Regional differences

The drive to eradicate polio in India started in 1995 using OPV, but despite repeated use of the vaccine, polio is still a problem there. The country has had more than 600 cases of polio each year for 2006 and 2007. More than 70% of cases occurred in the two northern states of Bihar and Uttar Pradesh, which contribute about 32% of the national child population under 5 years of age.

Most of the polio cases that are found in the rest of India have been shown to be due to the wild virus carried throughout the country by migrants from the two states. In addition, the poliovirus strain found in Uttar Pradesh has been carried to Nepal, Bangladesh, Namibia, Angola and the Democratic Republic of Congo.

Reasons for failure

Why is there more polio in these Indian states? It is known that not all children have been vaccinated with OPV and thus are susceptible to polio. However, the fact is that 64% of the polio cases in Uttar Pradesh had received more than 5 rounds of OPV, suggesting that the vaccine failed to induce immunity in a large number of cases.

This failure may be due to genetic factors in this population, or perhaps the nutritional status of recipients affects their response to the OPV, or perhaps the quality of the OPV is involved.

Adding to the problem in India is the existence of polio caused by pathogenic poliovirus derived from the OPV. According to a recent report, the Indian Medical Association has evidence that in 2006, there were 1,600 cases of polio that resulted from the OPV, and it believes that this number may be an underestimate.

This figure is completely at odds with the WHO, which as mentioned above, reported there were only 200 such cases worldwide for the past 10 years. The disparity may be a matter of classifying diseased individuals as genuine cases of vaccine-derived paralysis.

Searching for the right strategy

Eradicating polio in India is crucial for worldwide eradication. Some are questioning the strategy of continuing to use the OPV to accomplish the goal. Since OPV, for whatever reason, seems not to be entirely effective, using IPV have been suggested.

There should be no poliovirus derived from this vaccine since the virus in IPV is "dead". But IPV is more expensive, requires personnel who know how to inject it, and may even scare off people loathe to be stabbed with a needle.

The WHO sticks by its OPV approach. With funds to continue the program running low, the WHO has issued the following statement:

"Polio eradication will only succeed if the necessary funds are made available and with strong political commitment in polio-affected countries. More than 10 million children will be paralysed in the next 40 years if the world fails to capitalize on its US$5 billion global investment in eradication."

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www.cycletowalk.com

Cycle to walk

Ramesh Ferris is an Indian-born Canadian with a message: the end of polio is within reach. The 28-year-old polio survivor is hand cycling across Canada this year as part of the Cycle to Walk campaign – a fundraising and public education initiative geared to bring polio back to the forefront of people's minds. To date, the Cycle to Walk campaign has raised over a quarter of its goal of Canadian $1 million. Cycle to Walk launched from Victoria, British Columbia on April 12, 2008, and will arrive at Cape Spear, Newfoundland and Labrador on October 1. Visit www.cycletowalk.com for more information.

possible between you and the outside.

An enclosed metal car, truck or van (but NOT a tractor, golf cart, topless or soft top vehicle) is considered a safe shelter. Make sure the vehicle is not parked near trees or other tall objects that could fall over during a storm.

Inside the car, avoid touching any metal or wired device including the steering wheel or plugged-in cell phone. A direct strike to your car will flow through the frame of the vehicle.

Avoid open areas. Stay away from things that are tall (trees, hilltops, flag or telephone poles or posts), water, and other objects that conduct electricity (metal fences, lawnmowers, golf clubs, fishing rods).

If you are in a group in the open, spread out several metres apart from one another.

Stay away from metal bleachers, backstops, bicycles, and fences. Lightning can travel long distances through metal.

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By Hilda Donhoffer, MD, FRCPC

Killer & stinging caterpillars

Fatal bleeding syndrome from killer caterpillar sting

A recent report in the Canadian Medical Association Journal documented the case history of a young Canadian woman who died after she accidentally stepped barefoot on 5 caterpillars while traveling in Northeast Peru.

She immediately experienced burning pain shooting up from the affected foot to her thigh after the incidence. A headache also developed. But both symptoms subsided within 12 hours, so she did not seek medical attention.

She returned to Canada a few days later and soon noticed severe bruising. She was admitted to hospital and a blood coagulation abnormality was diagnosed and managed accordingly.

Since caterpillar venom was the suspected cause, antidote was requested from Brazil. Unfortunately during the 48 hours before antidote arrived, an irreversible multi-organ failure developed, and she died.

The Lonomia caterpillars that caused the fatal bleeding syndrome are native to South America and not found in North America. In a 5 year period, 688 cases of Lonomia envenomations (stings) were reported in the State of Rio Grande do Sul in Brazil.

Adventure travelers to South America should be aware of the dangers of Lonomia stings. If antivenin (antidote to the venom) is given within 12-24 hours after the sting, disastrous consequences can be prevented.

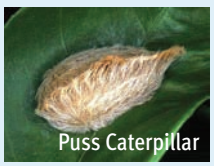
Stinging caterpillars in North America

In North America, there are more than 11,000 species of caterpillars. The number of caterpillar species with stinging capabilities is small, and most are harmless. Venomous or stinging caterpillars have hollow quill-like spines connected to poison sacs.

These caterpillars do not attack, but inadvertent contact may break off the spines (hairs), releasing toxins contained inside the sacs. The spines may penetrate the skin, or the toxin may spill onto the skin.

This causes burning, itching and hives. For most people, the sting produced by most species is generally minor, mild, and short-lived even though it is painful. The severity of the reaction depends on the type of caterpillar, the amount of venom and the sensitivity of the individual. When the spines become wind-born, they may cause dermatitis and conjunctivitis.

In North America, the Puss Caterpillar sting causes the most severe reaction including: intense burning and nettling of the skin, severe pain, reddening and inflammation, development of pustules and other lesions, numbness, swelling, and nausea. The pain may persist up to 12 hours.



http://edis.ifas.ufl.edu

The greatest risk of coming into contact with caterpillars is in the woods. If one lands on you, do not brush it off with a bare hand. Use a stick to remove it so that the fragile spines will not be broken off.

Remove any spines on your skin with an adhesive tape (that you should always carry with you when hiking). Wash the area with soap and water, and put an ice pack or a paste of baking soda on the affected area. If allergic symptoms develop, seek medical help immediately.

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HEALTH IMPACT OF VARIOUS AIR POLLUTANTS

	Repiratory tract symptoms and acute illness	Exacerbates Reactive airway disease (RAD)	Broncho-spasm in person without RAD	Increased mortality rates in many studies	Implicated in carcino-genesis
PM_{10}	+	+	+	+	+
SO_2	+	+	trace	debated	–
NO_2	+	trace	–	–	–
CO	see text	–	–	see text	–
0_3	+	+	+	–	–

PM_{10} (particulate matter)

Particulate matter refers to any particles suspended in air, such as dust, dirt, and smoke, which are 10 µ or less in diameter. These particles can be deposited deep into the lungs and are particularly harmful to health.

It has been shown that PM_{10} air pollution increased the incidence of cough by 3.7 times, bronchitis by 2.5 times, and earache by 1.6 times in normal healthy children. Asthma symptoms also increased by 1.5 to 2.1-fold in asthma patients exposed to chronically elevated PM_{10}.

SO_2 (sulfur dioxide)

The primary source is from the burning of sulfur-containing fuel. At rest, most of the SO_2 inhaled is absorbed in the nasopharynx. During exercise, more of it is delivered directly to the lungs.

Studies show that exposure is followed by an increase in inflammatory cells in the bronchoalveolar fluid. In healthy individuals, weak measurable broncho-constriction is shown during vigorous exercise at levels of 1 ppm or higher. But in patients with asthma, levels as low as 0.4 ppm can cause shortness of breath and wheezing during moderate exercise.

NO_2 (nitrogen dioxide)

Major sources are motor-vehicles and jet engines. High exposure has been linked with a 24-29% increased incidence of coughing, wheezing, and bronchitis in children. Broncho-constriction and exercise-induced symptoms have been noted in asthmatic patients exposed to moderately high levels of 0.3 ppm for short periods of time.

CO (carbon monoxide)

Levels can be high near highway interchanges and when traffic is congested. When inhaled, CO readily diffuses from the lungs into the red blood cells. It forms a tight bond with hemoglobin, preventing it from transporting oxygen.

Toxicity symptoms do not appear until a healthy individual has been breathing in CO at a high level of 100 ppm for 8 hours. But at risk individuals are more susceptible. CO in ambient air may produce ischemic symptoms in patients with cardiovascular diseases.

O_3 (ozone)

Ozone is created by a series of chemical reactions involving volatile compounds and nitrogen oxides in the presence of ultraviolet radiation. Sources include gasoline and other fuels, paint, and chemical solvents.

Ozone exposure causes eye irritation, chest pain, shortness of breath and cough. Symptoms in healthy individuals have been shown at the low concentration of 0.08 ppm after a day's physical activity of manual labour. In normal adults, an average of 1 mL of FEV1 (volume of air breathed out during the first second of forced expiration) is lost for every 0.001 ppm increase in ozone.

factors and health, refer to #3, #11, #17, #20, #23, #24; for body energy, refer to issues #9 and #30.

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Lymphatic fluid was discovered centuries ago. But it was thought that our lymphatic circulation only served as a transport system returning tissue fluid to the blood circulation.

It was only in the last few decades that the essential role of the lymphatic system in immune defense, wound healing, and tissue regeneration was recognized.

Novel discoveries of lymphatic cell markers since the last decade, and the explosion of medical research that followed, have unraveled new insights.

Better understanding of our lymphatic circulation has significant medical implications for the prevention and treatment of various inflammatory diseases and cancer.

Lymphatic circulation

Lymphatic circulation is essential for life. When genetic defects prevent the development of lymph vessels in the foetus, it cannot survive.

The lymphatic system consists of lymphatic vessels, lymph nodes and the lymphatic organs – the thymus, the tonsils, Peyer's patches in the gut, and the spleen. This system has multiple functions.

The lymphatic system complements the blood circulatory system in sustaining the correct amount and composition of tissue fluid in the body. It plays an important role in the body's immune defense and in inflammation. But it can also propagate malignant cells resulting in metastases of cancer.

Long road to rediscovery

Lymphatic fluid was observed and recorded a long time ago. Hippocrates around 400 BC saw vessels containing "white blood". Aselli (Italian physician) reported "milky veins" in the dog's gut in 1627.

What they saw were lymph vessels containing fat absorbed from food and transported after a meal. The lymph in other parts of the body is a clear fluid.

We have learned much about the blood vessels and blood circulation in health and disease states. By comparison, much less attention has been given by medical science to the lymphatic system until recent decades.

Even in the second half of the last century, while an abundance of new knowledge was gathered about the active role of blood vessels in cardiovascular disease, the centuries old view on the role of the lymphatic vessels still prevailed. It was thought that lymphatic circulation served only as transport pipes returning fluid from the tissues to the blood stream.

(For more on fat metabolism, refer to WellnessOptions #21).

New explosion of findings

The tide of research interest started to change during the last decade of the 20th century, when the vascular endothelial growth factor receptor (VEGFR-3) on the lymphatic endothelial cells was recognized.

Subsquent search for the molecules that bind to this receptor led to the identification of vascular endothelial growth factor-C and D (VEGF-C, VEGF-D) as its ligands.

Another explosion of studies started when UK biochemist DG Jackson discovered in 1999 a unique lymphatic endothelial cell marker, the lymphatic vessel endothelial hyaluronan receptor (LYVE-1).

Hyaluronan (a glycosaminoglycan) is found in the extracelluar matrix. It is primarily involved in cell adhesion and cell migration. Jackson described LYVE-1 expressed on the surface of lymphatic endothelium.

This discovery enabled the unequivocal identification of lymphatic endothelial cells and their differentiation from the endothelial cells of blood vessels.

Besides the recognition of lymphatic cells in cell culture, these discoveries also facilitate other studies such as the study of the normal development of lymphatic vessels in the foetus, and genetic abnormalities of lymphatic vessels caused by mutation.

Since then, several lymphatic cell markers have been discovered, and slowly, the sequence of gene activations during lymphatic vessel development and their responses to varied stimuli are elucidated.

Implications & research focus

The use of specific cell markers and the emerging results from recent studies give us new insight and perspective in the active role of the lymphatic vessel endothelium.

The recent review written by Oliver and Detmar entitled "The rediscovery of the lymphatic system" reflects how our understanding of the lymphatic vessel has fundamentally changed.

Investigation of the lymph vessels and their role in wound healing, in inflammation, in transplant rejection, and in the spread of malignant tumours is expected to yield important knowledge with significant medical implications in the near future.

WHAT IS LYMPH?

All the cells in the body are bathed in a fluid called tissue fluid or interstitial fluid. Water, protein, nutrients and oxygen delivered by the blood to the tissues pass from the blood capillaries to the cells through this fluid. Similarly, carbon dioxide and metabolites from the cells cross through the tissue fluid back to the blood capillaries.

However, this process is neither perfect nor complete. More water and protein leave the blood capillaries than are returned. The lymphatic capillaries pick up and transport the excess through the lymphatic vessels to the large veins and back to the blood circulation.

White blood cells, bacteria, viruses, other large molecules (macromolecules), and fat absorbed in the gut from food are transported by the lymph. The composition of the lymph depends on which organ it drains. Some examples of protein content are given in the table here.

APPROXIMATE PROTEIN CONTENT OF LYMPH IN HUMANS

Lymph source	Protein content (g/L)
Liver	62
Heart	44
Digestive tract	41
Lung	40
Skin	20
Skeletal muscle	20

New lymphatic vessel growth and cancer

In adults, the lymphatic endothelial cells are unperturbed (in a quiescent state). However, wound healing, inflammation and cancer can stimulate new lymphatic vessel formation (lymphangiogenesis).

How lymph vessels start to grow

For a century, two theories have been competing to explain the origin of lymph vessels.

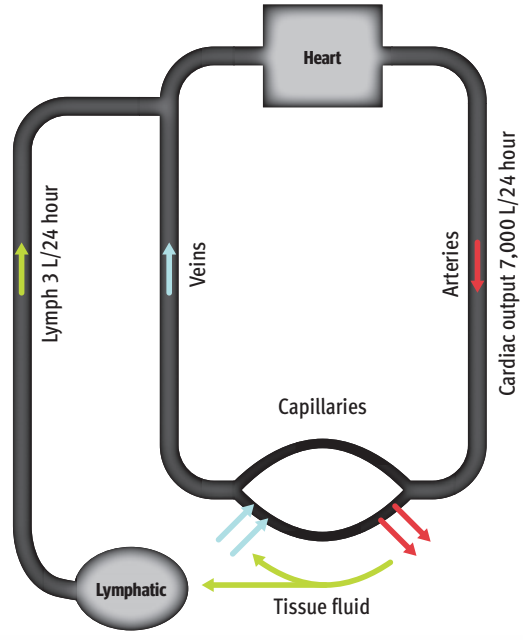
In 1902, FR Sabin suggested that the primary lymphatic sacs bud from the embryonic veins and then from these, the lymphatic vessels sprout. In 1908, GS Huntington suggested that the lymphatic sacs originate from precursor cells, independent of veins. These researchers developed their theories with only the microscope as their tool for observation.

Since there were no known lymphatic markers, the study of the lymphatic vessels was a neglected field for several decades.

By the end of the last century, several sophisticated research methods such as molecular techniques, cell cultures, and mouse models with impairment of

SCHEMATIC REPRESENTATION OF THE TWO CIRCULATORY SYSTEMS

In contrast to the blood circulatory system, the lymphatic circulation flows in one direction, from the periphery to the centre, and it has no pump. The blood and lymphatic circulations work in concert to maintain the ideal amount and composition of tissue fluid. Figure shows the volume contributions of the two systems.



LYMPHATIC CAPILLARIES

The lymph vessels start close to the blood capillaries in the tissue fluid as blind-ended tubes. Their wall is a single layer of endothelial cells kept open by anchoring filaments similar to the ropes of a tent. The endothelial cells are less tightly connected than in the blood capillaries and overlap somewhat, creating a valve-like structure referred to as “flap valves”.

These intercellular openings allow for an easier entry of proteins and other macromolecules.