



World Organisation
for Animal Health

Integrating Antimicrobial Resistance Mitigation into Beekeeping Practices in Eastern Africa

Nairobi, Kenya

2 - 4 September 2026



Ministry of Agriculture &
Livestock Development



The
Fleming Fund



Funded by
UK Government

WOAH Strategy on AMR.

Dechassa Tegegegne
SRR/SA AMR Programme officer
Nairobi, Kenya

2 - 4 September 2026



**Ministry of Agriculture &
Livestock Development**



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WOAH Strategy on Antimicrobial Resistance (AMR) and the Prudent Use of Antimicrobials

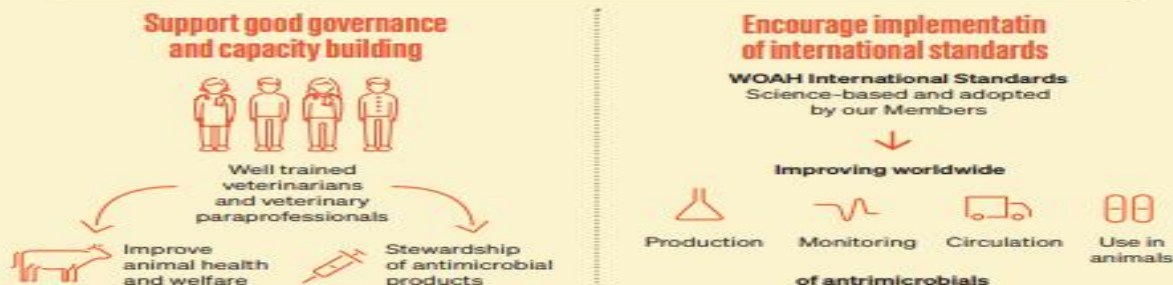
Protecting animal health and welfare by supporting global efforts to combat antimicrobial resistance



Antimicrobial Resistance



WOAH Strategy





AMR consequences in animal health



Ministry of Agriculture &
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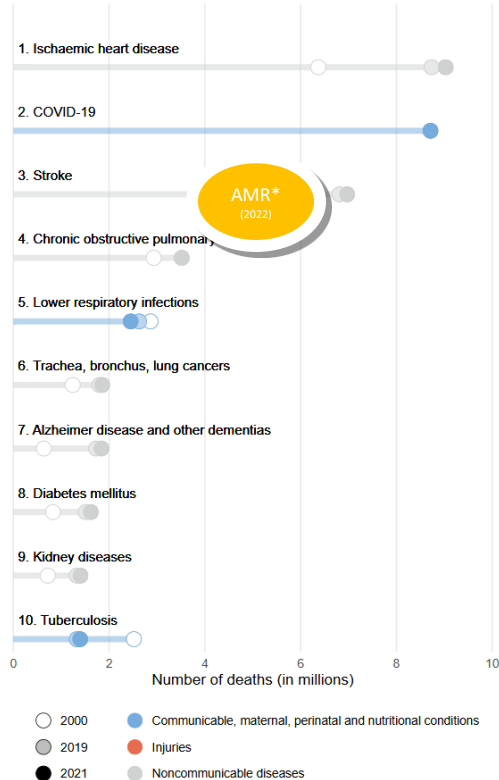
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AMR – Is that a real problem?

Leading causes of death in 2021 globally



Source: <https://www.who.int/news-room/fact-sheets/detail/the-top-10-causes-of-death>

*Source: <https://www.woah.org/app/uploads/2024/09/ihme-human-health-web-f23924.pdf>

Antimicrobial resistance could result in production losses in the livestock sector equivalent to the consumption needs of more than 2 billion people annually by 2050.

- A series of four reports, co-published with the World Bank (Sep.2024)
- Data from more than 200 countries estimating full toll of AMR (humans, livestock and our overall economies)

\$5.2 Trillion

The spillover of resistant pathogens from livestock to humans could **reduce global GDP by \$5.2 trillion** from 2025 to 2050.

\$1.7 trillion

Increased antimicrobial resistance in humans could lower annual global GDP by up to **\$1.7 trillion** by 2050.

39 million

Left unaddressed, antibiotic-resistant infections could lead to more than **39 million human deaths** between 2025 and 2050.

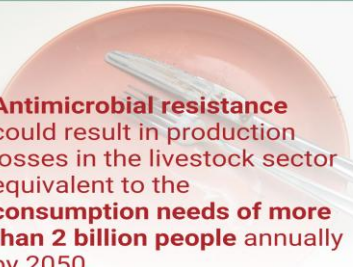
<https://www.woah.org/en/superbugs-could-jeopardise-food-security-for-over-two-billion-people-and-increase-annual-health-care-costs-by-us-159-billion-annually-by-2050-finds-most-extensive-modelling-to-date/>

- [illegible]







Antimicrobial resistance
 could result in production
 losses in the livestock sector
 equivalent to the
consumption needs of more
than 2 billion people annually
 by 2050.

World Organization for Animal Health | AID | International Development | CCD | Center for Disease Control and Prevention | Institute for Health Metrics and Evaluation | UNICEF | THE WORLD BANK

A 30% reduction in antimicrobial use in livestock within the next five years could raise annual global GDP in 2050 by up to \$14 billion by 2050.

An infographic titled "The spillover of resistant pathogens from livestock to humans could reduce global GDP by \$5.2 trillion from 2025 to 2050." The background features a woman in a purple dress holding a white lamb against a backdrop of green trees and a bright sun. At the top, logos for World Organisation for Animal Health (OIE), AID, CDO, FAO, Institute for One Health Metrics and Evaluation, UNICEF, and THE WORLD BANK are displayed. The main title "\$5.2 Trillion" is prominently shown in large red font. Below it, the subtitle reads: "The spillover of resistant pathogens from livestock to humans could reduce global GDP by \$5.2 trillion from 2025 to 2050."



Investments in **combating antimicrobial resistance** through drug innovation and health care improvements can yield returns as high as **28 times the initial funding.**

 The Rockefeller Foundation
 AID
 CCO
 Gates Foundation
 MRC
 NIH
 Wellcome Trust
 GSK
 Novartis
 Pfizer
 TSM WORLD'S LEADER










\$990 billion

Improved antibiotics, vaccination, and elimination of unsafe water, sanitation, and hygiene can increase global GDP by **\$990 billion** by 2050.


 Bilateral Cooperation for Global Health


 AID


 CGD

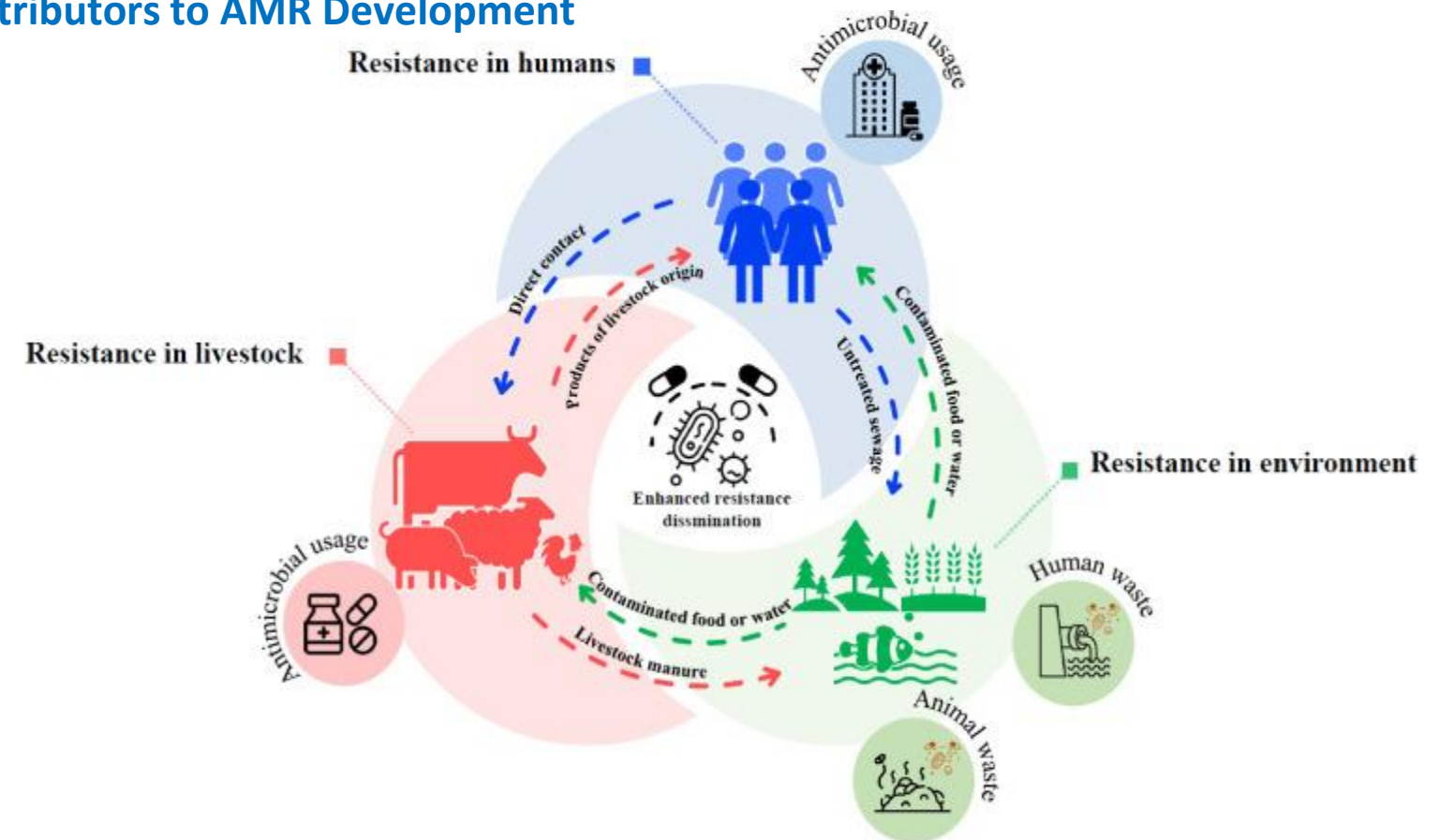

 Institute for Health Metrics and Evaluation


 Gates Foundation


 THE WORLD BANK

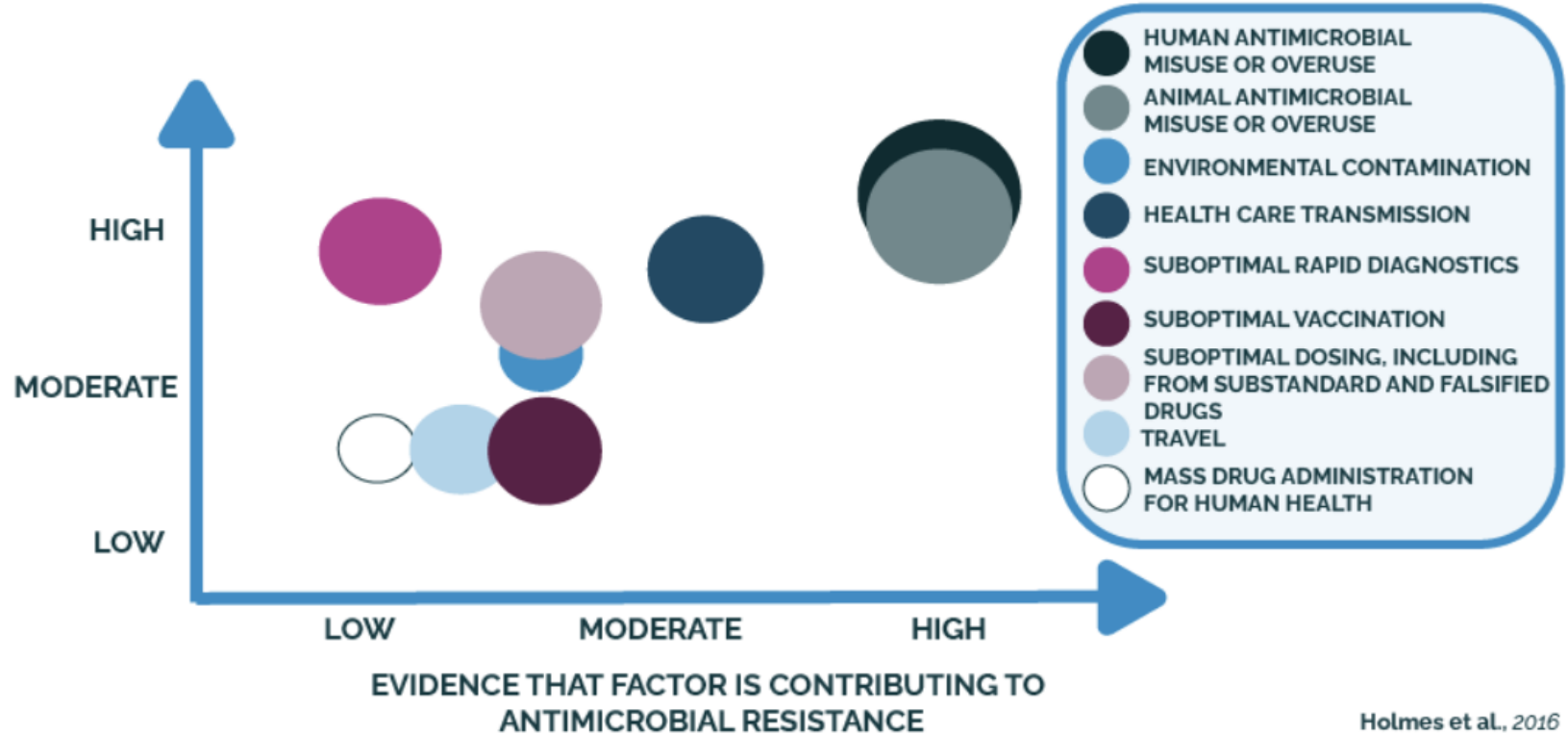
A 30% reduction in antimicrobial use in livestock within the next five years could raise annual global GDP in 2050 by up to **\$14 billion by 2050.**

This figure illustrates the interplay between livestock, humans, and the environment as contributors to AMR Development



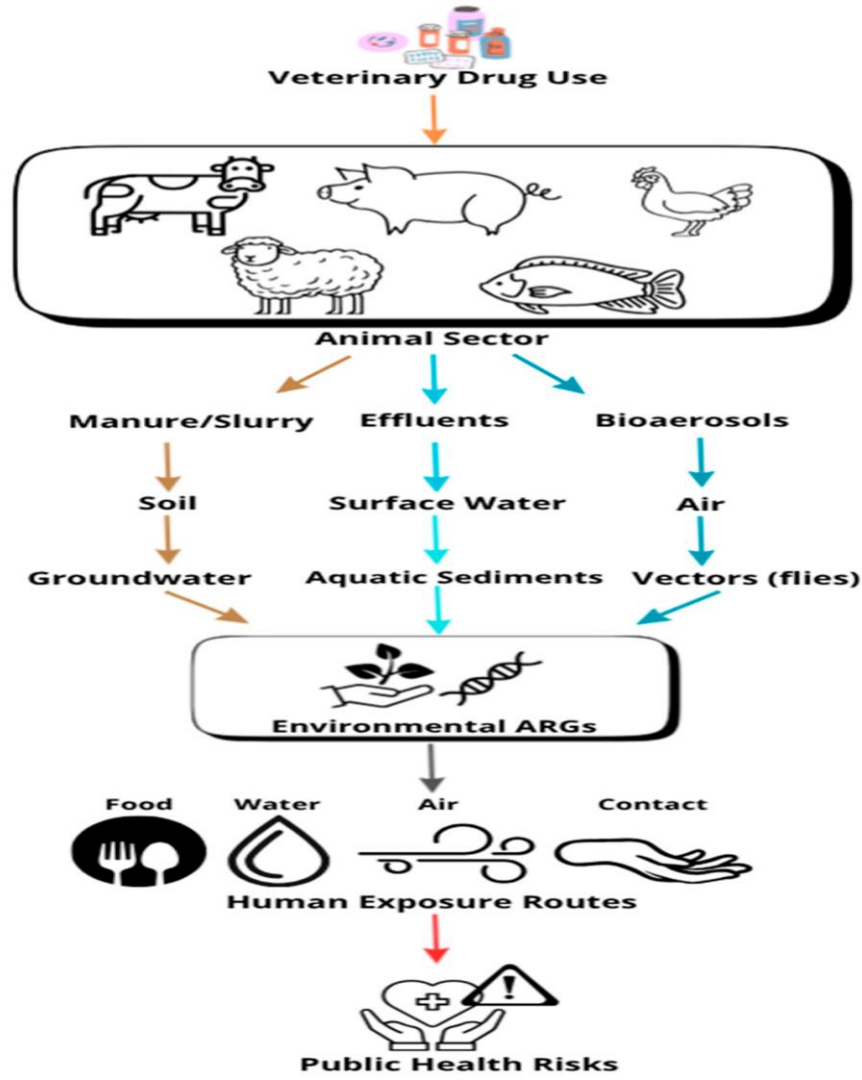
Factors contributing to antimicrobial resistance (AMR)

RELATIVE CONTRIBUTION OF FACTOR AS A DRIVER FOR ANTIMICROBIAL RESISTANCE

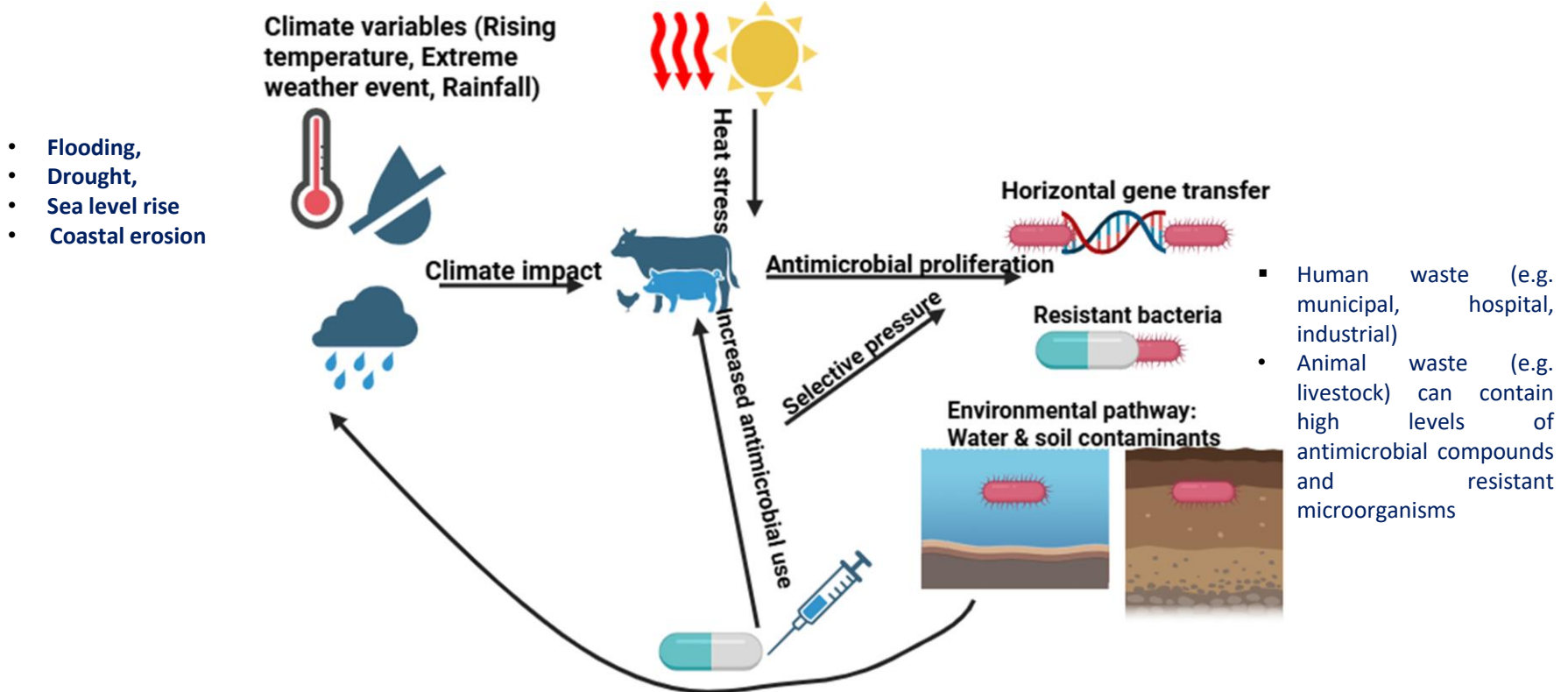


Holmes et al., 2016

Environmental dissemination pathways of ARGs from food-animal production within the OH framework



Climate change nexus AMR in the livestock



Mechanisms of AMR proliferation in livestock under climate change

Antimicrobial Resistance From Farm to Home

A AMR Evolution

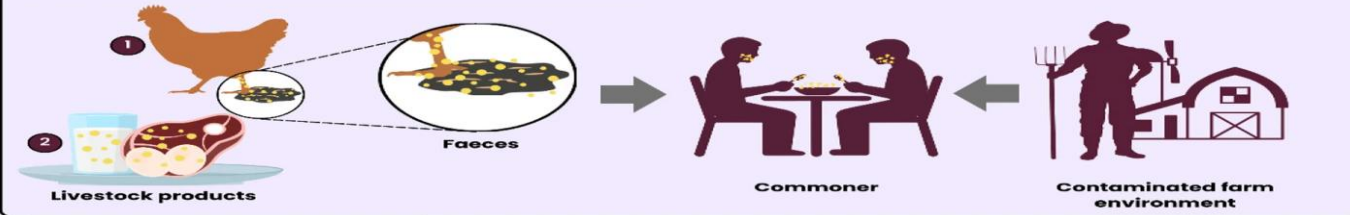
Livestock vs Antibiotics interface



B Role of Gut Microbiome



C Propagation of AMR to Humans



D Impact on Humans



A Comprehensive Narrative Review on the Hazards of Bee Honey Adulteration and Contamination



PESTICIDES

- Acaricides
- Organic acids
- Insecticides
- Fungicides
- Herbicides



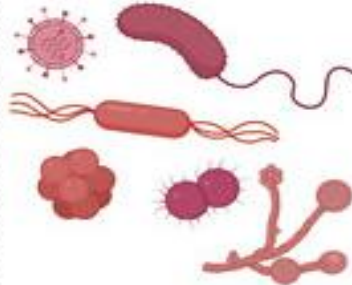
ANTIBIOTICS

- Streptomycin
- Erythromycin
- Lincomycin
- Sulfonamide
- Chloramphenicol



MICROORGANISM

- *Bacillus cereus*
- *Candida parapsilosis*
- *Clostridium botulinum*



HEAVY METALS

- Aluminium (Al)
- Arsenic (As)
- Cadmium (Cd)
- Iron (Fe)
- Lead (Pb)
- Mercury (Hg)
- Nickel (Ni)



AMR vs Honeybees

- Recent analysis results reveal that the gut of honeybee serves as a reservoir of AMR genes,
 - Probably due to
 - ✓ Antibiotics application history in beekeeping
 - ✓ Horizontal gene transfer from the highly polluted environment
- These AMR genes accumulate in the honeybee gut,
 - ❖ Could be transferred to the pathogen, even having the potential to spread during pollination , tending, social interactions.
 - ❖ Newly acquired resistance traits may cause fitness reduction in bacteria whereas facilitating adaptive evolution as well.

Hu et al. 2013

Why Antibiotic Use in Honeybees Matters?



**Residues in honey and
other bee products.**

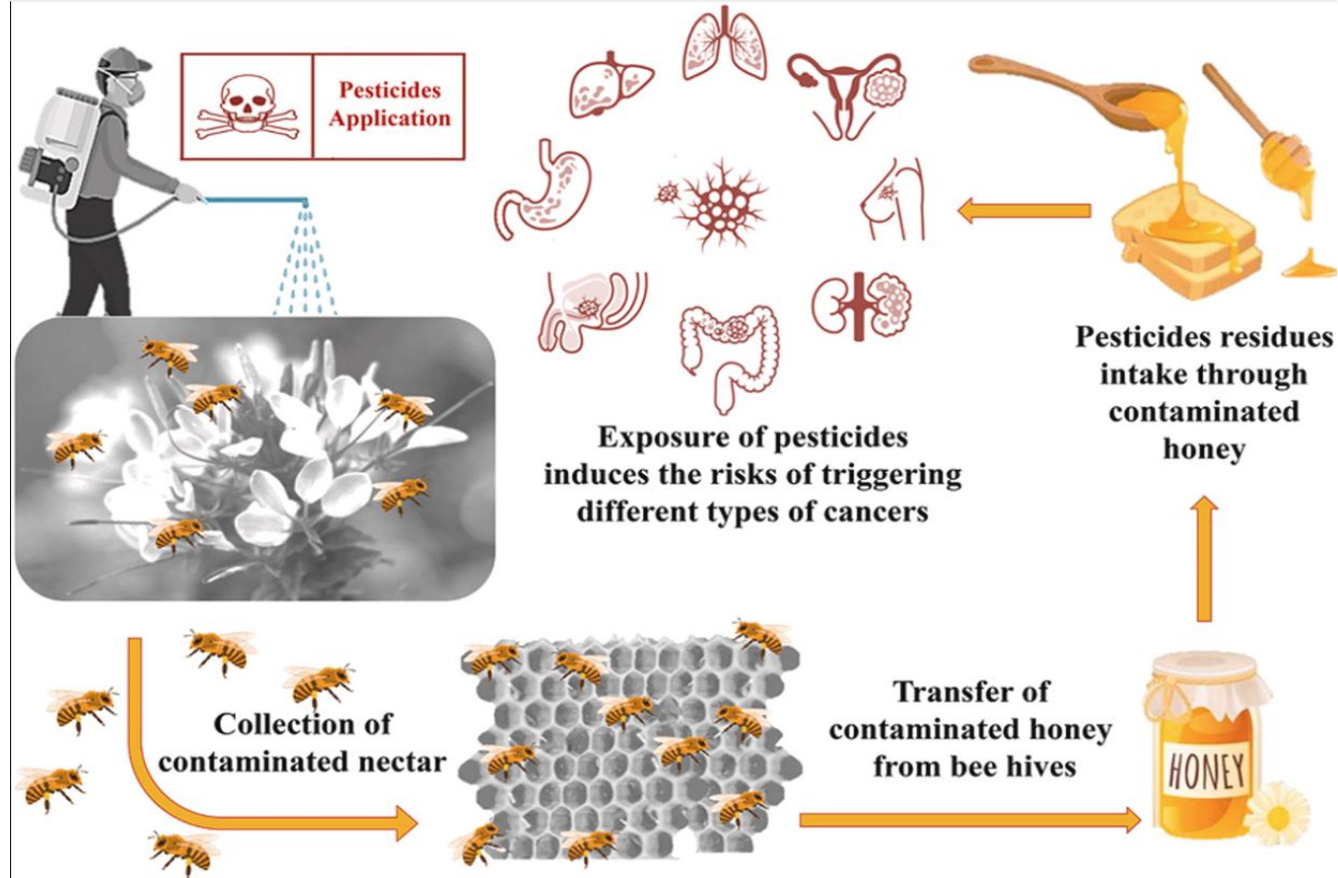


**Disruption of the
natural microbiota of
honeybees.**

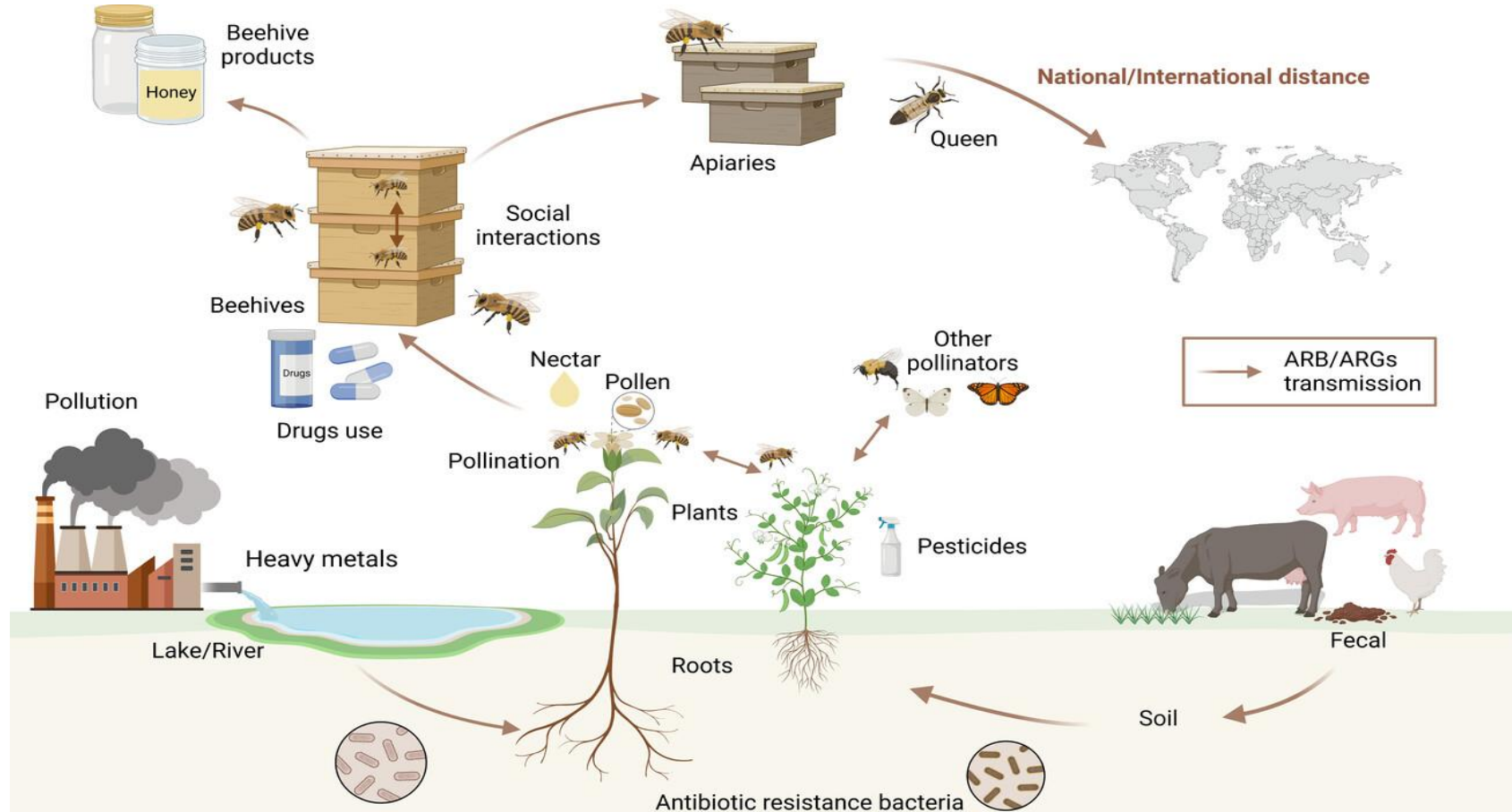


**Emergence and spread of
antimicrobial resistance.**

Exposure to pesticide residues in honey and its potential cancer risk assessment



The potential transmission routes of AMR bacteria and associated AMR genes mediated by honeybees and speculative factors affecting the horizontal gene transfer.



Antimicrobial Resistance Mitigation into Beekeeping Practices

- Agricultural and apicultural practices expose honeybees to a range of pesticides that have the potential to negatively affect their
 - physiology, neurobiology, and behavior.
- **These effects extend to the honeybee gut microbiome,** which serves important functions for honeybee health.
- **Gut microbial community plays an important role in the regulation of insect health**

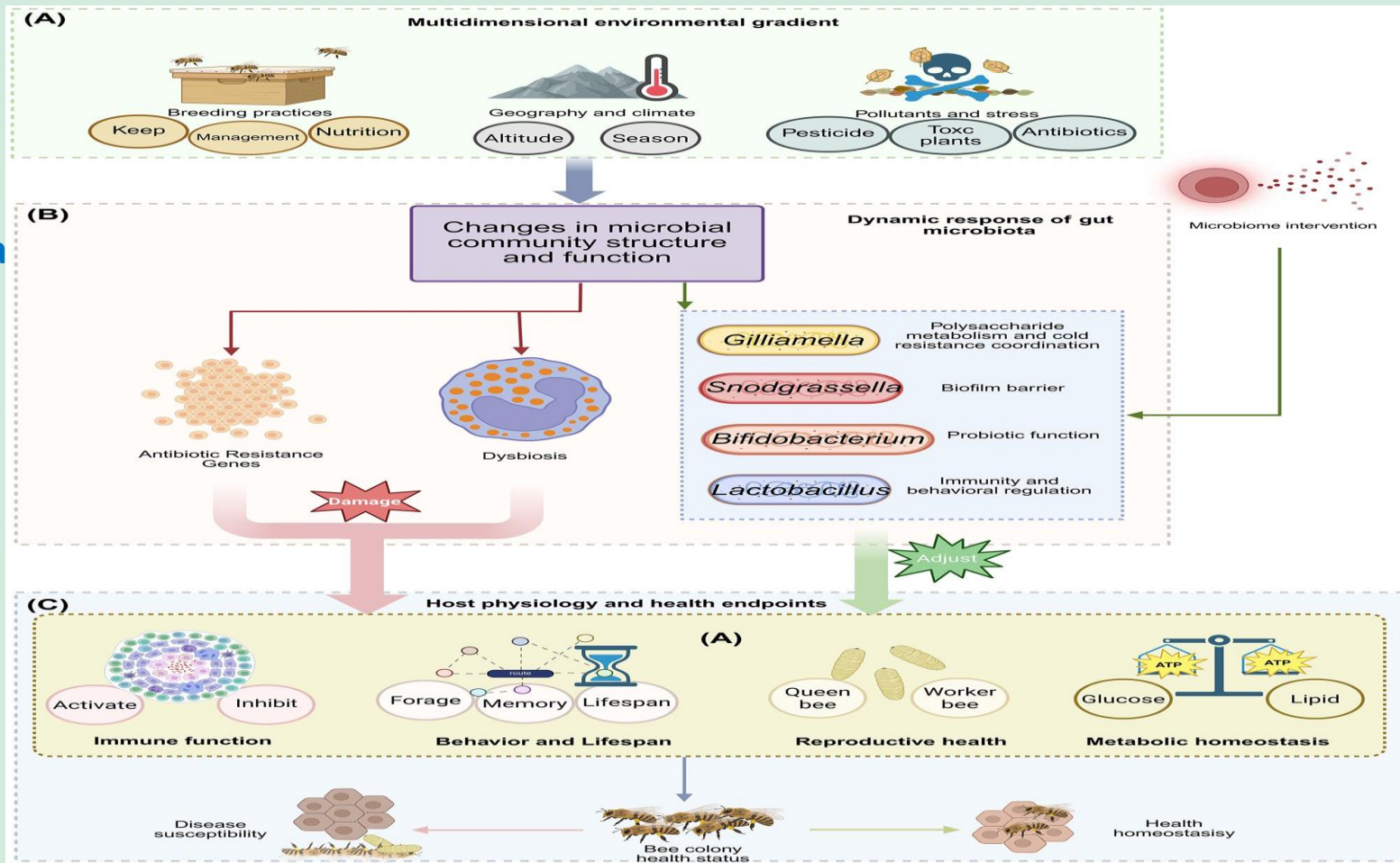


Gut microbial community of Bees

- In contrast to many other animals, honey bees have a relatively **simple and conservative gut microbiota community** which is dominated by **only eight core bacterial phylotypes**,
- *Snodgrassella alvi*,
- *Gilliamella apicola*,
- *Lactobacillus* spp.,
- *Bifidobacterium* spp.,
- *Frischella perrara*,
- *Bartonella apis*,
- *Parasaccharibacter apium* *Commensalibacter* spp.



Response of bee gut microbiota under multidimensional environmental stress and its mechanism of impact on



Gut bacteria contribute to honey bee health



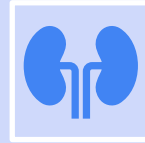
Regulating host hormonal signaling (Zheng et al., 2017)



Participating in food digestion (Zheng et al., 2019).

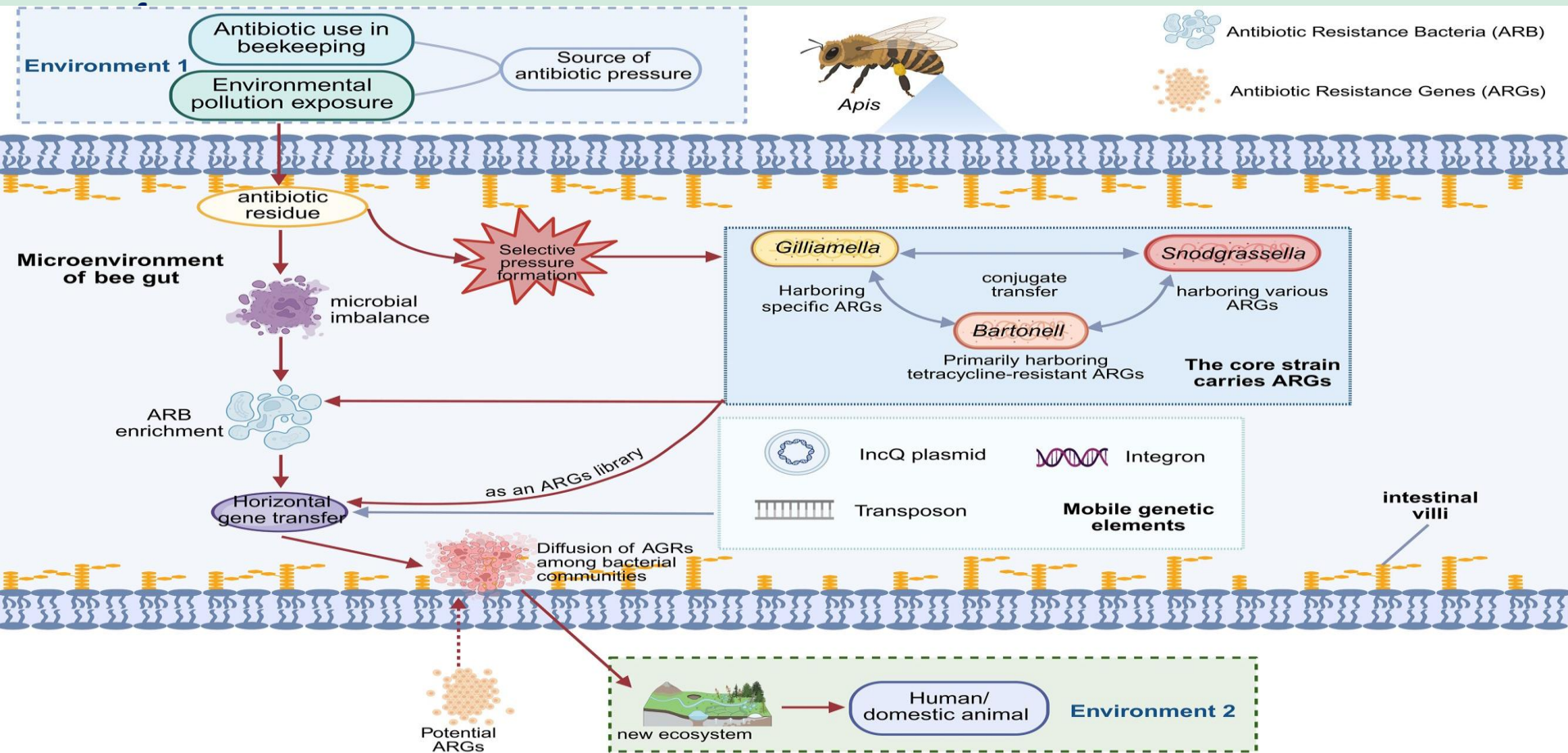


Priming the immune system against pathogenic infections (Emery et al., 2017).



Promoting the endogenous detoxification (Wu et al., 2020b).

Transmission and diffusion mechanism of ARGs in the bee gut. ARGs can enter the bee



1. *Env Microbiol Rev*, Volume 80, 2020, Page 1, <https://doi.org/10.1093/emicro/dnab001>

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POLICY BRIEF

STEWARDSHIP FOR ELIMINATING ANTIBIOTIC USE IN APICULTURE: HOW TO COMBAT ANTIMICROBIAL RESISTANCE AND PROTECT HONEY BEE HEALTH, HONEY BEE WELFARE AND FOOD SAFETY

TOWARDS ZERO ANTIBIOTICS IN BEEKEEPING

Protect Bees. Protect People. Protect Our Planet.

Antibiotics in beekeeping pose risks to bee health, food safety, human health, and the environment. A **One Health** approach and coordinated action can eliminate the need for antibiotics and ensure sustainable apiculture for future generations.

**ZERO
ANTIBIOTICS**
OUR GOAL
OUR FUTURE

KEY CHALLENGES



INCONSISTENT REGULATIONS

Diverse rules and enforcement gaps lead to uncontrolled use and barriers to trade.



LIMITED VETERINARY SURVEILLANCE

Lack of diagnosis, monitoring and reporting systems hinders appropriate treatment and control of bee diseases.



INSUFFICIENT ALTERNATIVES

Limited access to effective, proven non-antibiotic solutions and good beekeeping practices.



RISK OF ANTIMICROBIAL RESISTANCE (AMR)

Antibiotic use can drive AMR, threatening bee health, human health and the effectiveness of critical medicines.



CONTAMINATION OF BEE PRODUCTS AND ENVIRONMENT

Residues in honey, wax, pollen and propolis harm consumers and ecosystems, and reduce market access.

THE ONE HEALTH CONNECTION



Healthy bees contribute to food security, biodiversity and resilient ecosystems.

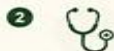
Eliminating antibiotics in beekeeping protects people, animals and the planet—today and for future generations.

RECOMMENDATIONS: THE PATH TO ZERO ANTIBIOTICS



1. STRENGTHEN POLICIES AND REGULATIONS

- Establish clear, science-based rules.
- Prohibit routine use and ensure enforcement.



2. IMPROVE VETERINARY SERVICES AND SURVEILLANCE

- Build capacity for diagnosis and monitoring.
- Implement national disease reporting systems.



3. PROMOTE GOOD BEEKEEPING PRACTICES

- Focus on hive hygiene, nutrition, queen health and biosecurity.
- Prevent disease rather than treat.



4. SUPPORT EFFECTIVE ALTERNATIVES

- Invest in research and validation of non-antibiotic solutions.
- Ensure availability and accessibility for beekeepers.



5. EDUCATE AND EMPOWER BEEKEEPERS

- Provide training on disease prevention and alternatives.
- Encourage responsible management decisions.



6. MONITOR, EVALUATE AND ENSURE TRANSPARENCY

- Track progress towards zero antibiotic use.
- Share data to build trust and drive continuous improvement.



**ZERO ANTIBIOTICS.
SUSTAINABLE APICULTURE.
A HEALTHY FUTURE.**

LET'S ACT TOGETHER NOW.



GOVERNMENTS



VETERINARIANS



BEEKEEPERS



RESEARCHERS



CONSUMERS



ZERO ANTIBIOTICS IN BEEKEEPING IS POSSIBLE.

COMMIT TODAY. PROTECT TOMORROW.



ANTIBIOTIC STEWARDSHIP IN APICULTURE:

PROTECTING HONEY BEE HEALTH AND WELFARE, FOOD SAFETY, AND COMBATING ANTIMICROBIAL RESISTANCE

Antibiotics are valuable tools when used responsibly to treat bacterial diseases in honey bees.

Prudent use protects bee colonies, ensures safe honey and hive products, and helps fight antimicrobial resistance (AMR) for future generations.



HEALTHY BEES
STRONG COLONIES



SAFE HONEY
SAFE FOOD



COMBAT AMR
PROTECT OUR FUTURE



USE ANTIBIOTICS RESPONSIBLY



DIAGNOSE CORRECTLY

Identify bacterial diseases accurately. Not all problems need antibiotics.



USE ONLY WHEN NECESSARY

Use antibiotics only for confirmed bacterial infections as prescribed by a veterinarian.



FOLLOW LABEL DIRECTIONS

Use the right product, dose, route, and duration.



RESPECT WITHDRAWAL TIMES

Do not harvest honey or hive products until the withdrawal period is over.



KEEP RECORDS & MONITOR

Record all treatments and monitor colony health.

BIOSECURITY

Prevent entry and spread of pathogens



EDUCATE & COLLABORATE

Work together and share knowledge



PREVENT DISEASE

Strong colonies through good nutrition, clean hives, and biosecurity



GOOD BEEKEEPING PRACTICES

Regular inspection and timely management



INTEGRATED APPROACH

Combine best management practices and judicious use of antibiotics



PROTECT THE ENVIRONMENT

Safe disposal of medicines and packaging



OVERUSE AND MISUSE LEAD TO AMR



Bacteria can become resistant, making treatments less effective.



Resistant bacteria can spread to other bees, animals, humans, and the environment.



AMR threatens animal and human health and increases costs.

WE ALL HAVE A ROLE

- ✓ Beekeepers: use antibiotics wisely.
- ✓ Veterinarians: prescribe responsibly.
- ✓ Regulators: ensure proper oversight.
- ✓ Researchers: develop better tools.
- ✓ Consumers: support responsible beekeeping.
- ✓ Together: safeguard bees, food, and health.



HEALTHY BEES. SAFE FOOD. RESPONSIBLE USE. STRONGER TOMORROW.

BE WISE, PRESCRIBE RIGHT, PROTECT OUR BEES AND OUR FUTURE.



RESPONSIBLE TODAY
SUSTAINABLE TOMORROW



Care for bees
Care for nature



Good practices
Better outcomes



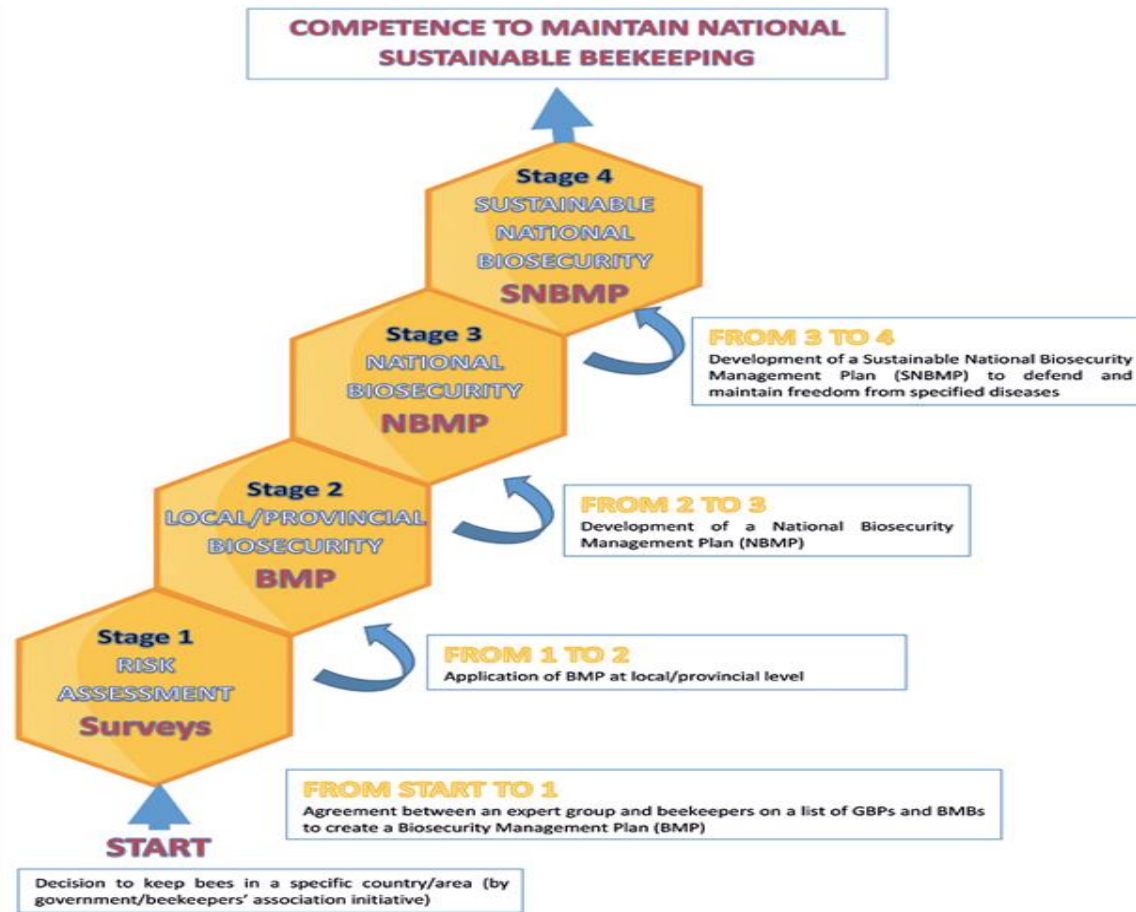
Antibiotic stewardship
A shared commitment



Healthy hives
Healthy planet

When in doubt, consult your veterinarian.
Responsible use today ensures effectiveness tomorrow.

The Progressive Management Pathway for Biosecurity Measures in Beekeeping (PMP-BMB)



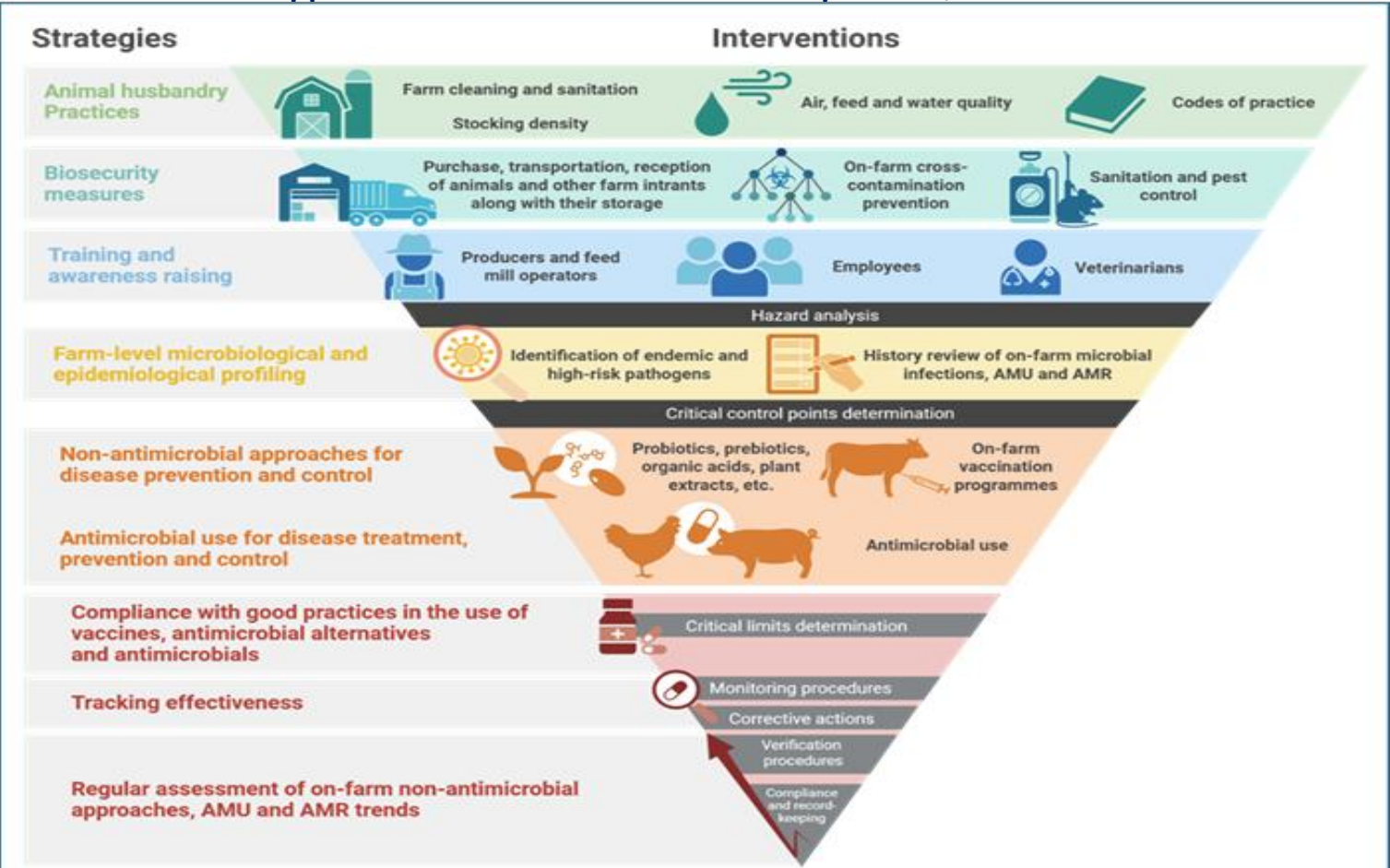
Antibiotics cannot protect against poor beekeeping practices

The main advice for **beekeepers** on use of antimicrobials in beekeeping

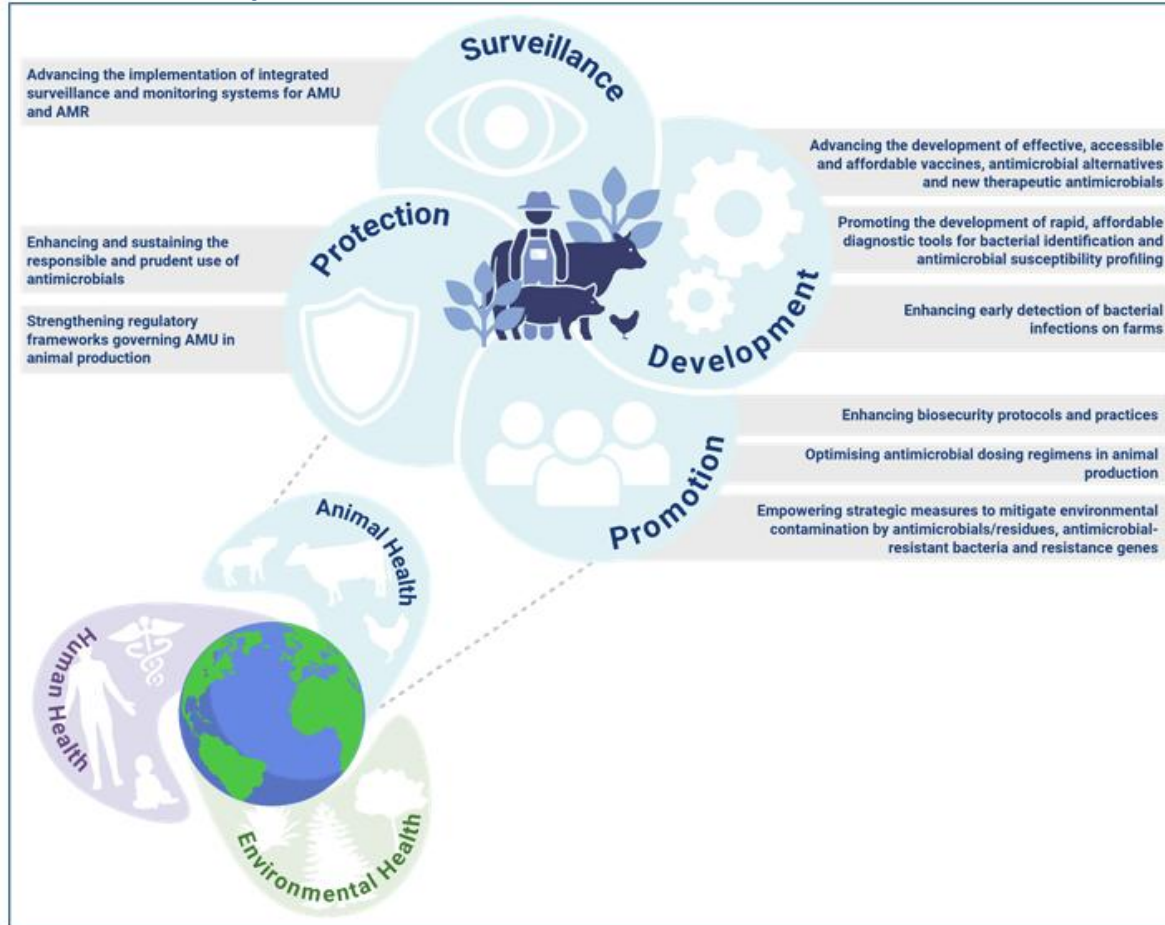
- Avoid/reduce use of antimicrobials and adopt GBPs and BMBs – medicines should never be considered a substitute for GBPs or BMBs;
- Only use antimicrobials according to a veterinarian's indication and the instruction label;
- Do not administer any antimicrobial during a honey flow or into honey supers;
- Do not misuse antimicrobials, including prophylactically, because it may lead to AMR;
- Spillover of antimicrobials may be toxic for honey bees and may lead to residues in hive products;
- Only use antibiotics for individual treatment on affected hives.



On-farm intervention strategies structured according to the adapted prerequisite programme principles and the Hazard Analysis Critical Control Point approach to reduce infectious disease pressure, AMU &AMR



Future directions for livestock stakeholders in One Health approach to promote prudent and responsible antimicrobial use in animal production and minimise the selection for antimicrobial-resistant bacteria





Thank You

www.woah.org woah@woah.org



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for Animal
Health

Organisation
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