WEEKLY EPIDEMIOLOGICAL REPORT

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Ministry of Healthcare and Nutrition

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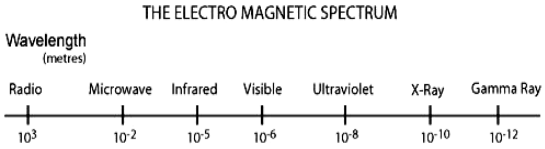
Radiation and Life *(Part 1)*

"Life on earth has developed with an ever present background of radiation. It is not something new, invented by the wit of man: radiation has always been there." Eric J Hall, Professor of Radiology.

Radiation is energy travelling through space. Sunshine is one of the most familiar forms of radiation. Sunshine consists of radiation in a range of wavelengths from long-wave infra-red to short-wave length ultraviolet, which may create the hazard. Beyond ultraviolet radiation are known as **ionizing radiation,** which can cause damage to matter, particularly living tissue. On the other hand, people owe their lives and health to ionizing radiation produced artificially. That radiation is used to diagnose diseases, and some people are treated with radiation to cure disease.

Natural background radiation is that which is naturally and inevitably present in our environment. This radiation comes from the sun as cosmic rays, land specially on granite areas and sea. Levels of this can vary. People living in granite areas or on mineralized sands receive more terrestrial radiation than others do, while people living or working at high altitudes receive more cosmic radiation. Most of our natural exposure is due to radon, a gas that seeps from the earth's crust and is present in the air we breathe.

Radiation comes from atoms, the basic building blocks of matter. Most atoms are stable; a carbon-12 atom for example remains a carbon-12 atom forever, but certain atoms eventually disintegrate into a totally new atom. These atoms are said to be 'radioactive'. An unstable atom has excess internal energy, with the result that the nucleus can undergo a spontaneous change to a more stable form. This is called 'radioactive decay'. This kind of atom is called an isotope, and unstable ones (which are thus radioactive) are called radioisotopes. Some elements, e.g. uranium, have no stable isotopes. When an atom of a radioisotope decays, it gives off some of its excess energy as radiation in the form of gamma rays or fast-moving particles. All the time, the atom is progressing to a stable state where it is no longer radioactive.



Types of radiation

X-rays and gamma rays

They represent energy transmitted in a wave without the movement of material, just as heat and light from a fire or the sun, travel through space. Unlike light, they both have great penetrating power and can pass through the human body. Gamma rays are the main hazard to people dealing with sealed radioactive materials used, for example, in industrial gauges and radiotherapy machines. Thick barriers of concrete, lead or water are used as protection from them.

Alpha particles

These are emitted from naturally-occurring heavy elements such as uranium and radium, as well as from some man-made elements. They are intensely ionizing but cannot penetrate the skin, so are dangerous only if emitted inside the body.

Beta particles

These are fast-moving electrons emitted by some radioactive elements. They are more penetrating than alpha particles, but easily shielded – they can be stopped by a few millimetres of wood or aluminium.

Neutrons

They are particles which are also very penetrating. On earth, they mostly come from the splitting, or fissioning, of certain atoms inside a nuclear reactor. Water and concrete are the most commonly used shields against neutron radia-

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tion from the core of the nuclear reactor.

It is important to understand that ionizing radiation does not cause the body to become radioactive.

Units of radiation and radioactivity

The basic unit of radiation dose absorbed in tissue is the Gray (Gy), where one gray represents the deposition of one joule of energy per kilogram of tissue. However, since neutrons and alpha particles cause more damage per gray than gamma or beta radiation, another unit, the Sievert (Sv) is used in setting radiological protection standards. This unit of measurement takes into account biological effects of different types of radiation. One gray of beta or gamma radiation has one sievert of biological effect, one gray of alpha particles has 20 Sv effect and one gray of neutrons is equivalent to around 10 Sv (depending on their energy).

Sources of Radiation

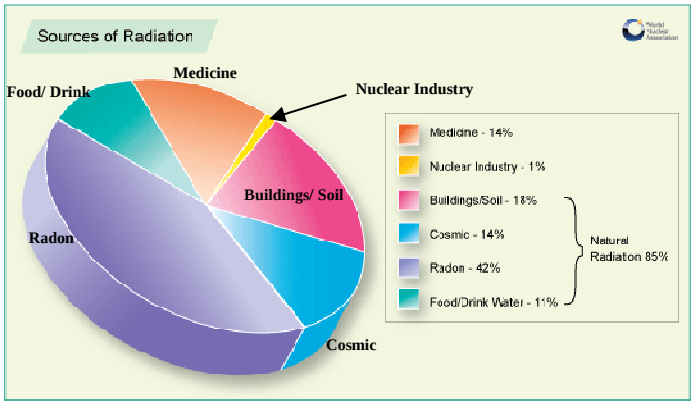
Natural background radiation

Naturally occurring background radiation is the main source of exposure for most people, and provides some perspective on radiation exposure from nuclear energy. The average dose received by all of us from background radiation is around 2.4 mSv/yr, which can vary depending on the geology and altitude where people live – ranging between 1 and 10 mSv/yr, but can be more than 50 mSv/yr.

Man-Made radiation

Ionizing radiation is also generated in a range of medical, commercial and industrial activities and most countries the main sources of exposure is medical X-rays.

Although the nuclear radiation for industrial purposes contributes only 1% to the total radiation, it is becoming more important and rampant due to the fossil fuel crisis. Nuclear energy is produced by a controlled nuclear chain reaction and creates heat—which is used to boil water, produce steam, and drive a steam turbine.



A typical breakdown between natural background and artificial sources of radiation is shown in the pie chart. Natural radiation contributes about 85% of the annual dose to the population and medical procedures most of the remaining 15%. Natural and artificial radiations are not different in kind or effect.

The health risks of radiation

Many things potentially of great benefit to humanity have associated risks when used. Radiation falls into this category. However, radioactive materials should only be used where the benefits significantly outweigh the risks. Ionizing radiation is only one of hundreds of things that may cause serious health effects in humans. The degree of damage caused by radiation depends in turn on many factors - dose, dose rate, type of radiation, the part of the body exposed, age and health, for example.

Radiation can be classified into acute radiation and chronic exposure radiation. Acute radiation is radiation received instantaneously: a high dose rate in a short period of time. Chronic radiation is the radiation received continuously: a low dose rate over a long period of time. Chronic radiation, although it is feared as much as acute radiation, according to evidence, is actually beneficial to people.

Acute doses can cause a pattern of clearly identifiable symptoms (syndromes). These conditions are referred to as Acute Radiation Syndrome. There are three main ranges that produce the most characteristic manifestations referred to as the haematological, gastrointestinal, and neuro- vascular syndromes. In haematological syndrome nausea, vomiting, fatigue and weakness, neutropenic fevers, systemic and localized infections, sepsis, and haemorrhagic manifestations can be seen leading to severe nausea, vomiting, watery diarrhea, cramps, severe tiredness, fever; progression to bloody diarrhoea, shock and even death can occur. In less than an hour and possibly within minutes of exposure, patients receiving these doses begin experiencing neurovascular symptoms such as cutaneous oedema and erythema, hypotension, hyperpyrexia, disorientation, prostration, loss of co-ordination, and possibly seizures.

A chronic dose is a relatively small amount of radiation received over a long period of time. The body is better equipped to tolerate a chronic dose than an acute dose. This is the type of dose received as occupational exposure. The formation of cataracts, teratogenic effects are the main effects of chronic radiation.

Although there is a link of radiation and cancers, cigarette smoking, dietary factors and sunlight are among the most probable causes of cancer. However, it is clear that radiation used improperly can increase health risks. On the other hand, large doses of radiation directed at a tumor are used in radiation therapy to kill cancerous cells, while much larger doses are used to kill harmful bacteria in food, and to sterilize bandages and other medical equipment. Radiation has become a valuable tool in our modern world.

Sources

- *Radiation and Life, World Nuclear Association, 2011*
- *Population monitoring in radiation emergencies: a guide for state and local public health planners: National Center for Environmental Health. CDC.2010. http://emergency.cdc.gov/radiation/pdf/population-monitoring-guide.pdf*
- *FAQs: Japan nuclear concerns: World Health Organization.2011*

This article was compiled by Dr. Pubudu Chulasiri, Medical Officer– Epidemiology Unit

Table 1: Vaccine-preventable Diseases & AFP

26th February – 04th March 2011(09th Week)

Disease	No. of Cases by Province									Number of cases during current week in 2011	Number of cases during same week in 2010	Total number of cases to date in 2011	Total number of cases to date in 2010	Difference between the number of cases to date in 2011 & 2010
	W	C	S	N	E	NW	NC	U	Sab					
Acute Flaccid Paralysis	00	01	01	00	00	00	00	00	00	02	01	19	19	0 %
Diphtheria	00	00	00	00	00	00	00	00	00	00	00	00	00	-
Measles	01	00	00	00	00	00	00	00	01	02	00	15	18	- 16.6 %
Tetanus	00	00	00	00	00	00	00	00	00	00	01	04	06	- 33.3 %
Whooping Cough	00	00	00	00	00	00	00	00	00	00	00	06	03	+ 100 %
Tuberculosis	56	20	05	24	28	20	09	19	28	209	206	1549	1766	- 12.8 %

Table 2: Newly Introduced Notifiable Disease

26th February – 04th March 2011(09th Week)

Disease	No. of Cases by Province									Number of cases during current week in 2011	Number of cases during same week in 2010	Total number of cases to date in 2011	Total number of cases to date in 2010	Difference between the number of cases to date in 2011 & 2010
	W	C	S	N	E	NW	NC	U	Sab					
Chickenpox	33	15	12	04	08	17	14	04	23	130	65	744	667	+ 11.5 %
Meningitis	04 CB=1 GM=3 KL=1	00	01 GL=1	02 VU=2	01 TR=1	07 KN=7	01 AP=1	00	02 RP=1 KG=1	19	15	190	324	- 41.3 %
Mumps	03	02	05	00	02	05	01	03	06	27	10	357	151	+ 136.4 %
Leishmaniasis	00	00	00	00	01 AM=1	01 KN=1	00	00	00	02	10	101	71	+ 42.2 %

Key to Table 1 & 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.

Data Sources:

Weekly Return of Communicable Diseases: Diphtheria, Measles, Tetanus, Whooping Cough, Chickenpox, Meningitis, Mumps.

Special Surveillance: Acute Flaccid Paralysis.

Leishmaniasis is notifiable only after the General Circular No: 02/102/2008 issued on 23 September 2008. .

Dengue Prevention and Control Health Messages

You have a duty and a responsibility in preventing dengue fever. Make sure that your environment is free from water collections where the dengue mosquito could breed.

Table 4: Selected notifiable diseases reported by Medical Officers of Health

26th February – 04th March 2011(09th 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	A	B	%
Colombo	77	767	6	48	0	2	4	42	0	4	5	56	0	1	0	9	0	1	**92**
Gampaha	26	263	4	22	0	2	0	13	0	8	23	73	0	7	1	15	1	1	**73**
Kalutara	18	118	4	33	0	2	1	15	0	6	7	29	0	0	0	1	0	0	**100**
Kandy	06	58	3	90	0	3	1	11	1	3	3	21	3	23	0	11	0	0	**87**
Matale	3	30	2	22	0	2	0	3	0	3	8	31	0	1	1	2	0	0	**75**
Nuwara	3	14	5	45	0	1	1	11	0	12	1	8	4	22	0	2	0	0	**85**
Galle	6	32	2	18	0	0	1	2	0	4	0	13	1	10	1	5	0	0	**95**
Hambantota	8	32	0	9	0	2	0	1	0	1	30	48	0	14	0	0	0	0	**75**
Matara	8	38	4	12	0	0	1	5	0	0	14	32	1	16	1	2	0	1	**88**
Jaffna	7	98	4	26	0	1	5	61	0	9	0	2	19	98	1	10	0	1	**91**
Kilinochchi	0	6	0	3	0	1	0	3	0	0	0	1	1	4	0	1	0	0	**75**
Mannar	1	13	0	3	0	0	1	6	0	0	1	7	0	24	0	0	0	0	**100**
Vavuniya	2	18	0	5	1	4	0	4	0	0	8	24	0	1	0	0	0	0	**100**
Mullaitivu	0	3	2	7	0	0	0	1	0	0	1	3	0	0	0	0	0	0	**50**
Batticaloa	21	91	7	85	0	1	0	2	0	0	1	6	0	0	0	1	0	1	**93**
Ampara	0	17	2	26	0	0	0	5	0	15	1	20	0	0	1	2	0	0	**100**
Trincomalee	5	28	4	63	0	0	0	1	0	4	2	32	0	1	0	3	0	0	**82**
Kurunegala	11	89	4	68	0	4	7	31	2	24	292	568	1	18	0	9	0	0	**83**
Puttalam	3	138	3	46	0	0	0	5	0	1	4	17	1	4	0	1	0	1	**56**
Anuradhapu	4	43	3	29	0	1	0	2	0	2	30	99	2	7	0	3	0	0	**89**
Polonnaruw	3	46	0	19	0	1	0	1	0	8	2	27	0	0	0	2	0	0	**71**
Badulla	1	44	1	25	00	0	0	13	0	0	0	8	1	5	2	11	0	0	**60**
Monaragala	1	42	3	20	0	0	4	9	0	0	4	24	1	16	0	6	0	0	**82**
Ratnapura	5	83	13	93	0	3	1	7	0	5	6	54	1	13	2	12	0	0	**89**
Kegalle	2	41	5	22	0	5	2	18	0	4	5	36	3	4	1	18	0	0	**100**
Kalmunai	2	6	6	80	0	0	0	0	0	0	0	2	0	0	0	1	0	0	**77**
SRI LANKA	**223**	**2159**	**87**	**919**	**01**	**35**	**29**	**272**	**03**	**113**	**448**	**1241**	**39**	**289**	**11**	**130**	**01**	**06**	**84**

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 04th March, 2011 Total number of reporting units =320. Number of reporting units data provided for the current week: 271
A = Cases reported during the current week. **B** = Cumulative cases for the year.

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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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