WEEKLY EPIDEMIOLOGICAL REPORT
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Antimicrobial Resistance - Part I

An antimicrobial is a substance that kills or inhibits the growth of microbes such as bacteria, fungi, parasites or viruses. Antimicrobial drugs either kill microbes (microbicidal) or prevent the growth of microbes (microbistatic).

Since their discovery during the 20th century, antimicrobial agents (antibiotics and related medicinal drugs) have substantially reduced the threat posed by infectious diseases. The use of these "wonder drugs", combined with improvements in sanitation, housing, and nutrition, and the advent of wide-spread immunization programmes, has led to a dramatic drop in deaths from diseases that were previously widespread, untreatable, and frequently fatal. Over the years, antimicro-bials have saved the lives and eased the suffering of millions of people. By helping to bring many serious infectious diseases under control, these drugs have also contributed to major gains in life expectancy experienced during the latter part of the last century.

These gains are now seriously jeopardized by another recent development: the emergence and spread of microbes that are resistant to cheap and effective first-choice, or "first-line" drugs. The bacterial infections which contribute most to human disease are also those in which emerging and microbial resistance is most evident: diarrhoeal diseases, respira-tory tract infections, meningitis, sexually transmitted infec-tions, and hospital-acquired infections. Some important ex-amples include penicillin-resistant *Streptococcus pneumoniae*, vancomycin-resistant enterococci, methicillin-resistant *Sta-phylococcus aureus*, multi-resistant salmonellae, and multi-resistant *Mycobacterium tuberculosis*. The development of resistance to drugs commonly used to treat malaria is of particular con-cern, as is the emerging resistance to anti-HIV drugs.

CONSEQUENCES

The consequences are severe. Infections caused by resistant microbes fail to respond to treatment, resulting in prolonged illness and greater risk of death. Treatment failures also lead to longer periods of infectivity, which increase the numbers of infected people moving in the community and thus ex-pose the general population to the risk of contracting a resistant strain of infection.

When infections become resistant to first-line antimicrobials, treatment has to be switched to second- or third-line drugs, which are nearly always much more expensive and sometimes more toxic as well, e.g. the drugs needed to treat multi-drug-resistant forms of tuberculosis are over 100 times more expensive than the first-line drugs used to treat non-re-sistant forms. In many countries, the high cost of such replacement drugs is prohibitive, with the result that some diseases can no longer be treated in areas where resistance to first-line drugs is widespread. Most alarming of all are diseases where resistance is developing for virtually all currently available drugs, thus raising the spectre of a post-antibiotic era. Even if the pharmaceutical industry were to step up efforts to develop new replacement drugs immediately, current trends suggest that some diseases will have no effective

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CAUSES

Microbes (the collective term for bacteria, fungi, parasites, and viruses) cause infectious diseases, and antimicrobial agents, such as penicillin, streptomycin, and more than 150 others, have been developed to combat the spread and severity of many of these diseases. Resistance to antimicrobials is a natural biological phe-nomenon that can be amplified or accelerated by a variety of factors, including human practices. The use of an antimicrobial for any infection, real or feared, in any dose and over any time period, forces microbes to either adapt or die in a phenomenon known as "selective pressure". The microbes which adapt and survive carry genes for resistance, which can be passed on.

Bacteria are particularly efficient at enhancing the effects of resistance, not only because of their ability to multiply very rapidly but also because they can transfer their resistance genes, which are passed on when the bacteria replicate. In the medical setting, such resistant microbes will not be killed by an antimicrobial agent during a standard course of treatment. Resistant bacteria can also pass on their resistance genes to other related bacteria through "conjugation", whereby plasmids carrying the genes jump from one organism to an-other. Resistance to a single drug can thus spread rapidly through a bacterial population. When anti-microbials are used incorrectly - for too short a time, at too low a dose, at inadequate potency; or for the wrong disease - the likelihood that bacteria and other microbes will adapt and replicate rather than be killed is greatly enhanced.

Much evidence supports the view that the total consumption of antimicrobials is the critical factor in selecting resistance. Paradoxically, underuse through lack of access, inadequate dosing, poor adherence, and substandard anti-microbials may play as important a role as overuse. For these reasons, improving use is a priority if the emergence and spread of resistance are to be controlled.

UNPRECEDENTED TRENDS

In the past, medicine and science were able to stay ahead of this natural phenomenon through the discovery of potent new classes of antimicrobials, a process that flourished from 1930-1970 and has since slowed to a virtual standstill, partly because of misplaced confidence that infectious diseases had been conquered, at least in the industrialized world. In just the past few decades, the development of resistant microbes has been greatly accelerated by several concurrent trends. These have worked to increase the number of infections and thus expand both the need for antimicrobials and the opportunities for their misuse. Such trends include:

- urbanization with its associated overcrowding and poor sanitation, which greatly facilitate the spread of such diseases as typhoid, tuberculosis, respiratory infections, and pneumonia;

- pollution, environmental degradation, and changing weather patterns, which can affect the incidence and distribution of infectious diseases, especially those, such as malaria, that are spread by insects and other vectors;

- demographic changes, which have resulted in a growing proportion of elderly people needing hospital-based interventions and thus at risk of exposure to highly resist-ant pathogens found in hospital settings;

- the AIDS epidemic, which has greatly enlarged the population of immunocompromised patients at risk of nu-merous infections, many of which were previously rare;

- the resurgence of old foes, such as malaria and tuberculosis, which are now responsible for many millions of infections each year;

the enormous growth of global trade and travel which have increased the speed and facility with which both in-fectious diseases and resistant microorganisms can spread between continents.

As the number of infections and the corresponding use of antimicrobials have increased, so has the prevalence of resistance.

Following their 20th century triumph in human medicine, antimicrobials have also been used increasingly for the treatment of bacterial disease in animals, fish and plants. In addition, they became an important element of intense animal husbandry because of their observed growth-enhancing effect, (e.g. glycopeptides and streptogramins) when added in sub-therapeutic doses to animal feed. Antimicrobials are also used in industry, e.g. to eliminate bacterial growth on the inside of oil pipelines.

The enhanced food requirements of an expanding world population have led to widespread routine use of antimicrobials as growth promoters or pre-ventive agents in food-producing animals and poultry flocks. It is estimated that about half of the total amount of antimicrobials produced globally is used in food animals. A recent review in Europe has shown that an average amount of 100 milligrams of antimicrobials is used in animals for the production of one kilogram of meat for human consumption. Such practices have likewise contributed to the rise in resistant microbes, which can be transmitted from animals to man.

Source :

Antimicrobial Resistance, WHO Fact sheet

[http://www.who.int/mediacentre/factsheets/fs194/en/]

Part II of this article on " Antimicrobial Resistance" will be continued in the next issue.

Table 1: Vaccine-preventable Diseases & AFP

8th - 14th December 2007 (50th Week)

Disease	No. of Cases by Province								Number of cases during current week in 2007	Number of cases during same week in 2006	Total number of cases to date in 2007	Total number of cases to date in 2006	Difference between the number of cases to date between 2007 & 2006
	W	C	S	NE	NW	NC	U	Sab					
Acute Flaccid Paralysis	00	00	01 HB=1	00	00	00	00	00	01	02	84	118	-28.8%
Diphtheria	00	00	00	00	00	00	00	00	00	00	00	00	00.0%
Measles	00	01	01	00	00	00	00	00	02	00	79	39	+102.5%
Tetanus	00	01 KD=1	00	00	00	00	00	01 RP=1	02	00	34	46	-26.1%
Whooping Cough	00	00	00	00	00	00	00	00	00	02	47	70	-32.9%
Tuberculosis	99	03	42	26	00	06	03	00	179	317	9519	9758	-2.4`%

Table 2: Diseases under Special Surveillance

8th - 14th December 2007 (50th Week)

Disease	No. of Cases by Province								Number of cases during current week in 2007	Number of cases during same week in 2006	Total number of cases to date in 2007	Total number of cases to date in 2006	Difference between the number of cases to date between 2007 & 2006
	W	C	S	NE	NW	NC	U	Sab					
DF/DHF*	123	13	12	15	37	12	03	21	236	255	6798	11424	-40.5%
Encephalitis	00	00	00	00	00	00	00	00	00	01	191	114	+67.5%
Human Rabies	00	00	00	00	00	00	00	00	00	00	58	71	-18.3%

Table 3: Newly Introduced Notifiable Diseases

8th - 14th December 2007 (50th Week)

Disease	No. of Cases by Province								Number of cases during current week in 2007	Total number of cases to date in 2007
	W	C	S	NE	NW	NC	U	Sab		
Chickenpox	17	02	15	12	07	02	28	11	94	3321
Meningitis	09 GM=8 KL=1	02 KD=1 ML=1	01 HB=1	01 JF=1	01 PU=1	04 PO=4	01 MO=1	03 KG=3	22	744
Mumps	05	07	07	22	08	06	03	05	63	2170

*DF / DHF refers to Dengue Fever / Dengue Haemorrhagic Fever.
NA= Not Available.

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.
Details by districts are given in Table

Provinces: W=Western, C=Central, S=Southern, NE=North & 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 4: Laboratory Surveillance of Dengue Fever

8th - 14th December 2007 (50th Week)

Samples	Number tested	Number positive *	Serotypes				
			D_1	D_2	D_3	D_4	Negative
Number for current week	02	00	00	00	00	00	00
Total number to date in 2007	469	52	01	25	16	00	09

Source: Genetech Molecular Diagnostics & School of Gene Technology, Colombo. * Not all positives are subjected to serotyping.

Table 5: Selected notifiable diseases reported by Medical Officers of Health

8th - 14th December 2007 (50th Week)

DPDHS Division	Dengue Fever / DHF*		Dysentery		Encephalitis		Enteric Fever		Food Poisoning		Leptospirosis		Typhus Fever		Viral Hepatitis		Returns Received Timely**
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	%
Colombo	80	1771	05	351	00	11	05	117	16	92	03	153	00	05	01	147	**85**
Gampaha	33	901	01	315	00	27	02	83	00	61	19	297	00	19	03	209	**79**
Kalutara	10	395	08	476	00	05	03	61	00	43	11	200	00	02	01	64	**91**
Kandy	07	403	06	309	00	04	00	64	00	15	09	136	02	84	03	1965	**77**
Matale	04	113	00	242	00	06	00	34	00	13	19	134	00	05	01	139	**50**
Nuwara Eliya	02	40	03	236	00	02	00	119	00	368	01	14	00	36	06	554	**86**
Galle	01	95	02	169	00	12	00	25	00	42	10	144	00	27	00	23	**75**
Hambantota	05	96	02	191	00	06	00	21	00	20	03	51	05	69	00	29	**100**
Matara	06	229	04	294	00	10	01	50	00	24	05	278	03	212	01	35	**100**
Jaffna	10	223	03	171	00	02	08	433	00	13	00	00	13	118	05	28	**63**
Kilinochchi	00	01	00	01	00	00	00	06	00	00	00	00	00	02	00	04	**25**
Mannar	00	07	00	32	00	00	09	106	00	00	00	02	00	00	01	25	**50**
Vavuniya	02	40	04	82	00	04	00	21	00	65	00	03	00	00	00	14	**75**
Mullaitivu	00	00	00	39	00	08	00	21	00	02	00	00	00	00	00	17	**40**
Batticaloa	01	78	00	472	00	10	00	23	00	10	00	00	00	22	06	1166	**55**
Ampara	01	05	06	183	00	00	01	06	00	02	01	08	01	03	00	36	**71**
Trincomalee	00	61	08	313	00	04	00	30	00	25	00	12	00	21	00	116	**33**
Kurunegala	22	747	10	509	00	08	00	68	00	37	01	82	03	40	02	104	**83**
Puttalam	15	285	01	205	00	17	03	98	00	09	00	31	00	07	03	82	**56**
Anuradhapura	12	244	14	198	00	10	00	22	00	17	11	39	00	20	01	43	**58**
Polonnaruwa	00	67	10	163	00	03	00	14	00	64	00	22	00	00	00	51	**100**
Badulla	01	75	13	623	00	06	00	95	00	13	00	46	02	169	06	391	**53**
Monaragala	02	49	00	348	00	02	00	56	00	37	02	48	01	88	01	46	**70**
Ratnapura	09	434	03	589	00	20	00	76	00	24	02	82	01	32	00	105	**69**
Kegalle	12	430	07	299	00	11	01	67	00	09	17	237	01	45	05	258	**82**
Kalmunai	01	09	08	237	00	03	01	10	04	14	00	02	00	02	03	132	**46**
SRI LANKA	**236**	**6798**	**118**	**7047**	**00**	**191**	**34**	**1726**	**20**	**1019**	**114**	**2021**	**32**	**1028**	**49**	**5783**	**71**

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 15 December. 2007. Total number of reporting units =290. Number of reporting units data provided for the current week: 238

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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@sltnet.lk.

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