



Food and Agriculture  
Organization of the  
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# Antimicrobial resistance in aquaculture: a One Health global management issue

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# What is antimicrobial resistance?

- A bacterial strain is **resistant to an antimicrobial** when the normally achievable concentration of the drug attained in tissues (with maximum dosage) is not high enough to completely inhibit it.
- AMR can arise by one of two mechanisms:
  1. Resistance from random mutation.
  2. Gaining the ability to resist one or more antibiotics by acquisition of gene(s) from a bacteria that has resistance (usually on **plasmids**).





# What does AMR mean for aquaculture?

- AMR in aquaculture can cause:
  - Slow therapeutic response
  - Recurrence of disease
  - Therapeutic failure
- If the ability to treat bacterial diseases with antimicrobials in aquaculture is lost:
  - It is an **animal welfare** issue.
  - It is an **economic issue** for producers.



# Does AMR in aquaculture affect human health?

- More research is needed to determine whether antimicrobial use in animals can lead to antimicrobial-resistant pathogens in the food chain.
- BUT it is clear that AMR is a true One Health issue, and fish health/animal health/human health are interrelated.



# Is there any good news?

- AMR **can be detected** by susceptibility testing at the onset of therapy.
- **Responsible** antimicrobial use under supervision of veterinarians and physicians can reduce and prevent AMR in pathogens affecting animals and people.
- Building capacity for fish health internationally **protects** the global aquaculture industry from AMR.



M. Gulam Hussain



# Managing AMR in aquaculture

- Nothing replaces **good husbandry** and **prevention**.
- **Prevent misuse:** only use antimicrobials following a proper diagnosis and under the supervision of a licensed veterinarian or fish-health professional.
- Use **alternatives** to antimicrobials when possible:
  - Treat predisposing factors
  - Vaccines
  - Prebiotics/probiotics



# Antimicrobial use in the US

- All antimicrobial use in US food fish requires veterinary oversight under the US Food and Drug Administration (FDA) Veterinary Feed Directive (VFD) rule:
  - A VFD order written by a licensed veterinarian is required to obtain antimicrobial medicated feed.
  - The veterinarian must examine fish, ascertain fish have bacterial disease, have oversight of medicated feed use, and be available for follow-up.
  - Client must agree to use medicated feeds as prescribed.



# Is AMR in aquaculture a problem in the US?

## Aquatic Research & Diagnostic Laboratory - Stoneville, MS 2019 Annual Case Summary Incidence of Antibiotic Resistance

Organism	# Tested	Resistance to One Antibiotic				Resistance to Two Antibiotics			Resistance to Three Antibiotics		
		Terramycin[R] (%)	Terramycin[I] (%)	Aquaflor®[I] (%)	Aquaflor®[R] (%)	Terramycin [R] & Aquaflor® [I] (%)	Terramycin[R] & Aquaflor®[R] (%)	Terramycin[I] & Aquaflor[I] (%)	Terramycin [R], Romet [I], & Aquaflor®[I](%)	Terramycin [R], Romet [I], & Aquaflor®[R](%)	Terramycin [R], Romet [R], & Aquaflor®[I](%)
<i>Flavobacterium columnare</i>	346	0	0	0	0	0	0	0	0	0	0
<i>Edwardsiella ictaluri</i>	247	4(1.6)*	1(0.4)*	1(0.4)	1(0.4)*	49(19.8)*	14 (5.7)*	0	3(1.2)*	1(0.4)*	1(0.4)
<i>Edwardsiella piscicida(tarda)</i>	80	2(2.5)	0	0	0	6(7.5) <sup>†</sup>	21(25.3) <sup>†</sup>	0	0	0	0
<i>Aeromonas hydrophila</i>	12	3 (25.0)	0	0	0	0	0	0	0	0	0
<i>Aeromonas sp.</i>	8	2 (25.0)	0	0	0	1 (12.5)	0	0	0	0	0
<i>Pleisomonas shigelloides</i>	5	0	0	0	0	0	0	1(20.0)	0	0	0
<i>Vibrio cholera</i>	6	0	0	0	0	0	0	0	0	0	0

R - resistant; I - Intermediate; S - Susceptible

<sup>†</sup> Multiple (3) submissions from same pond (1 pond 2 times, 1 pond 3 times)

\* Multiple (26) submissions from the same pond(s) (19 ponds 2 times; 6 ponds 3 times; 1 pond 4 times)

- Incidence has remained relatively constant over multiple years.
- Vigilance is key.





# FEED THE FUTURE

The U.S. Government's Global Hunger & Food Security Initiative

## Feed the Future Innovation Lab for Fish: Advancing the fish value chain and human nutrition

- **Our mission:**

- To alleviate poverty and improve nutrition in vulnerable populations through the reliable and inclusive provision of fish, a nutrient-rich animal source food.



*Sunil Siriwardena/WorldFish*



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# FEED THE FUTURE

The U.S. Government's Global Hunger & Food Security Initiative

## FAO-led Fish Innovation Lab project

Aquacultural and rural communities: Farm diversification strategy through integrated agriculture-aquaculture systems and nutrition-sensitive value chains for better nutrition outcomes in Nigeria

- The activity will:
  - consider the technologies that are accessible to local farmers and analyze how Integrated Agriculture-Aquaculture (IAA) systems influence the resilience, dietary diversity, livelihood options, rural employment (especially for youth and women), use of resources, and the role of institutional and policy innovations.
  - study value chain enhancement through market access facilitation and marketing management.

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