



# WEEKLY EPIDEMIOLOGICAL REPORT

A publication of the Epidemiological Unit,

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Vol. 35 No. 51

13<sup>th</sup> – 19<sup>th</sup> December 2008

## Zoonoses and water-related infections

Both Zoonoses and water related diseases are causing a significant impact on human health. This article briefly describes zoonoses and water related diseases and also their relationship.

In the past two to three decades, a number of new diseases have been recognized. The term “emerging infectious diseases” is used to describe infectious disease whose incidence in humans has increased recently or threaten to increase in the near future. In addition, a number of infectious diseases that have been under control are showing a trend of “re-emerging.”

There are a number of newly recognized infectious agents that have been associated with outbreaks of water related diseases or appear to have the potential for waterborne transmission. One of the important groups of diseases that has a water related disease transmission is zoonoses. In total, it is estimated that up to 75% of pathogens responsible for emerging outbreaks may be of zoonotic origin. As well as throughout the world, both in developed and developing nations, zoonotic diseases are a major public health problem.

It is very important to identify the source of the agent of an emerging infection and the likely and possible routes of transmission so that effective prevention and control measures can be established as soon as possible. This is a brief introduction to zoonoses and to water related diseases and water related zoonotic diseases.

Zoonoses. Diseases and infections that are naturally transmitted between vertebrate ani-

mals and man are called zoonoses. Zoonotic infections have been recognized among all the major groups of infectious agents; prions, viruses, bacteria, protozoa, and helminths. Some of these agents may infect only one type of animals and humans. Others may infect several types of animals and humans.

Based on the method of transmission, zoonoses can be divided into two types as direct and indirect zoonoses. In direct zoonoses, the infection is transmitted from animals to humans by direct contact with the animal by way of a bite, ingestion of animal tissues, or skin contact with an animal. Rabies is an example of direct zoonosis. In indirect zoonoses, the transmission of the infectious agent from animals to human occurs via a vector or a vehicle. Examples are Japanese encephalitis, leptospirosis and plague. Some infections, for example, tularaemia can be transmitted by both ways; i.e., directly via animal contact and indirectly via water ingestion or inhalation of infectious aerosols. For some zoonoses like avian influenza, Ebola virus, human immune deficiency viruses HIV-1 and HIV-2, it is not yet very clear how these infectious agents are transferred from animals to humans.

Zoonoses also can be categorized on the basis whether humans are a “dead-end-host” or whether subsequent human-to-human transmission can occur. In some zoonoses like rabies, the pathogen is normally transmitted between animals. Once the infection is accidentally spread to human they become dead-end-hosts. Infections like HIV-1 and HIV-2, after the vi-

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rus is transmitted from animal to human, it can be maintained in the human body and is subsequently transmitted from human to human.

**Water-related infections:** There are four main categories of water related infections. They are: “water-borne infections,” “water-washed infections,” “water-based infections” and “infections with water-related insect vectors.” Some infections may fit into more than one of these categories, and also water may not be the only transmission route or even the major transmission route for some of these infections. An understanding of these dynamics is very important in planning effective prevention and control measures.

**Water-borne infections:** These are classically recognized as water borne diseases, and examples are typhoid and cholera. The causative enteric microorganisms enter the water source through faecal contamination and transmission occurs by ingestion of contaminated water. Transmission depends on the following factors:

- The amount of faecal contamination in the water
- The concentration of pathogens in the faecal contamination
- The survival of the pathogenic organism in the water
- The infectivity of the organism
- The individual ingestion of (exposure to) the contaminated water

**Water-washed infections:** These diseases occur due to poor personal and/or domestic hygiene. They are not due to the presence of infectious agents in water but due to the lack of readily accessible water or even when available, not maintaining an adequate level of hygiene. This limits washing of contaminated hands and utensils thereby permitting transmission of infectious agents, for example, *Shigella* species. Factors associated with transmission of water borne diseases are also important in transmission of water-washed infections. Lack of water for bathing also facilitates the spread of diseases that affect the eyes and skin such as conjunctivitis and scabies. Control of these diseases is possible through provision of easy access to adequate quantities of water, and behavioural changes to improve personal and domestic hygiene.

**Water-based infections:** They are infections in which the pathogen must spend a part of its life cycle in an aquatic environment. This category is further subdivided into diseases acquired by ingestion of water and diseases acquired by contact with water. The main reason for diseases acquired by ingestion is poor quality of drinking water while reasons for water contact diseases varies. In industrialized countries these diseases are mainly associated with recreational exposure to contaminated marine water, freshwater lakes, ponds, creeks, or rivers, and less frequently water in swimming

pools. In developing countries, the risk of water contact diseases may be from bathing or washing in contaminated surface waters. Occupational exposure to water is also often associated with water contact diseases.

**Infections with water-related insect vectors:** These are the infections that are transmitted by insects who breed in water, such as mosquito vectors of malaria, or insects that bite near water, like the tsetse flies that transmit sleeping sickness.

**Other water-related transmission routes:** There are two additional water-related modes of transmission of infectious agents. They are the transmission by inhalation of water aerosols and transmission by consumption of raw or undercooked shellfish or contaminated fish. The major pathogens associated with aerosol transmission are *Legionella* species. Outbreaks of legionellosis have been associated with aerosols from cooling towers and evaporative condensers of large buildings or with hot and cold water systems in hospitals, hotels and other institutions. *Legionella* can proliferate in hot water tanks maintained at 30-54°C and exposure to aerosols from showerheads can occur.

Bivalve molluscan shellfish can serve as vehicles of enteric disease transmission because of their ability to concentrate enteric organisms from faecally contaminated water in their tissues.

**What are the zoonotic water-related infections?:** Certain criteria have been developed to determine whether an infectious disease is zoonotic and water-related at the same time. They are:

1. The pathogen must spend a part of its life cycle within one or more animal species. It should be able to replicate or undergo development within an animal host and within a human host. However, the organism may not always cause symptomatic disease in either the animal or human host.
2. Within the life cycle of the pathogen, it is probable that some life stage will enter water - via faeces, urine, or tissue of an infected animal or human. The organism must be able to survive in water for at a least few hours or days in order to be transmitted by exposure to water. Replication in water is not necessary.
3. Transmission of the pathogen (or toxin produced by the organism) from animal source to human must be through a water-related route - ingestion; contact; inhalation of water/wastewater aerosols; consumption of shellfish or other seafood harvested from waters infected by animals or animal waste; and consumption of seafood infected with a pathogenic organism.

Reference:

Cotruvo J A, Dufour A, Rees G, Bartram J, Carr R, Cliver D O, Craun G F, Fayer R and Gannon V P J. [Eds.] (2004) Waterborne Zoonoses. Identifica-

Table 1: Vaccine-preventable Diseases &amp; AFP

6<sup>th</sup> - 12<sup>th</sup> December 2008 (50<sup>th</sup>Week)

Disease	No. of Cases by Province									Number of cases during current week in 2008	Number of cases during same week in 2007	Total number of cases to date in 2008	Total number of cases to date in 2007	Difference between the number of cases to date between 2008 & 2007
	W	C	S	N	E	NW	NC	U	Sab					
Acute Flaccid Paralysis	01 CB=1	00	00	00	00	00	01 AP=1	00	01 KG=1	03	01	95	84	+13.1%
Diphtheria	00	00	00	00	00	00	00	00	00	00	00	01	00	-
Measles	05 KL=5	00	00	00	00	00	00	00	00	05	02	105	79	+32.9%
Tetanus	00	00	00	00	00	00	00	00	00	00	02	36	34	+5.9%
Whooping Cough	00	01 NE=1	00	00	00	00	00	00	03 KG=3	04	00	53	47	+12.8%
Tuberculosis	41	05	03	02	02	00	21	00	06	80	179	8032	9519	-15.6%

Table 2: Newly Introduced Notifiable Disease

6<sup>th</sup> - 12<sup>th</sup> December 2008 (50<sup>th</sup>Week)

Disease	No. of Cases by Province									Number of cases during current week in 2008	Number of cases during same week in 2007	Total number of cases to date in 2008	Total number of cases to date in 2007	Difference between the number of cases to date between 2008 & 2007
	W	C	S	N	E	NW	NC	U	Sab					
Chicken-pox	17	06	11	00	04	16	09	02	11	76	94	5324	3321	+60.3%
Meningitis	01 KL=1	02 ML=2	00	00	00	02 KR=2	03 AP=1 PO=2	00	05 RP=3 KG=2	13	22	1259	744	+69.2%
Mumps	06	01	07	21	02	01	04	00	08	50	63	2833	2170	+30.6%

## Key to Table 1 &amp; 2

Provinces: W: Western, C: Central, S: Southern, N: North, E: East, NC: North Central, NW: North Western, U: Uva, Sab: Sabaragamuwa.

DPDHS Divisions: CB: Colombo, GM: Gampaha, KL: Kalutara, KD: Kandy, ML: Matale, NE: Nuwara Eliya, GL: Galle, HB: Hambantota, MT: Matara, JF: Jaffna, KN: Killinochchi, MN: Mannar, VA: Vavuniya, MU: Mullaitivu, BT: Batticaloa, AM: Ampara, TR: Trincomalee, KM: Kalmunai, KR: Kurunegala, PU: Puttalam, AP: Anuradhapura, PO: Polonnaruwa, BD: Badulla, MO: Moneragala, RP: Ratnapura, KG: Kegalle.

Table 3: Laboratory Surveillance of Dengue Fever

6<sup>th</sup> - 12<sup>th</sup> December 2008 (50<sup>th</sup>Week)

Samples	Number tested		Number positive *		Serotypes										
					D <sub>1</sub>		D <sub>2</sub>		D <sub>3</sub>		D <sub>4</sub>		Negative		
	GT	AH	GT	AH	GT	AH	GT	AH	GT	AH	GT	AH	GT	AH	
Number for current week	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
Total number to date in 2008	124	160	09	25	00	00	06	10	01	09	00	00	02	00	

Sources: Genetech Molecular Diagnostics &amp; School of Gene Technology, Colombo [GT] and Genetic Laboratory Asiri Surgical Hospital [AH]

\* Not all positives are subjected to serotyping.

NA= Not Available.

## Data Sources:

Weekly Return of Communicable Diseases: Diphtheria, Measles, Tetanus, Whooping Cough, Human Rabies, Dengue Haemorrhagic Fever, Japanese Encephalitis, Chickenpox, Meningitis, Mumps.

Special Surveillance: Acute Flaccid Paralysis.

National Control Program for Tuberculosis and Chest Diseases: Tuberculosis.

**Table 4: Selected notifiable diseases reported by Medical Officers of Health**  
6<sup>th</sup> - 12<sup>th</sup> December 2008 (50<sup>th</sup> Week)

DPDHS Division	Dengue Fever / DHF*		Dysentery		Encephalitis		Enteric Fever		Food Poisoning		Leptospirosis		Typhus Fever		Viral Hepatitis		Human Rabies		Returns Received Timely*
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	%		
Colombo	17	1553	8	288	0	15	5	193	1	141	9	1042	0	8	1	115	0	0	77
Gampaha	7	934	6	226	0	20	2	62	7	111	2	817	1	8	4	194	0	7	86
Kalutara	7	463	5	359	0	14	4	85	0	44	6	663	0	4	0	46	0	2	92
Kandy	7	335	0	312	0	10	2	66	0	100	3	512	2	100	0	126	0	2	64
Matale	4	173	2	230	0	4	1	55	1	17	24	802	0	2	1	31	0	0	83
Nuwara	0	29	4	301	0	6	2	257	0	168	1	73	0	43	0	108	0	1	92
Galle	1	105	2	213	0	23	0	18	0	50	1	436	0	16	0	8	0	5	82
Hambantota	9	122	1	138	0	8	0	8	0	20	12	134	0	98	0	17	0	1	82
Matara	7	347	4	230	0	14	0	36	0	15	1	487	3	233	0	14	0	1	76
Jaffna	0	60	0	155	0	4	0	258	0	20	0	1	0	164	0	42	0	0	0
Kilinochchi	0	1	0	160	0	0	0	1	0	4	0	2	0	0	0	2	0	0	0
Mannar	1	26	0	28	0	6	0	160	0	0	0	0	0	1	0	16	0	1	50
Vavuniya	0	12	2	77	0	3	0	15	0	25	0	6	0	1	0	5	0	0	75
Mullaitivu	0	0	0	61	0	0	0	16	0	13	0	0	0	1	0	10	0	1	0
Batticaloa	0	87	8	242	0	8	0	32	0	30	0	12	0	0	0	95	0	10	73
Ampara	0	33	3	271	0	0	0	9	3	289	0	25	0	0	0	14	0	0	71
Trincomalee	0	185	1	121	0	2	0	13	0	14	0	33	0	17	0	15	0	0	60
Kurunegala	2	352	6	263	0	16	1	56	1	30	4	687	2	34	0	84	0	9	84
Puttalam	1	285	8	178	0	10	0	162	0	41	0	67	0	38	0	34	0	5	89
Anuradhapu	0	120	1	162	0	10	0	12	0	56	1	252	3	14	0	16	0	3	63
Polonnaruw	1	66	5	146	0	1	0	29	0	25	1	101	0	1	0	22	0	0	86
Badulla	1	103	4	506	0	9	0	126	0	112	0	72	2	128	2	180	0	1	73
Monaragala	0	60	2	358	0	4	0	55	1	124	2	96	1	107	0	59	0	2	64
Ratnapura	13	304	6	428	1	34	0	54	0	84	3	250	0	82	1	63	0	0	61
Kegalle	7	444	4	316	0	25	0	86	3	25	6	581	2	74	1	521	0	1	91
Kalmunai	0	38	4	326	0	2	0	17	0	16	0	4	0	3	1	28	0	0	54
<b>SRI LANKA</b>	<b>85</b>	<b>6237</b>	<b>86</b>	<b>6095</b>	<b>1</b>	<b>248</b>	<b>17</b>	<b>1881</b>	<b>17</b>	<b>1574</b>	<b>76</b>	<b>7155</b>	<b>16</b>	<b>1177</b>	<b>11</b>	<b>1865</b>	<b>0</b>	<b>52</b>	<b>71</b>

Source: Weekly Returns of Communicable Diseases (WRCD).

\*Dengue Fever / DHF refers to Dengue Fever / Dengue Haemorrhagic Fever.

\*\*Timely refers to returns received on or before 20 December, 2008 Total number of reporting units =309. Number of reporting units data provided for the current week: 219

PRINTING OF THIS PUBLICATION IS FUNDED BY THE UNITED NATIONS CHILDREN'S FUND (UNICEF).

Comments and contributions for publication in the WER Sri Lanka are welcome. However, the editor reserves the right to accept or reject items for publication. All correspondence should be mailed to The Editor, WER Sri Lanka, Epidemiological Unit, P.O. Box 1567, Colombo or sent by E-mail to chepid@slt.net.lk.

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