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PANDA

Permanent network to strengthen expertise on infectious diseases of
aquaculture species and scientific advice to EU policy

Coordination Action

Scientific support to policies

Work Package 2

Risk analysis of exotic, emerging and re-emerging disease hazards

Annex 9: Potential zoonotic agents associated with aquatic animal species

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Dissemination Level		
PU	Public	PU
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

Annex 9 - Potential zoonotic agents associated with aquatic animal species

The ability to produce zoonoses was an important consideration for certain specific hazards, although the terms of reference for the work package only concerned the potential impact on aquaculture and aquatic wildlife in the EU. However, an additional request was made by the Project Steering Group for a list of zoonotic disease hazards.

Not all causal agents listed are strictly zoonotic (i.e. animal disease transmissible to man), since some of the aquatic animal species can also act as vectors for disease transmission, especially some parasitic infections. This is also the case for certain human viral or bacterial illnesses and conditions caused by marine phycotoxins related to the consumption of live bivalve molluscs.¹ Nevertheless, such vectors were included for completeness.

Causal agent	Fish host range (natural host in bold)	Geographical distribution	Comment
Fish-bacterial			
<i>Aeromonas hydrophila</i>	Many but secondary infection	Many	<i>A. hydrophila</i> is of public health concern. Although not usually directly associated with fish, topical zoonotic infections can occur.
<i>Citrobacter freundii</i>	<i>Oncorhynchus mykiss</i>, <i>Salmo salar</i>, <i>Carassius auratus</i> and <i>Mola mola</i>	Australia, Europe (Scotland and Spain) and USA	Relatively minor fish pathogen with poorly defined distribution. May be of public health concern, although probably not associated with fish.
<i>Clostridium botulinum</i>	<i>Oncorhynchus</i> spp.	Europe (Denmark, UK) and USA	A minor fish pathogen with no known association to equivalent human botulinism.
<i>Edwardsiella ictaluri</i>	<i>Ictalurus punctatus</i>, <i>I. furcatus</i>, <i>Ameiurus catus</i>, <i>A. nebulosus</i>, <i>Clarias batrachus</i> and Salmonidae	Taiwan, Thailand, Vietnam and USA	Uncommon opportunistic pathogen of lower respiratory tract infections, with unclear association to fish.
<i>Edwardsiella tarda</i>	<i>Ictalurus</i> spp., <i>Anguilla</i> spp., <i>Oreochromis</i> spp. and Salmonidae	Africa, Asia, Australia, Europe (Belgium, Czechoslovakia, Germany, Israel, Italy, Norway and Spain), USA and Venezuela	Uncommonly reported from gastrointestinal disorders in immunocompromised human hosts and possibly associated with pet reptiles and the ingestion of raw fish.
<i>Lactococcus</i> spp. (<i>Lactococcus</i>)	<i>Oncorhynchus mykiss</i>, <i>Seriola</i>	Australia (Tasmania, Victoria),	Increasing in importance and geographic range as a fish

¹ Examples include viral hepatitis and gastroenteritis (e.g. hepatitis A, Norwalk and SRSVs), *Salmonella* spp., paralytic shellfish poison (PSP), diarrhetic shellfish poison (DSP) and amnesic shellfish poison (ASP).

<i>garviae</i>)	<i>quinqueradiata</i> and <i>Coris aygula</i>	Europe (Italy, Spain, Turkey), Israel, Japan, South Africa and Taiwan	disease. Associated with bovine mastitis and very occasionally with bacterial endocarditis or septicemia in immunosuppressed individuals.
<i>Mycobacterium</i> spp. (e.g. <i>marinum</i>)	Many	Many	Nontuberculous atypical mycobacterial granuloma disease is caused by <i>M. marinum</i> (e.g. from handling marine aquaria fish).
<i>Nocardia</i> spp.	Salmonidae, <i>Seriola quinqueradiata</i> and ornamental species	Australia and Japan	Nocardia infection caused by some strains can be a rare human disorder.
<i>Photobacterium (Vibrio) damsela</i>	Many	Many	Rarely associated with fatal necrotizing fasciitis (e.g. in Japanese and USA fishermen).
<i>Streptococcus agalactiae</i> <i>Streptococcus iniae</i>	<i>Sparus aurata, Liza klunzingeri, Pampus argenteus</i> <i>Oncorhynchus mykiss, Paralichthys olivaceus, Sardinops melanostictus, Brevoortia patronus, Morone saxatilis, Cichlidae</i> and <i>Lates calcarifer</i>	Kuwait, USA Australia, Europe (Italy, Spain) and Israel	The fish host species are present in aquaculture and the wild. Associated with endocarditis, as well as septicemia and meningitis in neonates. Identified as an emerging human pathogen producing fulminant soft tissue infection.
<i>Vibrio</i> spp.	Many marine species: <i>Anguilla</i> spp., <i>Scophthalmus maximus</i>, <i>Mullus</i> spp., <i>Pagrus major</i>, <i>Gadus morhua</i>, <i>Pseudopleuronectes americanus</i>, <i>Salmo salar</i>, <i>Sebastes schlegeli</i>, <i>Salmonidae</i>, <i>Solea senegalensis</i> and <i>Carassius auratus</i>, <i>Lates calcarifer</i> (<i>V. cholerae</i>)	Many: Australia, Canada, Europe (Denmark, Greece, Italy, Norway, Spain, UK), Faeroe Islands Japan, Iceland and USA	Vibrios are ubiquitous and some isolates are zoonotic. Examples include <i>V. cholerae</i> associated with contaminated food fish and <i>V. vulnificus</i> biotype 1 contracted from eating raw oysters, as well as <i>V. alginolyticus</i> , <i>V. damsela</i> , <i>V. parahaemolyticus</i> , etc. <i>V. vulnificus</i> biotype II is an eel pathogen.
Fish-parasitic			
Cestodes			
<i>Diphyllobothrium latum</i>	Many	Many	Diphyllobothriasis can occur in humans after eating raw or undercooked fish.
Nematodes			

<i>Anisakis</i> spp. (<i>simplex</i>)	Many	Many	Causes intestinal anisakiasis in humans from consumption of raw or improperly prepared fish.
<i>Capillaria</i> spp.	Many (freshwater tropical) species	Many	Some fish-borne species can cause intestinal capillariasis in humans following consumption of raw fish.
Trematodes			
<i>Heterophyidae</i>	Many species	Many	Infections by trematodes in general are among the most common fish-borne zoonoses.
Protozoa			
<i>Acanthamoeba</i> spp.	? <i>Tilapia aureus</i> , <i>Silurus glanis</i> , <i>Carassius auratus</i> and <i>Rutilus rutilus</i>	Unknown	Widely distributed in fish and fresh water and can cause meningoencephalitis or keratoconjunctivitis in humans.
<i>Pleistophora</i> spp.	<i>Macrozoarces americanus</i>, <i>Drepanopsetta hippoglossoides</i>, <i>Solea solea</i>, <i>Hippoglossoides platessoides</i>, <i>Anarhichas lupus</i>, <i>A. minor</i>, <i>Sciaena australis</i>, other marine fish and ornamentals, Cyprinids and other freshwater fish	Australia, Europe (Mediterranean, North Sea) and North America	The pathogenicity in fish depends on intensity and species. Some <i>Pleistophora</i> species are potentially opportunistic pathogens of humans, but not knowingly related to fish, although certain <i>Pleistophora</i> -like microsporidians may be acquired from raw or lightly cooked fish or crustaceans.
Molluscs-bacterial			
<i>Vibrio vulnificus</i> (biotype I)	<i>Crassostrea</i> spp.	Possibly China, Japan, Taiwan and USA	<i>V. vulnificus</i> (biotype I) is a natural inhabitant of estuarine waters and is not a known oyster or crustacean pathogen. However, bivalve molluscs are an important potential source of infection for immunocompromised individuals. Crustacean species have also been associated with rare infections. <i>V. vulnificus</i> enters human hosts via wound infections or consumption of raw shellfish (primarily oysters), and infections can cause acute septicemia and death in susceptible individuals.
Crustaceans-bacterial			
<i>Aerococcus viridans</i> (Gaffkaemia)	<i>Homarus</i> spp.	Canada, Europe (UK) and ?USA	Infrequently encountered as a human pathogen causing bacteremia, endocarditis and urinary tract infections.

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<i>Aeromonas hydrophila</i>	<i>Penaeus monodon</i> and <i>Cherax quadricarinatus</i>	Australia and Indonesia	<i>A. hydrophila</i> is of public health concern, although not usually directly associated with crustaceans.
<i>Lactococcus</i> spp. (<i>Lactococcus garviae</i>)	<i>Macrobrachium rosenbergii</i>	Taiwan and Thailand	Not known as a pathogen of crustaceans but associated with septicemia in immunosuppressed individuals.