ANTIMICROBIAL RESISTANCE IN FISH PATHOGENS ISOLATED FROM CULTURED RAINBOW TROUT IN TURKEY

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Introduction

Antimicrobial resistance is important in fish health as well as in human. In countries such as those of Europe and northern America, where licensing and regulation of the use of antimicrobials are strictly enforced and where their usage is always under veterinary guidance, it would be typical that only 2-4 agents are available in aquaculture. Those most commonly licensed antimicrobials are oxytetracycline, trimethoprim-sulfadiazine (or ormetoprim/ sulfadimethoxine in American countries), oxolinic acid and/or flumequine, and florfenicol).

In some countries like Norway and Sweden which have been collecting accurate statistics for years, recent estimates suggest that approximately 2 g of antimicrobials were used per tone of aquaculture product. Data from the UK would suggest an aquaculture usage of 10-20 g/t and those from Denmark, France and Greece would indicate a slightly higher use of between 40 - 100 g/t. With respect to Canada and Chile, best estimates (157 g/t and >200 g/t respectively) would suggest that usage is higher than in most European countries. Data from Asia, where the vast majority of aquaculture production takes place, has been even more difficult to obtain. However, an indirect estimate of usage in Viet Nam would suggest a figure of 700 g/t. This might suggest that European data would provide a poor guide to usages in other countries.

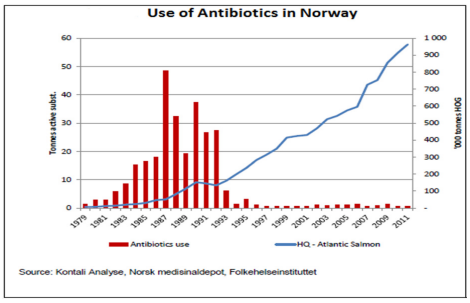

Figure 1. Use of antibiotics in Norway (Report from The Norwegian Veterinary Institute 2016)

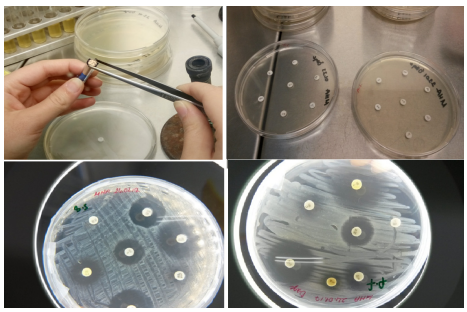

Figure 2. The Kirby-Bauer disk diffusion method was performed using multidisc

Aim

Antibiotics are widely used in the treatment of fish diseases. On the other hand, microbial resistance in veterinary medicine continues to increase as in human medicine, and this phenomenon reduces the variety of antibiotics to be used. For this reason, recent studies have been directed towards increased antimicrobial resistance. In this study it was aimed to determine antimicrobial resistance in fish pathogenic bacteria isolated from cultured rainbow trout in the Marmara Region of Turkey.

Methods

Seven pathogenic bacteria including *Yersinia ruckeri*, *Lactococcus garvieae*, *Aeromonas sobria*, *Vibrio* sp., *Bacillus* sp., *Acitenobacter* sp. and *Pseudomonas fluorescens* that isolated previously from several rainbow trout farms in the Marmara Region of Turkey were used in this study. All strains were tested for antimicrobial susceptibility by the disc diffusion method. The Kirby-Bauer disk diffusion method was performed using multidisk. Isolates were plated onto Mueller-Hinton agar (Oxoid) incubated at 20ºC for 48-96 h and results were interpreted based on the available CLSI data.

Results

✓Twenty seven different antibiotic discs were used and all isolates were determined as resistant at least nine antibiotics.
✓All isolates were determined sensitive to tetracycline, ciprofloxacin and enrofloxacin.
✓In addition, *Pseudomonas fluorescens* strains were found to be resistant more than seventeen antibiotics.

Table 1. Results of antibiotic resistance for isolates.

	Yersinia ruckeri	*Acinetobacter spp.*	*Pseudomonas fluorescens*	*Bacillus simplex*	*Aeromonas sobria*	*Vibrio spp.*	*Lactococcus garvieae*
SXT (25)	(S)	(S)	(R)	(S)	(S)	(S)	(S)
E (15)	(I)	(R)	(R)	(R)	(I)	(S)	(S)
FFC (30)	(S)	(I)	(R)	(S)	(S)	(S)	(S)
O (30)	(S)	(S)	(S)	(S)	(R)	(S)	(S)
EX (5)	(S)	(S)	(S)	(S)	(S)	(S)	(S)
OX (1)	(R)	(R)	(R)	(R)	(R)	(R)	(R)
R (10)	(S)	(S)	(S)	(S)	(I)	(R)	(R)
CN (30)	(S)	(R)	(R)	(S)	(S)	(S)	(S)
TE (30)	(R)	(R)	(R)	(R)	(I)	(I)	(I)
NV (5)	(S)	(R)	(R)	(S)	(S)	(S)	(S)
AK (30)	(R)	(R)	(R)	(R)	(R)	(R)	(R)
N (30)	(S)	(S)	(S)	(S)	(S)	(R)	(R)
S (5)	(I)	(I)	(R)	(R)	(S)	(S)	(S)
VA (30)	(R)	(R)	(R)	(R)	(R)	(I)	(I)
CIP (1)	(S)	(S)	(S)	(S)	(S)	(S)	(S)
C (30)	(S)	(S)	(R)	(S)	(S)	(S)	(S)
T (30)	(S)	(S)	(S)	(S)	(S)	(S)	(S)
P (10)	(R)	(R)	(R)	(R)	(R)	(R)	(I)
TC(75/10)	(S)	(R)	(R)	S	(I)	(I)	(I)
A (10)	(S)	(R)	(R)	(S)	(R)	(R)	(R)
G (10)	(S)	(S)	(S)	(S)	(S)	(I)	(R)
K (30)	(S)	(S)	(S)	(S)	(S)	(R)	(R)
B (10)	(R)	(R)	(R)	(R)	(R)	(I)	(I)
L (15)	(R)	(R)	(R)	(R)	(R)	(R)	(R)
OP (5)	(R)	(R)	(R)	(R)	(R)	(R)	(R)
ME (5)	(R)	(R)	(R)	(R)	(R)	(R)	(R)
Pb (300)	(S)	(S)	(S)	(S)	(S)	(I)	(R)

A (10): Ampicillin disk 10 µg,
AK(30): Amikacin disk 30 µg,
B (10): Bacitracin disk 10 µg,
C (30): Chloramphenicol disk 30 µg,
CIP (1): Ciprofloxacin disk 1 µg,
CN (30): Cephoxitin disk 30µg,
E (15): Erythromycin disk 15 µg,
EX (5): Enrofloxacin disk 5 µg,
FFC (30): Florphenicol disk 30 µg,
G (10): Gentamicin disk 10 µg,
K (30): Kanamycin disk 30 µg,
L (15): Lincomycin disk 15 µg,
ME (5): Methicillin disk 5 µg,
N (30): Neomycin disk 30 µg,
NV (5): Novobiocin disk 5 µg,
O (30): Oxytetracycline disk 30 µg,
OP (5): Optokin disk 5 µg,
OX (1): Oksasilin disk 1µg,
P (10): Penicilin-G disk 10 µg,
Pb (300): Polymyxin-B disk 300 µg,
R (5): Rifampicin disk 5 µg,
S (5): Streptomycin disk 1 µg,
SXT (25): Sulfamethoxazole/trimethoprim disk 25 µg.
T (30): Tetracycline disk 30 µg,
TC (75/10): Ticarcilin/clavulanic acid disk 75/10 µg,
TE (30): Teicoplanin disk 30 µg,
VA (30): Vancomycin disk 30µg,

(R): Resistant
(I): Intermediate response
(S): Sensitive

General Antibiotics
Commonly used in Aquaculture
Forbidden in Aquaculture

Conclusions

In this study, it was determined that antibiotic resistance among these fish pathogens continues to increase. As a result, producers should be informed about proper use of antibiotics and alternative methods must be developed in the treatment of fish diseases.

✓ For the control of fish bacterial diseases, the selection of correct antimicrobial agent is very important.
✓Antibiotics should not be used to support growth and protect aquatic animals.
✓Antibiotics of unknown substance and quantity should not be used
✓ Apart from animal breeding, welfare, management; hygiene, feeding, immunization and vaccination systems, producers shouldn't use of antibiotics
✓Preventive measures should be taken before diseases do not occur after they have exited, alternative therapies (probiotics, essential oils, phage therapy etc.) should be preferred
✓An antibiotic with a minimal residue limit should be selected to protect human health from potential hazards caused by contaminated fish meat.

Don't Forget , 18 November is European Antibiotic Awareness Day.

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