

Antimicrobial resistance in ready-to-eat vegetables: What the evidence says



Why this matters?

Antimicrobial resistance (AMR) is a One Health issue that can involve people, animals, plants, food, water and the environment. Ready-to-eat (RTE) vegetables need particular attention because they may be consumed raw or minimally processed, without cooking or another validated final kill step. Washing may reduce microbial load, but it does not remove all microorganisms or resistance determinants.

What was done

The latest (2000-2025) published research was reviewed to understand what is known about AMR in ready-to-eat vegetables. The review looked at:

- Where resistance microorganisms have been found in vegetable production and fresh produce;
- What may encourage resistance to develop or persist, including exposure to chemicals, metals and disinfectants;
- How AMR is currently monitored and managed; and
- How researchers assess the potential risks to growers, industry and consumers.



Key message

The research helps identify where monitoring and good management could make the biggest difference to AMR risk occurrence.



Modified from Álvarez-Fraga et al., 2026. *Environmental Science & Technology*. <https://doi.org/10.1021/acs.est.6c03391>

Key findings



AMR has been reported across the farm-to-fork pathway including vegetables, irrigation water, manure, soil and post-harvest environments.



Higher occurrence was often associated with untreated wastewater, polluted surface water, raw manure and fresh-cut handling.



Some chemicals used or present in production systems (including fungicides, herbicides, metals and disinfectants) may create conditions that help resistant microorganisms spread.

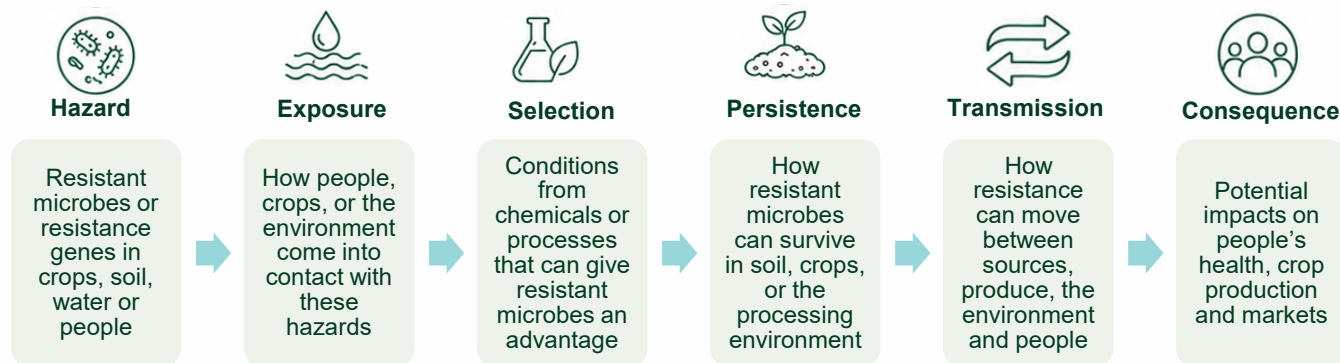


AMR in vegetable production is a farm-to-fork issue

From Evidence to Action

Priorities for AMR risk assessment and industry preparedness

Six components for future AMR risk assessment



These components help assess AMR risk alongside existing food-safety frameworks

What this means for industry



Use multiple safeguards across water, amendments, harvest, sanitation and chemical stewardship



Focus on high-contact pathways, especially where edible products directly contact water, soil, or shared equipment



Treat washing as risk reduction, not risk removal



Monitor hygiene and AMR separately. Both provide important information.

What growers can do now



Strengthen future AMR risk assessment by improving records and monitoring around:

- water source, treatment, timing and crop contact
- organic amendment source, treatment and withholding period
- harvest and packing hygiene
- wash-water management and sanitation verification
- chemical-use patterns, including fungicides, disinfectants, metals and other stressors
- any testing that distinguishes viable organisms from gene detection

What we still need to know



Consistent testing
Use the same approaches so results can be compared



What's present
Know when testing shows live resistant microbes, not just resistance genes



How resistance spreads after harvest
Understand movement during washing, handling, packing, and processing



What the impacts could be
Understand what AMR could mean for crop production and human health