against, marginalized by society and even criminalized in law, policy and practice. These populations may struggle to fulfil their human rights, including their rights to access health and social services") and the **World Health Organization** ("Vulnerability encompasses the effects of marginalization, exclusion and discrimination that contribute to poor health outcomes"). It was, however, noted that the concept is well suited for human health, but appeared more difficult to apply to animal or environmental health.

Additionally, only few case studies were or could be considered as true One Health actions. There is still much isolation and lack of an interdisciplinary collaboration, which highlights why the work of the AMR Stakeholder Network to promote the One Health approach remains crucial.

Finally, even though one of the committee members had to step down for personal reasons, their scoring was submitted and included in the final calculation.

Final Selection

Selection Committee members provided their individual grading, and averaged scores were calculated by the Secretariat and were used for ranking the applications. The Selection Committee agreed on the final presentation of twelve case studies, and the form of their presentation. Given the general purpose of this initiative, namely the dissemination of existing good practices, rather than creating a competition it was decided that there was not any need to present the cases according to their ranking. The selected submissions are presented in the report per category, in alphabetical order of the organisations' names.

Finally, the Selection Committee decided that, regardless of the outcome, all those who submitted a case study should receive an answer with a short explanation of the decision. The Secretariat drafted the messages to be sent to applicants, which were then approved by the Committee.

Results

Output

The ideal output decided at the onset of the project was to have 10-15 selected case studies. Submissions were categorised according to their One Health impact and those scoring better in each category are presented in the report. Even though the large majority of submissions were related to human health, the committee strived to achieve a fair representation of all areas in the final report.

In the report, submissions are divided into categories based on the areas they tackle as follows:

- One Health: human, animal and environmental health (3 submissions)
- One Health: animal and environmental health (1 submission)
- One Health: human and animal health (1 submission)
- Animal health (1 submission)
- Human health (6 submissions)

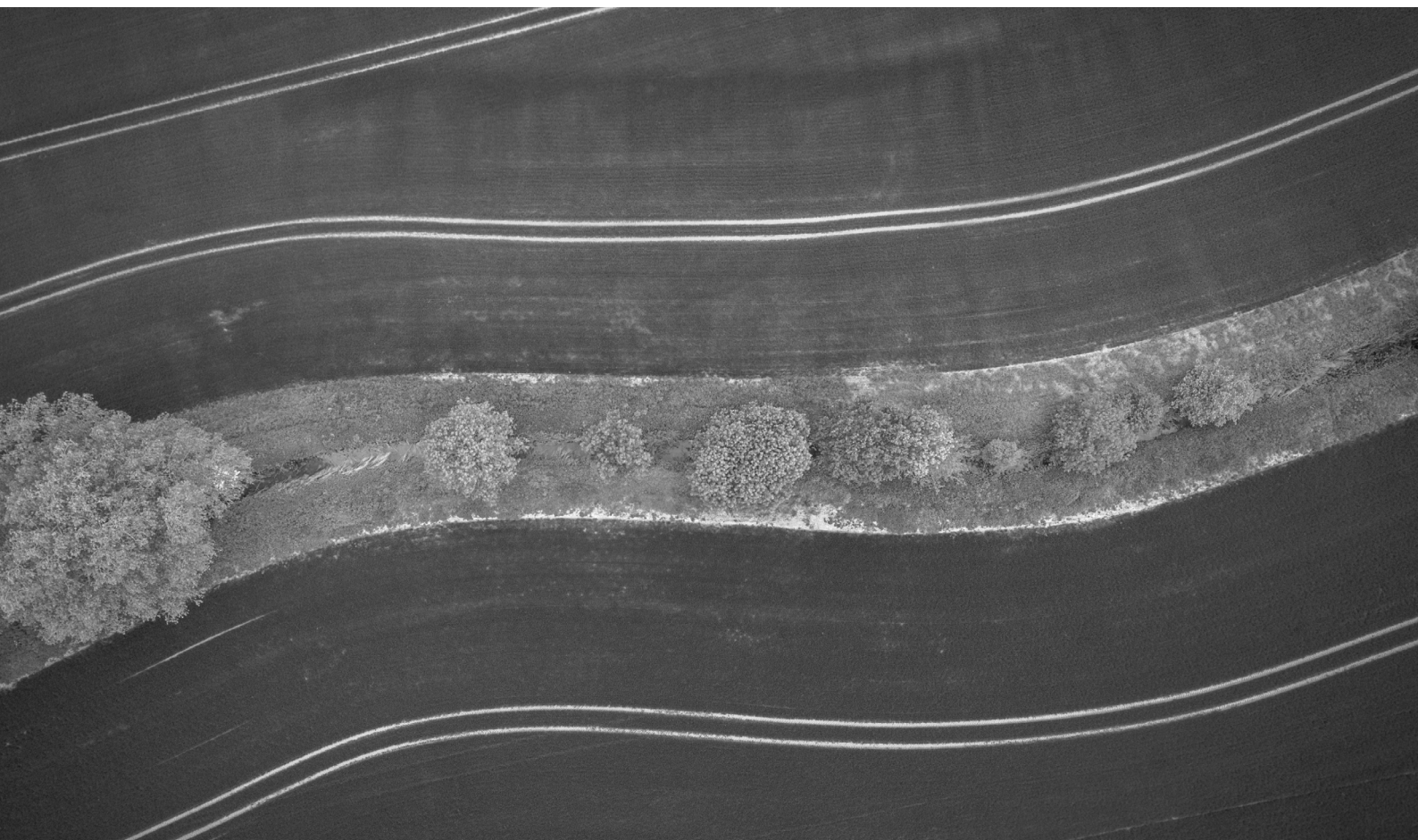
Lessons Learned

Despite the turbulent times, there was interest in this initiative from stakeholders from across Europe, and across different sectors, showing the interest to invest in good practices that improve health, minimise disease and therefore the need for antibiotic use. Organisations valued their participation in this exercise, as shown by the final total of 41 submissions and can act as examples to motivate more responsible use of antibiotics.

Conclusions and Recommendations

Having reviewed the 41 submissions received, the selection committee and co-authors of this report draw the following conclusions and recommendations:

- Implementation of One Health in practice seems to be still in infancy. The vast majority of the projects keep to be developed and implemented within the sector's boundaries.
- When it comes to development and implementation of best practices to tackle AMR in practice, it seems that the topic is better understood and employed in human healthcare and animal health care, than in the environmental angle, e.g. participation of plant and agri-sector, is not yet very evident.
- For evidence-based approaches to tackle AMR, there is an urgent need for interdisciplinary and cross-sectoral collaboration. Project development would benefit from such partnerships, which could further ensure greater impact whilst ensuring sustainability.



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Note: partial contribution due to unforeseen circumstances, stepped down after completing the assessment of all applications.

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