



JSS Academy of Higher Education & Research
(Deemed to be University) (Accredited A+ Grade by NAAC)

COMPENDIUM ON SDG-14

LIFE BELOW WATER

Compendium of Activities in Achieving UN Sustainable Development Goals



2021-22

Table of Contents

Sl.No	Title	Page number
1.	ABOUT SDG 14	3
2.	RESPONSIBILITY TOWARDS SDG 13	4
3.	RESARCH AND ACADEMIC APPROACHE TOWARDS SDG 14	5
4.	DEPARTMENT OF WATER & HEALTH, JSSAHER	6
5.	ACTIVITIES SUPPORTING SDG 14	7-10
6.	COLLABORATIONS RELATED TO SDG 14	11
7.	PUBLICATIONS RELATED TO SDG 14	12-20

ABOUT SDG 14

Healthy oceans and seas are essential to our existence. They cover 70 percent of our planet and we rely on them for food, energy and water. Yet, we have managed to do tremendous damage to these precious resources. We must protect them by eliminating pollution and overfishing and immediately start to responsibly manage and protect all marine life around the world.

Status in India

- **People around** 13.36% of the population live in coastal district
- Ranked 12th among top 20 countries responsible for marine pollution
- Generates 25,000 of plastics every day and around 40% remains uncollected
- Sea level rises by 1.33 mm/year on costs
- Second largest producer of fish

RESPONSIBILITY TOWARDS SDG 13

At home

- Use less water so that excess wastewater will not run on to the ocean
- Reduce non-toxic chemicals and dispose them in a proper way
- Recycle the wet waste as a fertilizer and cut down what we throw across town
- Avoid using plastic covers, carry go-green bags or reusable bags and shop prudently and try to pick sustainable seafood.
- Reduce Vehicle Pollution by taking walk to near places, using bicycle, shifting for eco-friendly vehicles like electric car and scooters, solar powered vehicles, carpool or taking local transportation.
- Consume Less Energy by choosing energy efficient light bulbs and don't overset your thermostat, switch off the lights and fans when not in use.

In the ocean

- Fish Responsibly: follow "catch and release" practices and keep more fish alive end overfishing, illegal, unreported, and unregulated fishing, and destructive fishing practices and refrain from introducing new subsidies.
- Practice Safe Boating Anchor in sandy areas far from coral and sea grasses. Adhere to "no wake" zones.
- Respect Habitat: Healthy habitat and survival go hand in hand. Treat with care. Do not disturb the Eco-system.
- Last but not the least volunteer for clean-ups at the beach and in your community. You can get involved in protecting your watershed too!

RESEARCH AND ACADEMIC ACTIVITIES AT JSSAHER SUPPORTING SDG 14

<https://jssuni.edu.in/jssaaher/faculty-of-natural-sciences/>

<https://www.jssuni.edu.in/JSSWeb/WebShowFromDB.aspx?MID=0&CID=11&PID=10002>

DEPARTMENT OF WATER & HEALTH, JSSAHER

The continuous rise in population and environmental problems are witnessing a drastic destruction of our living habitat which is not only resulting in climate change and drinking water problems due to pollution but also in outbreaks of several communicable and non-communicable diseases. Water contamination and climate change poses many threats to human health from severe weather and water linked infectious disease risks to disrupted food systems and population displacement.

To manage these water associated health threats and other environmental problems, we must switchover to sustainable management approaches including technological frameworks to mitigate the water contamination, drinking water treatment options, climate change in many areas, alternative energy sources, including green infrastructure, governance and technology.

Human exposure to water associated infections occurs by unsafe drinking water, contact with contaminated water, recreational water, or food. The Department of Water & Health (DW&H), as the name indicates is dedicated to carryout extensive research on analysis, assessment and mitigation of human diseases through water treatment and sustainable environmental management approaches including geo-spatial techniques and nanotechnology. The DW&H has recognized as one of the pioneer research centre in the field of Water Research and Technology.

The major research activities mainly concentrating on advanced water treatment (PC/PEC, Hybrid-membrane technology, bio-remediation, etc) methods for safe and clean drinking water, integrated water resources management at catchment and rural level, water quality improvement and feasible treatment techniques at rural region, water-energy-environment nexus, advanced materials for clean and alternative energy, geo-spatial techniques for water resource management and sustainable township, nano-technological approaches for human health and environment, pollution mitigation techniques and ecosystem conversation.

All faculty members are well qualified and have good interdisciplinary research experience from pioneer research institutes that enable to mentoring the students to achieve their research goal of their interest.

Moreover, the faculty members have a unique diversity of research interests and actively encourage cross-disciplinary research problems. The research activities in the DW&H is associated and supported by world class hospital with more than 300 health professionals from medical, dental and pharmacy fields to enhance the skills which provides better understanding of dynamic interaction of water-health-energy-environment nexus mechanisms and mitigation strategies.

The faculty members in DW&H has research collaborations with reputed institutions at national and international level and providing excellent platforms under research exchange program to the students and research scholars to carryout cutting edge research in the field of Water Research and Advanced Technology. The DW&H has received financial support from national and international funding agencies to conduct the state-of-art research in the field of Water and Health Research.

World Water Day



Division of Environmental Sciences, Department of Water & Health, JSS Academy of Higher Education & Research, Mysuru has organised an awareness program and walkathon at Bannimantap, Mysuru to commemorate the World Water Day to bring awareness and drive home the importance of water, water conservation & hygiene.

The Division organised e-poster presentations on the theme “Leaving No One Behind”, Environmental Captioning and Photography on the theme “Life in landscape “ among the students to create awareness of environment and water conservation. Sri. U N Ravikumar, Former Director, CART, Mysuru delivered a special lecture on “Water for Life” during the World Water Day celebrations and educated the participants on water conservation and sustainable development through rainwater harvesting. He also spoke about the existing problems and alternative routes for overcoming those water-related problems.

Dr. Kushalappa PA, Director Academics, JSS AHER, Dr. Balsubramaian S, Director Research, JSS AHER, Dr. Raveesha KA, Head, Department of Water & Health, Faculty members participated in the event.

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CPO - PHARMACEUTICAL BIOTECHNOLOGY - Collaborations and Outcomes

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Updated on: Feb 13, 2022

Recent Scenario of Impact of Xenobiotics on Marine Fish: An Overview

[https://www.jssuni.edu.in/jssweb/WebShowFromDB.aspx?](https://www.jssuni.edu.in/jssweb/WebShowFromDB.aspx?MODE=SSMD&PID=10003&MID=12002&SMID=0&CID=0&DID=0&PAGESEARCHFORWHATID=21438)

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Updated on: Nov 30, 2021



Diketopiperazine derivative from marine actinomycetes *Nocardopsis* sp. SCA30 with antimicrobial activity against MRSA

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[MODE=SSMD&PID=10003&MID=12002&SMID=0&CID=0&DID=0&PAGESEARCHFORWHATID=23843](https://www.jssuni.edu.in/jssweb/WebShowFromDB.aspx?MODE=SSMD&PID=10003&MID=12002&SMID=0&CID=0&DID=0&PAGESEARCHFORWHATID=23843)

Updated on: Oct 21, 2021



MARINE BIODIVERSITY AT JSSAHER



ACTIVITIES SUPPORTING SDG 14

Awareness program on Water borne diseases were given to the students and maintenance of the aquatic ecosystem was clearly explained to the students to create a good water body and in turn preventing the spread of the water borne infections and diseases.



LARVA SURVEY PROGRAMME

A Larva survey program was conducted on the 6th of November in A block Medar block as a survey organized by the urban health center, the theme being mosquito control activities as a part of NVBDCP. Participants of this program were urban health center staff and health inspector, Mr. Santhosh HB, under the supervision of Dr.Krishnaveni YS.21 houses of A block were addressed in the event. Activities conducted in the survey were larva survey, emptying of containers containing larvae /pupae, and health education on vector-borne diseases. Health education details were given by the health inspector, Mr. Santhosh on the topic of vector-borne disease and disease control. as the response from the participants, people showed interest in knowing about the harmful effects and emptied containers having larvae.

In the next follow up decrease in vector indices was seen.



A Larva survey program was conducted from 15th November to 25th November in A block Medar block as a survey organized by the urban health center, the theme being mosquito control activities as a part of NVBDCP. Participants of this program were urban health center staff, health inspector Mr. Santhosh HB, health assistant Mr. Sunil YS and medico-social workers Mr. Mallikarjun and Mr. Yatheesh under the supervision of Dr. Krishnaveni YS 174 houses of A block and C block were addressed in the event.

Health education details were given by the health inspector, Mr. Santhosh and Mr. Sunil YS on the topic of vector-borne disease and disease control and by Mr. Mallikarjun Swamy and Mr. Yatheesh on the topic of waste management and environmental hygiene. In response the participants showed interest in knowing about the harmful effects and emptied containers having larvae. In the next follow up decrease in vector indices was seen.



A similar program was conducted from 26 November to 25 December at Rmc colony, Haleem Nagar which included households of A block and the houses participated were 41 houses from Yashwanthnagar, 59 houses from RMC colony, 16 houses from Rajarajeshwari Nagar, 20 houses of G block, 280 houses of Haleem Nagar.

The effect of the program was the same even in these houses i.e. decrease in the vector indices in the follow-up was seen.



LARVA SURVEY PROGRAMME

The larvae survey program was conducted by Urban Health Centre at Haleem Nagar, Bamboo Bazar. As a part of the National Vector Borne Disease Control Program, mosquito control activities were conducted in Urban Health Centre from 01/01/2022 to 25/01/2022. With all Covid appropriate measures, health education activities were organized in Households of Haleem Nagar. Urban health center staff, Health inspectors – Mr. Santhosh, Mr. Sunil, and MSW staff- Mr. Mallikarjunswamy, Mr. Yatheesh conducted the activities. Talks were given on Vector-borne disease and vector control. Medico-social workers explained to the people about Waste Management and environmental hygiene. A total of 260 houses were surveyed and supervised by the medical officer Dr. Krishnaveni YS. A similar program was conducted from 01/03/2022-25/03/2022 in Bamboo Bazar, Medar block, with 91 houses surveyed.

Activities conducted in the larvae survey program include the Larva survey, Emptying of containers containing larva /pupae, and Health education on vector-borne diseases. The responses from participants were observed by showing interest and emptied containers having larvae. The decrease in vector indices was seen in follow-up as the effect of this program.



NCD Prevention programme and larva survey was conducted at JSS Urban Health Centre by JSS UHC. JSS UHC staffs actively participated. The details of the programme were house to house visit and larvae survey. Health education to each family was given on balanced diet, exercises and symptoms of NCDs. Anthropometric and clinical examination (BP, weight PR, SPO2) of adults >30yrs was also done. Iron and folic acid tablets were distributed to anemic adolescents and women. For patients requiring further treatment they were referred to UHC/ Higher centre.








Larva surveys were conducted as part of the National Vector-borne disease control programme in the UHTC field practice area. The survey was conducted in Haleem Nagar by health Inspectors Mr Santhosh and Mr Sunil in January where 260 houses were visited and educated about integrated vector control and prevention of Vector-borne diseases like dengue chikungunya. In March survey was done in 91 houses in the Medar block. In each house, containers were examined and those containing larvae were shown to household members and were emptied. Residents were also educated to avoid water collection and disposal of solid wastes to prevent Aedes breeding. People were informed about the symptoms of vector-borne disease and were educated about early diagnosis and treatment. Larvae collected from households were demonstrated in schools for children and awareness was created.

RESEARCH & PUBLICATION RELATED TO SDG 14

COLLABORATIONS RELATED TO SDG 14- Research Collaborations and their

Outcomes

Name of the Collaborator	National / International	Outcomes (if any)
National Institute of Biologicals, Govt of India, New Delhi	<p>National</p> 	professional in depth specific training of the students (06) on Standardizations of biologicals and biosimilars
National Institute of Ocean Technology, Chennai	<p>National</p> 	Project work of student (01) on marine biotechnology
Pasteur Institute of India, Coonoor	<p>National</p> 	Research Collaboration
Society of Biotechnologists, India	<p>National</p> 	Join Symposium And Research Collaboration
Sudan Academy Of Science , Sudan	<p>International</p> 	Research Collaboration
Kyushy University for Health and welfare, Japan	<p>International</p> 	Training in the area of virology and Join Publication (02 Nos.) and join Presentations (02)

PUBLICATIONS RELATED TO SDG 14

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NOTIFICATIONS: < COAG PATH National CME on Coagulation Disorders on 5th Nov 2022.

CPO - PHARMACEUTICAL BIOTECHNOLOGY - Collaborations and Outcomes

<https://www.jssuni.edu.in/jssweb/UDHP.aspx?PID=346>
Updated on: Feb 13, 2022

Recent Scenario of Impact of Xenobiotics on Marine Fish: An Overview

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Diketopiperazine derivative from marine actinomycetes Nocardiosis sp. SCA30 with antimicrobial activity against MRSA

<https://www.jssuni.edu.in/jssweb/WebShowFromDB.aspx?MODE=SSMD&PID=10003&MID=12002&SMID=0&CID=0&DID=0&PAGESEARCHFORWHATID=23843>
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PUBLICATIONS RELATED TO SDG 14

1.	Diketopiperazine derivative from marine actinomycetes Nocardiosis sp. SCA30 with antimicrobial activity against MRSA.
2.	Coronavirus: occurrence, surveillance, and persistence in wastewater.
3.	Growth and biosorption of purple guinea and Ruzi grasses in arsenic contaminated soils

4.	Photocatalytic degradation of MB by TiO ₂ : studies on recycle and reuse of photocatalyst and treated water for seed germination
5.	Influence of Jeevamrutha on Beneficial Soil Microorganisms: A Review
6.	Azolla A organic feed for fish farming Review
7.	Attitude and perception of farmers towards organic farming in selected villages of Nanjangud taluk
8.	Effectiveness of solar fence in reducing human elephant conflicts in Manchahalli village Mysuru, Karnataka, India
9.	Assessment of physico chemical characteristics of plant dry leaf based vermicompost
10.	Effect of different physicochemical parameters on pectinase production by marine bacteria https://in.linkedin.com/in/harshitha-m-d-bb65971b5

Recent Scenario of Impact of Xenobiotics on Marine Fish: An Overview

- [Jagadeep Chandra S,](#)

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Abstract:

Xenobiotics from chemicals to plastics have seriously interfered with the biological process of living system. Their impact on aquatic ecosystem, fish in precise is studied with significant interest. However, studies on impact of xenobiotics on marine fish are limited. This literature review integrates and summarizes the impact of xenobiotics on marine fish. The review tries to understand the impact of macro and micro litters, microplastic, metals like mercury and nanoparticles. Finally, we conclude with the ways to regulate the presence and distribution of these xenobiotics in marine environment.

Keywords: [Fish](#), [Litters](#), [Marine](#), [Xenobiotics](#)

Diketopiperazine derivative from marine actinomycetes *Nocardiopsis* sp. SCA30 with antimicrobial activity against MRSA

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- [Jamuna Bai Aswathanarayan](#),
- [Mahadevaswamy G. Kuruburu](#),
- [Subba Rao V. Madhunapantula](#) &
- [Ravishankar Rai Vittal](#)

Abstract

Actinobacteria isolated from marine sources are a potential source of novel natural products. In this study, we report isolation, biological activity and characterization of secondary metabolites from strain *Nocardiopsis* sp. SCA30, isolated from marine sediments of Havelock Islands, Andaman and Nicobar, India. The ethyl acetate extracts of the isolate on screening for biological activity demonstrated antibacterial potency and antiproliferative activity. The extracts showed anticancer activity in a panel of cell lines, including HCT 15, HT 29, MCF 7 and MDA-MB 468, at concentrations ranging from 62.5 to 1000 µg/ml. A dose-dependent reduction in cell viability was observed in all the tested cell lines. The extract at 15 µg/ml and 30 µg/ml inhibited growth of methicillin-resistant *Staphylococcus aureus* ATCC NR-46071 and NR-46171 with MIC's of 15.62 and 7.81 µg/ml, respectively. LC-MS and NMR studies revealed that the antibacterial and anticancer compound isolated from *Nocardiopsis* sp. SCA30 is 1-acetyl-4-(4-hydroxyphenyl)piperazine.

Assessment of ^{210}Po and ^{210}Pb in marine biota of the Mallipattinam ecosystem of Tamil Nadu, India

Author links open overlay panel

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<https://doi.org/10.1016/j.jenvrad.2010.06.003>Get rights and content

Abstract

To provide baseline data on background radiation levels for the future assessment of the impact of nuclear and thermal power stations, a systematic study was carried out in the Mallipattinam ecosystem of Tamil Nadu, India. Mallipattinam is located between the Kudankulam and Kalpakkam nuclear power plants and near to Tuticorin thermal power plant. Water, sediments, seaweeds, crustaceans, molluscs, and fish were collected to measure the concentrations of ^{210}Po and ^{210}Pb . The concentrations of ^{210}Po and ^{210}Pb in most samples are comparable to values reported worldwide. In fish, the concentrations of ^{210}Po and ^{210}Pb are in the range 16–190 Bq kg⁻¹ and 8–153 Bq kg⁻¹, respectively. The concentration factors of ^{210}Po and ^{210}Pb for the biotic components ranges from 10³ to 10⁶.

Recent Scenario of Impact of Xenobiotics on Marine Fish: An Overview

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ABSTRACT

Xenobiotics from chemicals to plastics have seriously interfered with the biological process of living system. Their impact on aquatic ecosystem, fish in precise is studied with significant interest. However, studies on impact of xenobiotics on marine fish are limited. This literature review integrates and summarizes the impact of xenobiotics on marine fish. The review tries to understand the impact of macro and micro litters, microplastic, metals like mercury and nanoparticles. Finally, we conclude with the ways to regulate the presence and distribution of these xenobiotics in marine environment.

Key words: Fish; Litters; Marine; Xenobiotics.

INTRODUCTION

Xenobiotics or foreign bodies are difficult to contain given their ubiquity all over the world.¹ Numerous xenobiotics include chemicals like herbicides, pesticides, metals and their derivatives, pharmaceuticals including antibiotics and many more. Both short and long period exposure to these xenobiotics can cause irreversible damage to living being, with several reports supporting the claim^{2,3}. Xenobiotics enter the living system and undertake four stages: absorption, distribution, metabolism and elimination⁴. Standard xenobiotic metabolism follows continuous biotransformation like oxidation, reduction/hydrolysis of the main molecule to produce reactive groups (-NH₂, -COOH-OH) followed by conjugation of hydrophilic molecules (glutathione, sulfate, glucuronic acid) to raise the hydrophilicity of xenobiotics culminating in intestinal excretion⁵.

There are also findings where xenobiotics induce carcinogenesis by gene mutation⁶. The effect of xenobiotic pollution in aquatic ecosystem is well documented⁷ and pattern of their impact on fish/aquatic animals falls under three major categories behavioral, neurophysiological and reproductive⁸. The above effects are usually interconnected⁹, as neurological modifications affect the behavior patterns in the fish; while changes in behavior affect reproductive system¹⁰. In this review, we have attempted to discuss the recent scenario of xenobiotic and marine fish interaction and provide a literature overview of biological modifications observed in different marine fish species upon external and internal contact with xenobiotics.

OBSERVATIONS

Ingestion of marine litters

Ingestion of litter by different species of marine fish has been reported^{11,12}. Approximately 700 species of marine organisms have known to

ingest marine litter¹³. Plastics (micro and macro) form the major part (92%) of litter ingested by the marine organisms¹⁴. Plastics are also manufactured as very tiny particles such as micro-beads, plastic nanoparticles, etc. These tiny particles are easily ingested by marine fish impacting the marine food webs, which directly affects the human consumers¹⁵.

A study¹⁶ reported information on the presence of marine litter in the stomachs of fish species in diverse marine habitats for the Adriatic and North eastern Ionian macro region. The occurrence of macro litter was studied in 614 specimens belonging to 11 species, on the other hand 230 specimens related to 7 species was studied for micro species. The findings underline the presence of litter in the stomach of the fish *Citharus linguatula*. The presence of macro litter in the guts was less than 3 % in North eastern Ionian and North Adriatic but approximately in the North Adriatic (Slovenian sea). The ingested micro and macro litter varied depending on the zones. The research concluded that marine fish was affected by macro litter ingestion.

Microplastic ingestion

Microplastics are ingested by living organisms due to their small size and abundance. Microplastics have been extensively researched for their impact on living organisms including human beings. In marine environment such as ocean and sea microplastics can easily enter the marine organisms due to their very tiny size (< 5mm). There are several reports which suggest ingestion of these microplastics by marine organisms, fish in precise^{17,18}. But most of the studies have been reported in the laboratory conditions¹⁹. A study²⁰ in the important fishing zone such as Northwestern African upwelling system has been reported to show the presence of microplastic particles in the digestive tract of *Scomber colias* (Atlantic chub mackerel). The study revealed out of the gastrointestinal tract examined 120 fish, 78.3 % were found have microplastics, 74.2 % showed fibres, 17.5 % had plastic fragments and 16.7 % had

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paint. The study revealed the microplastic contamination in marine fish *Scomber colias*.

Mercury accumulation

The release of mercury from anthropogenic and natural sources like incineration and coal combustion reach the aquatic ecosystem by atmospheric deposition²¹ and results in significant repercussions to invertebrates and vertebrates²². Mercury is classified into three types of chemicals, elemental, inorganic and organic. Inorganic mercury is the one mostly released to the environment²³. Many models have been developed to identify the zonal variance of mercury and understand the main culprits²⁴. This is the main reason to identify and study the pattern and distribution of mercury in aquatic environment. As the most important source of entry of mercury in humans and animals is the consumption of fish²⁵, it is important understand the presence and abundance of mercury in aquatic environment. It also helps to understand the magnitude of mercury pollution reaching the main consumers, human beings²⁶. A study²⁷ analyzed the total mercury accumulation in the gut and bodies of 13 species of marine fish. They also reported the mercury concentration in water, sediment, fodder materials and fish prey to depict the bio-accumulation dynamics. Marine fish demonstrated high level of mercury accumulation in comparison to fresh water fish. According to the study²⁷ mercury content increased in accordance to the trophic level of the consumer. Total mercury levels in marine fish (samples from coastal waters and market) displayed more than the legal limits.

Impact of nano-ZnO on *Mugilogobius chulae*

Aquatic toxicity due to nanoparticles has been studied extensively in recent years. However, the studies on the marine fish toxicity and distribution are very limited. A study²⁸ reported the impact of zinc oxide nanoparticles on marine fish *Mugilogobius chulae*. The research team also reported the relative difference in zinc oxide nanoparticles dissolution and dispersal of the same in seawater as well as freshwater. The impact of zinc oxide nanoparticles on hatching, mortality, embryonic development, deformity and histopathology was reported^{29,30}. The results indicated that zinc oxide nanoparticles showed higher solubility in seawater than freshwater. The zinc oxide nanoparticles also remarkably inhibited hatching. The LC₅₀ on the fifth day was found to be 45.40 mg/L with significant spike in the mortality rate. Though exposure to Zn²⁺ showed hatching inhibition and higher lethality, but its impact was less than the zinc oxide nanoparticles at the similar doses³¹⁻³³. Zinc oxide nanoparticles caused spinal bending, hypoplasia, odema and other deformities in *Mugilogobius chulae* larvae and embryos. Histopathological studies exhibited hepatocyte and enterocyte enlargement, vacuolar degeneration, and morphological abnormalities of the fish. The study underlines the impact of zinc oxide nanoparticles on marine fish.

CONCLUSION

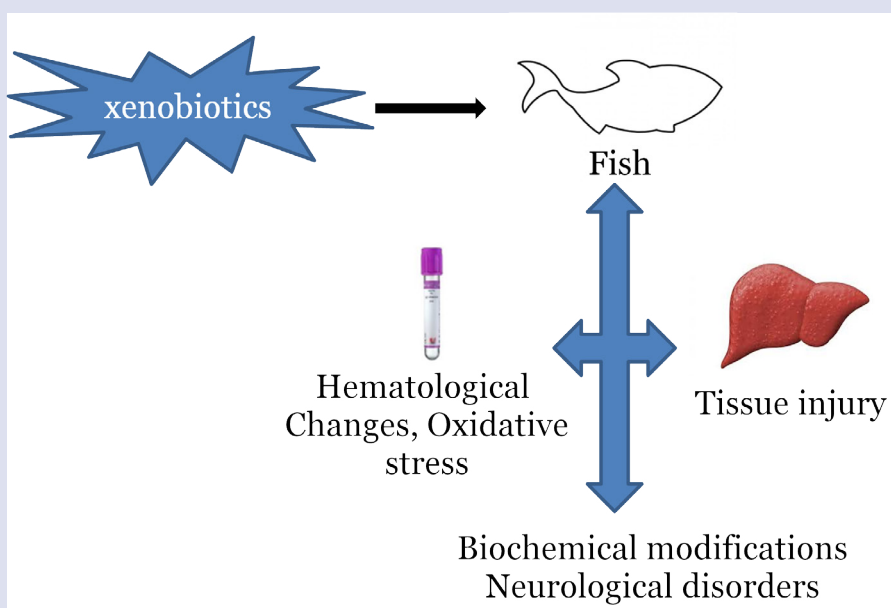
The study of the literature on impact of xenobiotics on marine fish shows serious consequences. The entry of different chemicals and their mode of entry are to be given importance by the concerned authorities to avoid more accumulation and distribution. The xenobiotics in marine fish not only impact the aquatic organisms but also human health. So, regulations which govern the presence and release of chemicals are the key to regulate marine pollution due to xenobiotics.

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GRAPHICAL ABSTRACT



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