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Pharmaceuticals in the aquatic environment, milk, vegetables, and fruits: A review

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Abstract:
Background: *Pharmaceuticals are essentialfor the survival of humans and animals life. Due to economic prosperity and longevity the prescription and use of the pharmaceuticals has increased many folds with the beginning of the present century. Due to misuse and overusepharmaceuticals are emerging as a major environmental threat. Antibiotics are the most widely used pharmaceuticals. The pharmaceuticals residues or related daughter products are reported in surface water, ground water, soil, milk, plants, vegetables, and fruits posing a threat to humans, animals and ecosystem. As milk, vegetables, and fruits are the sources of vitamins, carbohydrates, essential trace metals, antioxidants these are the key part for survival of the human.*
Results:*The accumulation of the pharmaceuticals mainly antibiotics in food products adversely affects human health. These compounds affect ecological processes, biogeochemical cycling, and organic contaminant degradation via microbial communities in the environment and cause the development of multi-antibiotic-resistant bacteria posing environmental pollutant and causes serious risks to human and veterinary health.This review aims to report the concentration of the commonly used pharmaceuticals in the aquatic environment, milk samples, plants, vegetables, and fruits consumed by humans and their impact on animals and humans.*
Key Words*: Pharmaceuticals, Antibiotics, Human, Environment, Milk, Vegetables, Fruits*

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I. Introduction

Environmental pollution by organic pollutants is of major concern globally since the last two decades, as these organic pollutants have adverse effects on the health of aquatic, terrestrial, human, and animal. Environmental pollution by organic pollutants with the climate change, scarcity of useable water, decrease in the fertility of the soil, loss of biodiversity, decrease in natural resources are causing challenges to agricultural scientists to feed the increasing population. The pharmaceuticals are an integral part of human life as are used in human (65%), veterinary (29%) medicine, food additive and agriculture (6%).

Pharmacology is the branch in which drugs are studied; commonly the chemical compounds which are used for diagnosing, curing or treating diseases are called drugs. Survival in today’s life is not possible without the products of the pharmaceutical industries. In the last three decades due to population growth; advances in pharmaceutical research and development; ageing societies and economic developments the consumption of the pharmaceuticals in the developed and developing countries are continuously increasing[1]. Globally more than 3000 biologically active (even at low levels) compounds are used as medicines for human and animals. It is estimated that globally more than 200,000 tonnes of pharmaceutical products are used every year, one-fourth of which are consumed by European countries only. Before the pandemic of Covid-19, it was estimated that worldwide about 300 million people of the age group15-64 consumed pharmaceuticals at least once in the year.

Undoubtedly pharmaceuticals have cured number of deadly diseases, lengthened life span but indiscriminate use and improper disposal has caused the presence of pharmaceutical residues in all the components of the environment (geosphere, biosphere, and Polar Regions of every continent). Pharmaceutical like endocrine disruptors, antimicrobial, synthetic estrogens are present even on Northern Antarctica. Pharmaceuticals are present in the environment of almost all the countries of all the 5 UN regional groups.

The present review reports the concentrations of commonly used pharmaceuticals in the aquatic environment, milk samples, plants, vegetables, and fruits and their impact on animals and humans.

II. Types of Pharmaceuticals

Human and veterinary pharmaceuticals can be classified as:

2.1 Analgesics including opioids and non-opioids:

These are those compounds which relieve pain without sleep or loss of consciousness. These compounds affect the peripheral and central nervous system. Commonly used are acetylsalicylic acid, acetaminophen, ibuprofen, diclofenac, naproxen, COX-2 etc.

2.2 Antidepressants and antiepileptic:

These drugs also called as neuroactive compounds directly affect the central nervous system and regulate behaviour by influencing the pattern of the neuroendocrine signal. Citalopram, escitalopram, fluoxetine, benzodiazepines, paroxetine, vortioxetine etc are some commonly used drugs.

2.3. Antiviral drugs:

These are those medicines which retards the reproduction rate of flu viruses. Broad spectrum antivirals are effective against several of viruses. Commonly used antiviral drugs are baloxavir, marboxil,remdesivir, oseltamivir (Tamiflu), and zanamivir.

2.4 Antipyretics:

These are the compounds which are used to reduce the elevated temperature of the body. The body temperature is elevated when in certain parts of the brain the concentrations of prostaglandin E_2 (PGE_2) are enhanced, which alters the neurons firing rate in the hypothalamus. Antipyretics reduce the levels of PGE_2 by inhibiting the secretion of the cyclooxygenase enzyme, and/or reduce proinflammatory mediators. Acetaminophen, acetylsalicylic acid, paracetamol, proxyphene, ibuprofen, Naproxen, Ketoprofen and methimizole are some commonly used antipyretics medicines.

2.5 Cardiovascular agents, beta-blockers and ACE inhibitors:

The medicines used to treat problems related with the heart such as arrhythmias, blood clots, coronary artery disease, high or low blood pressure, high cholesterol, heart failure, and stroke are known as Cardiovascular agents. Beta- blockers reduce the body's natural 'fight-or-flight' responses by reducing the stress on the heart and the brain's blood vessels. These medicines are given to the patients suffering from angina, high blood pressure, anxiety, migraine, glaucoma, and thyroid. Angiotensin-converting enzyme (ACE) inhibitors inhibit the secretion of the blood vessel narrowing enzyme angiotensin II, which lower down the body blood pressure by relaxing the veins and arteries. Captopril, enalapril, lisinopril, losartan, valsartan, diltiazem, verapamil, metoprolol are used as antihypertensive, beta- blockers and ACE inhibitor.

2.6 Antibiotics:

These are those natural or synthetic compounds which stop infections caused by bacteria by supporting the body's natural defence to eliminate them. Any compound which can kill germs in the living body may be technically called as antibiotics Those antibiotics which kills the bacteria are called as bactericidal antibiotic while those which prevent them from reproduction i.e. growth are called as bacteriostatic. Globally broad-spectrum antibiotics are widely used and the global consumption is approximately 1,00,000 tonnes annually. Commonly used antibiotics are Tetracycline, penicillin, erythromycin, azithromycin, Cephalosporins, Carbapenems, Fluoroquinolones,vancomycin, linezolid and tedizolid, aztreonam, sulfonamides, Rifamycins, gentamicin, streptomycin, etc.

2.7 Antiseptics and Disinfectants;

Antiseptic are those compounds which inhibit the action of microbes by applying on the surface of the skin of a living body, they may be bactericidal or bacteriostatic. Commonly used antiseptics are Dettol (a mixture of chloroxylenol and terpineol), iodoform, 0.2% phenol solution etc. Disinfectants are those antimicrobials agents which are applied on non-living objects and destroy the microorganisms which are on the surface of objects. Commonly used disinfectants are chlorine, sulphur dioxide, 1% of phenol, alcohol.

2.8 Anti-glycemic drugs:

These are those compounds which control blood glucose level in persons with diabetes. Globally approximately 200 million peoples are suffering from diabetic Mellitus disease. Insulin, metformin, amylin, Byetta and Victoza are some drugs which are generally used as antidiabetic, the metformin is globallythe most widely prescribed anti-glycemic drug.

2.9 Anti-allergic medicines:

These are those medicines which are administered to stop allergies caused by medicines, foods, or any other reasons. The allergic reactions may be mild (causing itching, hives or rash, or sneezing) or severe which sometimes became life-threatening. Antihistamines diphenhydramine, hydroxyzine, promethazine, steroids dexamethasone, hydrocortisone and hormones Epinephrine, adrenaline are generally used as anti-allergic medicines**.**

2.10 Hormones:

These are those chemicals which interfere in the natural functioning of the endocrine system in humans and animals and are responsible for the diseases like breast, prostate, testes cancer, lowering of sperm counts, thyroid dysfunction, and alteration in neurological system and deformation of reproductive organs.

III. Sources of the Pharmaceuticals in the environment

With the developments in the Pharmacology branch, economic development, population growth and increasing of ageing societies the use and development and production of pharmaceuticals have increased in both the developed and developing countries. Major sources of the pharmaceuticals in the environment are human and animal excretion, bathing, improper disposal of the expired/ unused medicines i.e. pouring in the drain, flushing in the toilet, improper disposal by the hospital, medicinal institutions, and house-hold wastes and waste dumping by the research institutions and drug manufacturing units. After consumption, the pharmaceuticals are partially metabolized in the gut of human and/or animals and 30-90% is excreted unaltered or as active metabolites via urine and faeces and is released into the waste system[2,3]**.** Worldwide the pharmaceuticals are accumulated in soils via application of sewage sludge in the agricultural fields; application of pharmaceuticals in aquaculture; by outdoor animals and by the application of the fertilizers, from where they are translocated to plants/ edible parts and after rainfall contaminates the ground waters. Though the volume of urine is only 1% of total wastewater volume it contributes 65% pharmaceuticals to the wastewater bodies.

IV. Pharmaceuticals in the aquatic environment

It is estimated that by 2050 the worldwide population will be about 9.8 billion and the urban population will be about70% of the total population, which will cause stress on water bodies.As the pharmaceuticals cannot be easily evaporated, easily dissolves in the aqueous medium are easily passed from wastewater into the soil and aquatic environments[4] (Ground water, surface water).

A recent survey of the literature denotes that sewage water, surface water, groundwater, soil, air, or biota is contaminated by hundreds of active pharmaceutical ingredients (APIs). The concentration of these compounds varied from ng/L to μg/L[5-7]**.** Theconcentration of the APIs in the effluents of the pharmaceutical industries in the countries India, China, USA, Korea and Israel ranges up to mg/L[8]. The concentration of the pharmaceuticals in the local surface water bodies was more than in the blood of patients who are undergoing treatment.

Several researchers[9-10] during their studies found various pharmaceuticals in the aquatic environment and the concentration of the pharmaceuticals ranges from ng to mg/L. Sedlak and Pinkston[11] have reported the presence of 40 pharmaceuticals above 1000 ng/L in wastewater and 120 pharmaceuticals above 1 ng/L. They also reported that the concentration of metoprolol, propranolol, and ibuprofen reaches above 3000ng/L in the wastewater. It is estimated that the sewage water is also contaminated with about 30tonnes of radiographic contrast media annually.As hospital effluents contain pharmaceuticals residues, microbes, pathogens, infectious fluids, radioactive substances affects adversely sewage system and environment[12].

Pharmaceuticals in water adversely affect aquatic fauna, in fishes the tissues, are damaged by the painkillers; sex changes in the fish and behavioural changes are caused by the contraceptives and antidepressant. Wastewater became the hotspot for the bacteria to generate the antibiotic-resistant genes if even the traces of antibiotics are in the wastewater. As per EPA estimation, about 50% of the population worldwide uses groundwater for drinking.

Releasing of domestic sewage water, hospital wastes, industrial waste and other organic pollutants in the water bodies without proper treatments causes hypoxia, eutrophication, bioaccumulation, and dissemination of pathogens in the aquatic system[13-14]. Several researchers[15-18] have reported that water used for drinking and agricultural purposes has numerous antibiotics resistant bacteria use of such water causes serious health risks in the humans. The concentrations of the pharmaceuticals in the aquatic environments (waste water, surface water, hospital effluents, river water, and aquaculture) are recorded in the Table 1.

V. Pharmaceuticals in the Plants and Vegetables

Soil, plants, fruits and vegetables are the most essential segments for human and animal life as fruits and vegetables are the essential part of the human diet. Anthropogenic activities are the major causes of the continuous increase in the pollution of these segments.Due to the increase in world population and changing dietary habits the demand of the vegetables and fruits is increasing globally[19]. Globally water is scare; the wastewater in most of the developing countries is used for irrigation of the cultivated fields. Corcoran et al[20]., during their research found that approximately 20 million hectares of land in 50 countries are irrigated by wastewater or partially treated wastewater containing pharmaceuticals, their metabolites, antibiotics resistant genes and 10% of the world population consumes the food which is irrigated by wastewater

As the wastewater contains these pollutants are bio accumulated in soils, plants and vegetables[21,22] (mostly in the plant tissues)**.**These bio accumulated pharmaceuticals are translocating in the edible parts of the food crops[23,24] which are anintegral part of the human and animal life. The survey of the literature showed that the accumulation of the pharmaceuticals in the vegetables was in the order[25] leaves > stem/shoot > root > fruit, they also found that lettuce leaves can accumulate caffeine, carbamazepine, and sulfamethoxazole and hormones in very high concentration, while in tomato it was accumulated only in roots. Wu et al.[26] during their research studies found that pharmaceuticals are easily bio accumulated in leafy vegetables like lettuce, spinach and cabbage they also found that pharmaceuticals having high translocation potential are more bio accumulated. A survey of literature denotes that pharmaceuticals in water significantly affects the aquatic organisms the growth of the roots of Lemna minor is retarded in presence of antidepressant Fluoxetine[27,28] reported that growth and biomass production of plant *Dacus carota* is decreased in presence of Metformin the antidiabetic medicine. Carter et al.[29] found the reduction in the number of photosynthetic pigments, white spot, and burnt edges of Cucurbita pepo plants matured leaves. The concentration of the various pharmaceuticals in the plants, fruits and vegetables are reported in Table 1.

VI. Pharmaceuticals in the Milk

As the per capita milk consumption in the developing countries is increasing, to take care of the farm animals the use of the veterinary medicines for therapeutic and prophylactic purposes is also increasing, which results in the presence of these organic pollutants in milk, dairy products and dairy wastes.

India's contribution to global milk production is about 18% (Globally highest producer). A number of the researchers have found pharmaceuticals mainly antibiotics in milk and dairy products beyond their permissible limits[1, 30-31]. The survey of the literature indicates that approximately 12% of milk in the USA and 11% of milk in the UK is contaminated with antibiotics β –lactum. One of the major sources of the presence of pharmaceuticals in animal milk is the use of water of the water wells by the farms.

Presence of pharmaceuticals in milk not only affects milk quality, cheese and yoghurt formation (by inhibiting the formation of lactic acid and development of flavour) causing economic loss but also causes health problems to the consumers like allergies, alteration in intestinal function[32-33]. Consumption of the antibiotics contaminated milk for a longer period causes intestinal microflora to become drug- resistant.Tetracycline contaminated milk causes photosensitivity reaction, pigmentation on nails and discolouration of teeth. Optic neuropathy, brain abscess are some common problems associated with long exposure to chloramphenicol contaminated milk[34]. Drinking of the azithromycin contaminated milk affects the cardiovascular and immune system in the citizenry, while food allergic reactions e.g. urticarial, anaphylaxis, bronchospasm, haemolytic anaemia, thrombocytopenia, acute interstitial nephritis, serum sickness, Stevens-Johnson syndrome; toxic epidermal necrolysis are caused by drinking β –lactum contaminated milk[35,36]. Intake of antibiotics at very low concentration for a longer period results in the development of antibiotic-resistant organisms in the humans. The data of the concentrations of the pharmaceuticals in the milk samples are reported in Table1.

VII. Steps which will help in decreasing the pharmaceuticals contamination in the environment:

- Use medicines only on the recommendation of the Doctor.
- Take medicines only in the recommended dose and up to the recommended period.
- Don't flush/drain the expired/ unused medicines.
- Hospital effluents, wastewater from the manufacturing unitsand domestic sewage water must be properly treated and disposed of.

VIII. Conclusion:

- The use of pharmaceuticals for well being of humans and animals is indispensable. But since the last 20years these are used indiscriminately in the medical, agricultural and animal husbandry sectors. So, these pharmaceutical residues in the environment are becoming as latest environmental hazardous pollutants.
- Residues of the pharmaceuticals are present in the surface water, groundwater, milk samples vegetables, fruits, other crops worldwide. 12% of the milk samples in the USA and 11% of the milk samples in the UK are contaminated with antibiotic group Beta –lactum.
- As the sewage water is used for irrigation in the developing countries the marketed vegetables and fruits in the developing countries are contaminated with pharmaceuticals mainly antibiotics.
- The pharmaceuticals present in the aquatic medium adversely affect the aquatic biota.
- The presence of the pharmaceuticals mainly antibiotics in the drinking water, fruits, vegetables and milk is posing a serious threat to humans by developing antibiotic-resistant bacterias.

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Table 1: Concentration of different pharmaceuticals in sewage wastewater, hospital effluent, ground water, river water, aquaculture water, milk, vegetables/fruits, plant tissue manure

Compound	Wastewater/ Sewage water	Hospital Effluent	Freshwater/ Surface water	River water	Aquaculture	Milk	Vegetables/ fruits	Plant Tissues/ Manure
Acetominophen	61ug/L (11); 3.6-99.6 ug/L (37); 37-1500 ng/L (38) ; 1.57-56.9 ug/L (39); 10 ng/L (40); 0.004-384 ug/L (41); 15.7ug/L(42); 150-570 ng/L (43); 1.9- 56944 ng/L (44): 810-1883 ng/L (45)	4.1-62.25 ng/L (46); 5.75 mg/L (47); 62250 ng/L (44); 160 ug/L (48)	28.6-507 ng/L (49); 1.89 mg/L (50); 10,000ng/L (51); 0.04-0.42 ug/L (52); 280-13440 ng/L (53); 75 ng/L (54); 187-520 ng/L(55);4.1-78170 ng/L (44)	10 ug/L (51); 86.6-902 ng/L (56);3.1-13.7 ng/L (57); 1490 ng/L(58); 5.36 ng/L (59)	91 ng/L (60)			
Acetyl salicyclic acid	0.14-2.8 ug/L (41); 15.2 ug/L (55); 0.04-0.42 ug/L (52)	0.004-384 ug/L (41)	0.002-20.96ug/L (61); 105-90000ng/L (38); 0.13 ug/L (62);476-20960 ng/L (53)	40-164 ng/L (63); 0-804 ng/L (64)				
Albuterol	11-35 ng/L (38)							
Amoxicillin	27ug/L (11); 0.54-1.29ppb (65); 172.6ng/L (66); 62.5 ng/L(outlet) (66);17.7 µg/L (67);13.8µg/L (67); 0.0-33800 ng/L (68); 147-1670 ng/L (69); 16.2-189 ug/L (55)	7.3-39.1ppb (65); 0.16-0.79µg/L (70); 0.001-0.023ppm (71); 5.86 µg /L (72); 2-57ng/L (73)	622ng/l (74); 0.06-0.36µg/L (70); 4-17 ng/L (53)	0.0-16.7ng/L (75); 0.14-0.37ng/L(65); 0.0-2.7ng/L (76)	0-40 ng/L (73;0.0-0.06µg/mL (77)	68-802 ug/kg (78)	0.81-0.91 mg/kg (25)	
Ampicillin	139ppb (79)	131ppb(79);0.09-0.54 µg/L (70) 0.001-0.024 ppm (71); 1.24 mg/L (80)	0.0-0.16µg/L (70)	40-164 ng/L(73)	0.0-0.20µg/mL(77)	0.5-92 ug/kg (78)		
Atenolol	0.0-4.03ug/L(37); 512-3000 ng/L (38); 2-21ug/L (81); 0.1-33.1ug/L (82); 264-1860 ng/L (83); 427ng/L (84); 329-730 ng/L (85); 129-1451 ng/L(69);134-2110 ng/L (86,87)		859 ng/L (38); 690 ng/L (50)12.6-665 ng/L (88); 1850 ng/L (55)	1-91 ng/L (89); 8-68 ng/L (90); 241 -679 ng/dm^3 (91); 10.1-100 ng/L (92)				
Atrovasatin	22-180 ng/L (69); 45.8 ng/L(93)		101 ng/L (92); 7.3ng/L (51); 42-209 ug/L (94)	21.7ng/L (95,96); 0.56-1990 ug/L (94)				
Azithromycin	160-1866 ng/L (97); 112-274 ng/L (97); 9.2ug/L (11); 130-505.5 ng/L (98);	85-113 ng/L (99); 189-62507 ng/L (51)	0.0-16.7 ng/L (49,56); 2356ng/L (51); 4.86-13.01 ng/L (104); 0.61 ug/L (94)	0.0-25.7 ng/L (56); 0.0-67 ng/L (89); 0.0-1620		9708.7 ug/kg (106)		

	390 ng/L (84); 0-592 ng/L(100); 45.2-597.5 ng/L (100); 1083 ng/L (101);728-1890 ng/L (69); 88-680 ng/L (102); 3020-4120 ng/L (103)			ng/L (10); 0-67 ng/L (98); 240 ng/L (105); 19-2270 ng/L (73)					
Benzoylecgonine	241-1274 ng/L (107)		770 ng/L (108); 10-1019 ng/L (107)						
Bupropion	2.1ug/L(11);19.1 ng/L (109)		227ng/L (51)						
Caffeine	24-123ug/L (80); 10 ng/L (110); 5000 ng/L (84); 27500-74800 ng/L (85); 125 ug/L (41); 5173-113200 ng/L (44); 7570-11403 ng/L (45)		31.5-620-902 ng/L (56); 2130ng/L (111); 7051 ng/L (89); 0.29 mg/L (50); 7110 ng/ (51); 1.1-0.42 ug/L (52); 6.2-12.3 ng/L (112); 19-127000 ng/L (53); 3760 ng/L (55); 65-6798 ng/L (44)	131-708 ng/L (56); 66.3-8570 ng/L (89); 54.7-199 ng/L (90); 37.6-72.2 ng/L (113); 0-666 ng/L (64)					
Carbamazepine	57-240 ng/L (38); 0.04-378 ug/L (82); 21-832 ng/L (114); 940ng/L (83); 60.58ug/L (85); 0.001-300 ug/L (115); 0.004-18ug/L (41); 132 ug/L (116); 73-151 ng/327-949 ng/L (69); 43.4-672.5 ng/L (49);60-276000 ng/L (115); 1035-11478 ng/L (117); 0.30 ug/L (55); 5-1680 ng/L (44); 340-482.5 ng/L (118)	30-70 ng/L (44); 0.54-2 ug/L (119); 3ng/L (120)	0.02-8.05ug/L (61); 0.0-5.90 ng/L (56); 566 ng/ L (113); 730 ng/L (121); 0.42 mg/L (50); 595 ng/L (122); 1238 ng/L (51) 0.041-0.34 ug/L (52); 0.6-1.4 ng/L (112); 0.01-4.5ug/L (62); 12.6-659 ng/L (88); 69 ng/L (54); 229-390 ng/L (55)	0.0-11.5 ng/L (56); 1-30 ng/L (89); 0.0-136 ng/L (10); 92-186 ng/L (113); 2-128 ng/L (123); 72-1090 ng/dm^3 (91)(; 2-388 ng/L(64); 8.8 ng/L (124); 13.9 ng/L (58);1346 ng/L (63); 14-2900ng/L (125)		1.7-216 ng/g dry plant weight (126)		
Cefadroxil	0.02-0.85 ug/L (41); 18.25ug/L (127)	3.24mg/L (80)							
Cefixime		10.85μg/L (72)							
Cefpodoxime		0.28mg/L (80)							
Cefprozil	1.7ug/L (11)								
Cefuroxime	0.6μg/L (66); 1.7 μg/L (67); 49-24380 ng/L (88)	0.0-246 ng/L (73)		195-7800 ng/L (73)					
Cephalexin	14ug/L (11); 0.0-3.23 ug/L (37); 0.0-308.0 ng/L (100)		11-29 ng/L (53)						
Chloroamphenicol	0.0-23ng/L (69)	0.06-0.59 μg/L (70)	0.0-0.08μg/L (70); 355 ng/L (128); 0.36 ug/L (62)		5-32ng/L (129)				
Chlortetracycline	44μg/L (130); 0.02-1.5 ug/L (41); 68 ug/L (131)	0.37-17.7 ng/L (51)	8.4-15.4 ng/L (56); 690ng/L (51); 690 ng/L (128)	8.8-19.7 ng/L (56)					
Ciprofloxacin	1.5mg/L (67);1.4 μg/L (67);231-371 ng /L (97); 258-398ng/L (97); 3.0-5.45 mg/L(132); 41μg/L (73); 3.1ug/L (11); 45-260ng/L (38); 211-	237 μg/L (137); 218-236 μg/L (138); 0.07-0.08μg/L (70); 1.35 mg/L (80); 0.03-125	0.0-0.06μg/L (70); 0.2 ng/L (132); 0.001-6500 ug/L (61);0-6500,000 ng/L (50); 1.27 ug/L (142); 0.85 ug/L (143); 116ng/L (51); 30 ng/L (128);	1.3-124 ng/L (145); 10,000-2,500,000 ng/L (50); 5015 ug/L (146); 6-	250 ng/L (141)				

	630 ng/L (98); 24000 ng/L (84); 2180-5600 ng/L (84);27ng/L (133); 222-27100 ng/L (134); 38.4-584.9 ng/L (100); 0.82-6453 ng/L (135); 0.8-212 ug/L (41); 199-2950 ng/L (69); 2.54-26.2 ng/L (136); 446-1070ng/L (103); 48-1450ng/L (86); 135-165.8 ng/L (118)	ug/L (119); 1.3-33.9 ng/L (139); 1.99 ug/L (140); 5329-7494 ng/L (134); 1400-26000 ng/L (98); 53300 ng/L (141); 3.2-19715 ng/L (51)	0.0- 323.7 ng/L (144); 0.6-12ng/L (53); 30.0-298.3 ng/L (104)	20 ng/dm^3 (91); 14300 ng/L (134) ; 14.9-21.3 ng/L (147)				
Citalopram	3-72 ug/L (81); 282.3ng/L (148)		0-8000ng/L (50); 219ng/L (51)	0-76000 ng/L (50); 75-40900 ng/L (73)				
Clarithromycin	1129-3077ng/L (97); 377-762ng/L (97); 2.8ug/L (11); 1-10 ug /L (81); 280-1213.5 ng/L (98); 88 ng/L (84); 60ng/L (120); 38-83 ng/L (85); 0.0-313.2 ng/L (100); 0.0-122ng/L (101); 33-501 ng/L (69); 87-160 ng/L (102)	1.51-159732 ng/L (51); 0.85-2 ug/L (119)	443 ng/L (122); 72 g/L (51); 0.0-154 ng/L (149); 276 ng/L (150)	0.9-1497ng/L(151); 0.0-48 ng/L (89); 2-21 ng/L (142); 0.0-85 ng/L (56); 1.1-8.3 ng/dm^3 (91); 159 ng/L (95)				
Clofibric acid	40 ng/L (40); 68ng/L (152); 165 ng/L (44);53 ng/L (153)		79100 ng/L (154); 10ng/L (51); 28 ng/L (155)	8-24ng/dm^3 (91)				
Cloxacillin		0.31mg/L(80)						
Codeine	8-837 ng/L (156)	0.2-50 ug/L (119)	1000ng/L (108); 0.214 mg/L (50); 1000ng/L (51); 0.1-0.30 ug/L (52)	262 ng/L (63)				
Decoquinate	17-732 ng/L (32)							
Diclofenac	4-37ug/L(80); 0.001-94.2 ug/L (82); 115.1ng/L (133); 18-240 ug/L (115); 0.008-0.98 ug/L (41); 124200ng/L (152); 5.2 ug/L (42); 385-1709 ng/L (69);7.9-237.7 ng/L (49); 38-1020 ng/L (86, 87); 836000 ng/L (39);8.8-3600 ng/L (44); 881.1-4760 ng/L (118)	7200 ng/L (157); 0.24-15 ug/L (119) ; 328 ng/L (44)	18740 ng/L(158); 42ng/L (51); 9.7 ng/L (133); 6.72-940 ng/L(155); 0.27-1.52 ug/L (62); 96-115 ng/L (53); 258-1398 ng/L (159);48-364 ng/L (88); 180 ng/L (54); 1070 ng/L (160); 444-4830 ng/L (55); 8.8-127 ng/L (44)	140-310 ng/L (161); 0.0-54 ng/L (85); 0.14-18.74 ug/L (61); 0.0-64 ng/L (89); 0.0-380 ng/L (10); 0.0-51 ng/L (113); 228-3000 ng/dm^3 (91); 0-678 ng/L (64); 32 ng/L (102); 675ng/L (95,96)				
Diltiazem	2.6ug/L (11);54-340 ng/L (38); 42.7 ng/L (109)	0.71-2 ug/L (119)	130ng/L (51);0.0-17.4 ng/L (56);	3.38-8.64 ng/L (56)				
Doxycycline	0-2.37 ng/ L (162); 1.58-6.75 mg/L (132) ; 1-11 ug/L (81) ; 5.3-9	0.1-7 ug/L (119); 24-120 ng/L (76);	0-234ng/L (164); 0-47.3ng/L (165); 0.48ng/L(166);	0-103.1ng/L (9);			6.5(animal-manure); 0.87(soil);2.1(S	

	ng/L (98) ; 1.8-264 ng/L (163); 584 ug/L (131); 12.6 ng/L (118)	1.2-62.6 ng/L (51);1.20-32.8ng/L (118)	0.8ng/L (132); 0.0-10.1 ng/L (56); 80 ng/L (51)	10-110ng/L (150); 0.0-12.8 ng/L (56); 1.9-68 ng/L (76); 32.9 ng/L (57)			lµdge) (167); 0.23-13.5(168); 37 (131)
Enrofloxacin	50-78ng/L (97); 0.008-1.1 ug/L (41); 20-34 ng/L (97); 28ng/L(32); 2.9 ng/L (169)		0-25,000 ng/L (50); 15ng/L (51)	0-30,000 ng/L 50); 2.9 ng/L (57)	680 ng/L (141)		
Erythromycin	1.5ug/L (11); 0.14-10 ug/L (82); 182.7 ng/L (98); 7000 ng/L (84); 9-249 ng/L (170); 0.009-0.34 ug/L (41); 2.4-271.3 ng/L (49); 18-359 ng/L (86)	0.001-0.008 ppm (71); 27-83 ug/L (119); 7.2 ug/L (140); 1200 ng/L (141); 0.01-101 ng/L (51)	0.0-27.69 ng/L (56); 137 ng/L (122); 438 ng/L (51); 0-568 ng/L (171); 1.00 ug/L (62); 57.6 ng/L (150)	0.78-15.9ng/L (172); 0.7-85.3ng/L (173); 0.0-63.7 ng/L (56); 9-423 ng/dm^3 (91); 24-145 ng/L (105); 91.9 ng/L (96); 32.9-38.8 ng/L (174)	4 ng/L (141); 5.5-57.4 ng/L (60)		
Fluoxetine	28.5 ng/L (110);2.36-24.8 ng/L (136); 4-1570 ng/L (86)		0.0-3.4 ng/L (56) 32.0 mg/L (50); 65ng/L (51)	0.0-4.45 ng/L (56); 0.0-48 ng/L (64); 2.3-42.9 ng/L (175)			
Furosemide	42-1088ug/L(81); 491-2437 ng/L (69); 161-1990ng/L (86); 11.9-24.3 ug/L (55)	2600 ng/L (12)		359 ng/L (95)			
Gabapentin	5.4ug/L (11); 690-1700 ng/L (176);518-3720 ng/L (86); 213 ug/L (55); 10 ng/L (177)		1887 ng/L (38); 54ng/L (51); 4730-11200 ng/L (55)	17.4-1445 ng/L (92); 19.1 ng/L (95,96)			
Gatifloxacin	3.7µg/L (66); 0.48 µg/L (67)						
Gemfibrozil	3.4ug/L (11); 308-2400 ng/L (38); 17 ng/L (40); 0.01-42 ug/L (115); 42-1772 ng/L (69)		790ng/L (51); 5-1374 ng/L(155); 1.8-2.6 ng/L (112); 409-677ng/L (55)	12-3678 ng/dm^3 (91); 6-744ng/L (64)			
Gentamicin	0.0-19100 ng/L (178)	400-7600ng/L (178)	0.0-21ng/L (171)	0.0-1400ng/L (Seawater) (178)	198.7ug/kg (179)		
Hydrochlorothiazide	790-2800ng/L (38)		75ng/L (51); 819-1470 ng/L (55)				
Ivermectin						2 ug/kg (milk)(180)	
Ibuprofen	37ug/L (11); 285-4200 ng/L (38); 8-94ug/L (81); 0.004-603 ug/L (82); 8.02-43.22 ug/L (116); 5ng/L (120); 221 ng/L (133); 0.16-4.4 ug/L (41);143000 ng/L (152); 20.1 ug/L (42); 26.4-294 ng/L	0.07-43 ug/L (119); 141000 ng/L(84)	31320 ng/L (74); 414 ng/L (122); 2796ng/L (51); 62 ng/L (133); 1-2148 ng/L (155); 8.0 ng/L (112); 276-516 ng/L (182); 6297 ng/L (183); 6.75-373 ng/L (88); 3210 ng/L (160); 5-414 ng/L (44)	100-1100 ng/L (161); 0.0-303 ug/L (61); 610.0- 195 ng/L (89); 0.0-988 ng/L (10); 9-2383 ng/L			

Lisinopril	132-3300ng/L (38)						

	(136);500 ng/L (54); 52-100 ng/L (103); 1673000ng/L (39); 21700ng/L (181);20.1 ug/L (42); 15.7 ug/L (55); 10-17933 ng/L (44)			(154); 0.0-210 ng/L (121);87-789 ng/dm^3 (91); 0-804 ng/L (64); 2.4-320 ng/L (103); 116 ng/L (95,96); 203 ng/L (58); 2302 ng/L (63)			
Ketoprofen	2-13 ug/L (81); 0.004-8.56 ug/L (82); 6540ng/L (152); 4.8 ug/L (42); 1720-6007 ng/L (69); 19.7-844 ng/L (136); 210-5480 ng/L(86); 1170 ng/L (181)		2.8 ng/L (112); 930 ng/L (160)	40-3300 ng/L (161); 2710ng/L (111); 2.8-163 ng/dm^3 (91); 0-268 ng/L (64); 620 ng/L (184); 193 ng/L (95,96)	8.3-24.7 ng/L (60)		
Levofloxacin	532-1425ng/L (97) 600-6800ng/L (97); 0-6.2mg/L (132); 41.75 ng/L (98); 5-2247 ng/L (185); 38.2 ug/L (55)	0.414 ug/L (142)	87.4 ng/L ; 5-2247 ng/L (185)	0.0-10.5 ng/L (186)		87.4 ng/L ; 5-2247 ng/L (185)	
Lincomycin	37-54ng/L (97); 884-1136ng/L (76); 1.2-11.3 ug/L (41)	0.3-2 ug/L(119)	860.7ng/L (187); 0.0-40.5 ng/L (56); 730ng/L (51); 730 ng/L (128);339-2840ng/L (150)	1.2-248.9ng/L (188); 0.0-59.2 ng/L (56); 20-24.4 ng/dm^3 (92); 10.1ng/L (57)	2.9-226 ng/L (60)		
Lisinopril	132-3300ng/L (38)						

Metaformin	24ug/L (11); 4.02-31.2 ug/L (37); 16.1-1372.8 ng/L (49,56); 134-367 ug/L (55)	154000 ng/L (84)	590-34000 ng/L (189); 130 ng/L (54); 5450-7130 ng/L (55)	45.2-2595 ng/L (92); 8250 ng/L (190)			
Metronidazole	28 ng/L (98); 0.0-93.2 ng/L (100); 13-392 ng/L (69)	3.8µg/L (137); 0.1-90 ug/L (119); 130400 ng/L (141)	5.46 ug/ L(140)				
Metroprolol	3.1ug/L (11));280-660 ng/L (38); 2-9 ug/L (81); 0.002-152 ug/L (82);1621.5ng/ L (83);0.5-90 ug/L (115); 0.0-196 ng/L (69); 410 ng/L (189);274 ng/L (44); 12.5-67.4 ng/L (118)	0.42-25 ug/L (119); 2400-25000ug/L (98)	0-7000 ng/L (50); 237ng/L (51); 7.6-324 ng/L (191);336-499 ng/L (55); 24.8-90 ng/L (44)	8041 ng/L (192); 0-240 ng/L (122)			
Mupirocin	2.8ug/L (11); 1.53 ug/L (55)						
Nalidixic acid	68-79ng/L (97);224-358ng/L (97); 0.0-50.3 ng/L (100)						
Naproxen	2.4ug/L (11); 7-66 ug/L (81); 0.002 ug/L (82); 2.94-36.17 ug/L (116); 109.3 ng/L (133); 0.06-0.48 ug/L (41); 2.82 ug/L (42); 4161-10150 ng/L (69); 1220-9585 ng/L (193); 104.3 ng/L (194); 16.8 ng/L (136); 432-3160 ng/L (103);40-1630ng/L (86); 464000 ng/L (39); 2.62-235 ng/L(195); 872 ng/L (181); 12-625 ng/L (44)	10-11 ug/L (119)	107ng/L (51); 6.8 ng/L (133);147 ng/L(155); 228.3 ng/L (193); 52.4-124.2 ng/L (75); 6.67-145 ng/L (88); 110 ng/L (54); 4-125 ng/L (191); 1424 ng/L (160); 20-483 ng/L (44)	80-380 ng/L (161); 0.005-32 ug/L (61);19600 ng/L (111); 5.7-100 ng/dm^3 (91); 8-214 ng/L (64);340 ng/L (184); 73.1 ng/L (95,96); 2.98-221 ng/L (195)			
Neomycin					2048.5 ug/kg (179)		
Norfloxacin	155-514ng/L (97); 2554-2775ng/L (97);20.6-150 ng/L (98); 0.0-5411 ng/L (135)	23µg/L (137); 0.03-44 ug/L (119); 0.8- 4.4 ng/L (139);3300-37000 ng/L (98);1500 ng/L (141)	441.9 ng/l (15); 0.004-520 ug/L (61);0.0-520,000ng/L(50); 120 ng/L (51) 0.0-367 ng/L (144); 0.7-4 ng/L (53)	.0-4700 ng/L (50); 251 ug/L (146); 40-88 ng/dm^3 (91); 0.0-518 ng/L (161)	6060000ng/L (141)		
Norfluoxetine	0.0-10.4ug/L (37)		13.6ng/L (51)				
Novobiocin	254-364ng/L (97); 78-92ng/L (97)						

Ofloxacin	2.88-384 ng/L (136); 0-12.4 ng/L (162); 400 ng/L (98); 2.45-4.12 mg/L (132); 85µg/L(73);0.0-305.1 ng/L (100); 11.1-1330 ng/L (196); 497 ng/L (17); 6.9 ng/L(26); 37-1470 ng/L (86); 81000ng/L (39)	73µg/L(137);1.199 mg/ L (187);23-510 ng/L (98);19800 ng/L (141);0.28mg/L (80); 3400 ng/L (157);0.35-35 ug/L (119); 0.9-27.1 ng/L ((139)	0.3-990ng/L (164);0.0-182.7 ng/L (165); 0.0003-17.7ug/L (61) ; 43.5 ng/L (150);1547-4778ng/L (197); 0.0-80ng/L (166); 1199.7 ng/L (5); 2.1-26.4 ng/L (56);0-11,000ng/L (50) ; 0.0-503 ng/L (144)	306.1ng/L (145); 0.7 ng/L (198): 308 ng/L (199); 8-23 ng/L (102); 0-113.9 ng/L (200); 23-85190 ng/L (73);53-108ng/L (150); 6.0-36.7 ng/L (56); 180-10,000ng/L (50); 542.4 ug/L (146); 0.0-6.4 ng/L (201)	238.6 ng/L (141)		
Oxaprozin	6.6ug/L (11)						
Oxyclozanide						130ug/kg (202)	
Ox tetracycline	664-841 ppb (79); 9µg/L (130);-9.4 mg/L (132); 4.3-233 ng/L (76); 0.01-0.94 ug/L (41); 0.68 ug/L (203); 230 ng/L (54); 1880 ng/L (150)	3200 µg/L (138); 0.01-4 ug/L (119); 75-1487 ng/L (76); 0.38-31.3 ng/L (51)	0.4ng/L (132); 0.0-30.5 ng/L (56); 1340ng/L (51)	12.4-26.3 ng/L (56); 3-26 ng/L (76)	0.056-0.234µg/mL (77); 75 ng/L (60)	223 ppb (79) ; 1.5µg/kg (130)	47(animal-manure); 1.4(soil); 7.37(Sludge) (167) 0.15-59.6(168) 354 (131)
Quinolones							0.1-5447(204, 205)
Paracetamol	31-1052 ug/L (81); 1.76-243 ug/L (206); 105780 ng/L (120); 12300-12400 ng/L (85); 64000ng/L (39); 17.7-227 ug/L (55)	5-1368 ug/L (119); 105910 ng/L (120); 211926 ng/L (94)	0.02-230 ug/L (61); 0.02-1.89 ug/L (206)	2-7024 ng/L (89); 144-305 ng/L (113); 15700 ng/l (154); 78-188 ng/ dm^3 (91); 0-804 ng/L (64); 1565 ng/L (63); 14.3-9822 ng/L (92)			
Penicillin	4ug/L (11); 0.0-160 ng/L (207); 0.004-0.15 ug/L (41)	0.85-5ug/L (119)				15.22 ug/L (208); 13-353 ug/kg (78)	
Phenytoin	2.7ug/L (11)						
Propranolol	90 ng/L (209); 0.001-100 ug/L (115); 9-7500 ng/L (87)	298ng/L (84)	590 ng/L (210); 40.1 ng/L (122); 0.80 mg/L (50); 53ng/L (51); 0.7ng/L (112); 5.48-48.1 ng/L (88)	3.2-15 ng/dm^3 (91); 64.9 ng/L (92); 57 ng/L (95,96)			
Roxithromycin	234-388ng/L (97); 554-785ng/L (97); 1.5-290 ng/L (98); 1.9-269n g/L (49)		180ng/L (51); 480 ng/L (54)	0.3-66.5ng/L (173); 1.4-190 ng/L (102)			
Sparfloxacin	0.5µg/L (66);2.1µg/L (67); 19000 ng/L (39)						
Streptomycin	0.0-2700ng/L(178)			0.0-3400ng/L(Sea water) (178)	280.6 ug/kg (179)		

Sulfadiazine	0.28-71.8 ng/L (162); 3.3ng/L (169); 0.364 ug/L (203); 1.22-41.0 ng/L (49); 1.8-57 ng/L (102)	0.001-0.003 ppm (71)	0-520ng/L (211); 0-45.6 ng/L (165);9- 137 ng/L (197)	0.7-6.4ng/L (212);0- 726 ng/L (150); 0.58 ng/L (124); 0.93-68 ng/L (102)	164-3941 ng/L (32)	0.001-0.004 ppm (71)	5 (animal-manure) 0.76(soil);0.056(Sludge) (167); 7 (131)
Sulfadimethoxine	3.7ng/L (169)		15,000ng/L (51)			31-69ug/kg (78)	
Sulfadimidine	0.53-89.1 ng/L (162)		0-123ng/L (211); 0.0-9.9ng/L (165);nd- 113 ng/L (214);nd-49 ng/L (166)	2.5-65.2ng/L (212); 2.1-623.3ng/L (200); 0-1080ng/L (150)			2(animal-manure); 0.011(soil);0.027(Sludge) (167) 0.06-6.04 (168)
Sulfamerazine	2.2ng/L (167)		1.5ng/L (51); 0.7-1.2 ng/L (215)				4.5(animal-manure); 0.31(soil);0.037(Sludge) (167); 28.7 (213)
Sulfamethadiazine			0.0-23.5 ng/L (56)	0.0-20.6 ng/L (56)			
Sulfamethazine	9.6 µg/L (130); 2.5-114ng/L (169); 0.008-0.16 ug/L (41); 3.2-586 ng/L (69); 132 ng/L (44)	19153 ng/L (141)	0.0-25.7 ng/L (56); 220ng/L (51)	0.0-14.1 ng/L (56); 360 ng/L (44)	29-180 ng/L (32); 2 ng/L (141)	0.0 µg/kg (130)	0.1-1.2 mg/kg in Plant tissue (25)
Sulfamethizole	10 µg/L (130); 2.4/L (169); 0.004-0.2ug/L (41); 11-480 ng/L (86)	0.03-8.55 ng/L (51)	130ng/L (51)				0.10-0.66 (168)
Sulfapyridine	0-210ng/L (162); 400 ng/L (32); 78.2/L (169), 2012); 4.7-112 ng/L (100)		0 -510ng/L(211)	0.19-13.69ng/L (150); 1.4-112.5 ng/L (9); 121ng/L (75); 1.1-42.5ng/L (212)			

Sulfamethoxazole	0.23-1.02µg/L (216, 217); 0.16-0.9 µg/L (218); 0.4 µg/L (130); 0.3-36.38 ng/L (162);159-174ng/L (97);1044-1280ng/L (97); 252µg/L (73);62.1-88.8ng/L (77); 3.8ug/L (11); 5--15 ug/L (81); 0.003-0.98ug/L (82); 10-57ng/L (110); 162 ng/L (84);30-132 ng/L (85); 59.3 ng/L (133); 98-2200ng/L (219); 7.8 ug/L (220); 0.0-68.5ng/L (99); 0.52-88 ug/L (41); 19-43 ng/L (102); 26-633 ng/L (87); 1520 ng/L (179) ;12.6 ug/L (55); 156-984 ng/L (44)	81µg/L (136);4.6 µg/L (137);0.06-0.12µg/L (70); 0.001-0.018 ppm (71); 0.04-83 ug/L (119); 65-9800 ng/L (219); 20.6 ug/L (219); 20300 ng/L (141); 0.15-373 ng/L (51); 1335 ng/L (44)	0-650ng/L(211); 0.0-171.6ng/L (165);13-149ng/L (214); 0-250 ng/L (166); 0.0-0.08µg/L (70); 0.001-29 ug/L (61); 0.0-44.4 ng/L (49,56); 0.17 mg/L ; 1.40 mg/L (50); 1.25 ug/L (143); 1900ng/L (51); 6 ng/L (131); 608 ug/L (219); 0.3-18.6 ng/L (163); 0.06-0.33ug/L (52); 1.50-2.93ug/L (62); 0.6-2 ng/L (53) 380 ng/L (54);25.7 ng/L (150); 727-772 ng/L (55); 1.7-300 ng/L (44)	2.2-764.9ng/L (9); 0.0-68ng/L (151); 1.9-35.6ng/L (212); 0-616ng/L (150); 0.0-42.6 ng/L (56); 0.0- 56 ng/L (89); 10-110 ng/dm^3 (91); 60-80ng/L (213); 10-252 ng/L (73); 320 ng/L (58); 106.7 ng/L (96)	0.0-0.05µg /mL (77); 2390000 ng/L (141); 2.2-23.2 ng/L (60);	0.7 µg/kg (130); 0.001-0.002 ppm (71)	18(animal-manure); 0.67(soil);.24(Sludge) (167): 0.12-2.8 (168) 1.06-1.89mg/kg) Roots of radish (25)
Sulfamethoxypyridazine	92-905 ng/L(32); 3.4ng/L (169)						
Sulphaquinoxaline	104-337 ng/L (32); 2.6/L (1697)						
Sulphonamide	2.8 ug/L (220)	15.7 ug/L (220)	0.4 ug/L (220)			2.5ug/kg (221); 13.5-147.9 ug/kg (222)	
Tetracycline	254 µg/L (130); 1.2ug/L (11); 23 ng/L (98); 45.4 ng/L (133); 0.0-231.2 ng/L (100);58-1960 ng/L (76)	0.0-0.001 (79); 0.01-4 ug/L (119); 13-1598 ng/L (76); 100 ng/L (141)	0.0-14.7 ng/L (56); 1.30 ug/L (143); 140ng/L (51)	0.0-18.9 ng/L (56); 14 ng/L (223)	180 ng/L (224); 0.012-0.112µ g/mL (77)	5460 ug/kg (106); 271.4 ug/kg (179) ; 16-134.5 ug/kg (225)	57(animal-manure); 0.97(soil);2.17(Sludge) (167); 0.1-0.235 (162);2.4-3.8 (226) 98.2 (131)
Tindidazole		88µg/L (137); 0.26 mg/L (80)					
Toltrazuril						27ug/kg(227)	
Triamterene	1.4ug/L (11)						
Tramadol	2.2ug/L (11); 0.8-14.2 ug/L (81); 1686.9 ng/L (156); 76000 ng/L (84)		635-854 ng/L (55)				

Trimethoprim	121-165ng/L (97); 1088-1578ng/L (97); 107µg/L (73); 24.71-24.99 ng/L (77); 2.2ug/L(11);23-552ng/L (32); 0.06-6.8 ug/L (82);40-86.8 ng/L (228); 265ng/L (83); 2.6 ug/L (219; 15.2-190.6ng/L(100); 1.4-18 ug/L (41); 42-635 ng/L (69); 4500 ng/L (54); 33-788 ng/L (86)	2.2 µg/L(138); 0.01-15 ug/L (119); 6.6 ug/L (219; 7100 ng/L (141); 0.06-273 ng/L (51)	0.004-13.6 ug/L (61); 0.0-15.3 ng/L (56); 0.018mg/L (122), 8.0mg/L(50); 710 ng/ L (51); 0.4 ug/L (219); 0.08-0.28 ug/L (52); 6.7 ng/L (112); 0.40-5.5 ug/L (62); 1-7 ng/L (53); 274-633 ng/L (55)	0.0-20.2 ng/L (49,56); 3-26 ng/L (89); 0.0-9 ng/L (10); 5-100 ng/dm^3 (91); 17.2 ng/L (124); 196 ng/L (95,96); 16-106.5 ng/L (73)	1040000 ng/L (141); 1.5-94 ng/L (60)		2-17 ug/kg in plant tissues (25)
Tylosin	0.009-0.64 ug/L (11)		0.0-1.49 ng/L (56); 280ng/L (50)	0.3-2.8ng/L (151)	97.9ug /kg (179)		
Vancomycin	0.0-61 ng/L (229); 0.006-0.14 ug/L (41)		0.0-153.4 ng/L (171)	11.7ng/L(172)			