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SNAKE BITES IN CANADA

CANADIANS are fortunate in being almost completely exempt from the risk of venomous snake bites. Our only venomous snake is the rattlesnake and this reptile is thinly distributed in limited areas in the southern fringe of our country. The habitat of the Pacific rattlesnake extends upwards from the United States into the southern part of British Columbia. Similarly, the Prairie rattlesnake extends into the southern portions of the prairie provinces. In Ontario the Massasauga rattlesnake inhabits the Bruce Peninsula and the eastern shore of Georgian Bay. It formerly was found on the northern shore of Lake Erie and perhaps a few still exist in that region. Its habitat certainly extends into the States bordering the southern shore of Lake Erie. The timber rattlesnake formerly was found in the gorge of the Niagara River but probably it has now died out in that area. The last recorded kill of a timber rattlesnake was a good many years ago.

There is much that is fascinating in the study of venomous snakes. They have evolved a highly effective mechanism to obtain their food. Rattlesnakes live on small rodents and frogs. These are killed by the injection of a complex and highly toxic venom so powerful that death of their prey occurs within a few seconds or minutes of the strike. The venom is produced and stored in paired poison sacs on either side of the reptile's head and is injected into the victim through two hollow fangs located at the anterior end of the upper jaw. Normally these are folded back and are covered by a sheath of mucous membrane. During the act of striking, they are turned forward by a muscular mechanism; the sheath is stripped backwards and the fangs are driven into the prey by the force of the strike rather than by a biting action.

Rattlesnakes belong to the order of pit vipers which are distinguished by a small pit on either side of the head midway between the eye and the nostril. These pits are organs of heat perception of such great sensitivity that the pit viper can detect and kill its warm-blooded prey in total darkness. These reptiles can, therefore, hunt equally well by night as by day. As they have no organ of hearing, this ability to detect their prey by heat perception is of considerable importance. Also, since they can and do hunt by night, precaution against their bites must be taken by night as well as by day.

The venom of rattlesnakes is exceedingly toxic. It is designed to kill quickly the small animals on which they feed, and this it does very effectively and rapidly. The venom of the Massasauga rattlesnake is said to be five times as potent, unit for unit, as that of the Texas rattlesnake. A field mouse struck by a Massasauga rattlesnake may be dead in two seconds (Logier). To the rattlesnake this immediate lethal effect of its bite is important. It does not swallow its prey until it is dead. If death or at least paralysis were not nearly instantaneous, a fleet-footed mouse could quickly disappear from the scene.

It is striking evidence of the deadly toxicity of rattlesnake venom that the quantity intended to kill a field mouse or a baby chipmunk is quite capable of killing a human being if a full dose of venom is delivered through the skin into the subcutaneous tissue.

Nevertheless, the risk of rattlesnake bites to human beings is minimal. In Ontario far more humans die each year from insect bites than from rattlesnake bites; indeed, only two fatal cases in the latter category have been recorded in the last 50 years. To be harmful, the venom must be injected through the skin into the subcutaneous tissue. Since the hollow fangs are short and the distal opening through which the venom is ejected is somewhat above the tip of the fang, even a thin layer of clothing may prevent full penetration of both fangs. Thicker layers of clothing and of more resistant material, such as leather, provide virtually complete protection. Other factors too, such as thickness and toughness of the epidermis, a glancing strike or oblique entry of the fang, combine to reduce the incidence of serious rattlesnake bites to a very low level. With reasonable precaution there is little danger of serious trouble from rattlesnakes.

It is sometimes contended that rattlesnakes have increased in numbers in recent years, at least along the shore of Georgian Bay. It is difficult to be certain that this is true. The vast increase in the number of people who holiday in the Georgian Bay area would account for an apparent increase in the number of rattlesnakes. When more people camp in a sparsely settled area, they will see and kill more rattlesnakes than were seen and killed 20

years ago. The increase in the number of rattlesnakes encountered may therefore be, in part at least, accountable by the fact that there are more hunters and not necessarily more game.

Much can be done to avoid rattlesnake bites by a few simple precautions. While in the bush one should wear clothing. The rule should be "no bare skin" and the clothing should be heavy enough or thick enough to prevent penetration of a rattler's fangs through the underlying skin. When berry picking or preparing a camp site, the juniper bushes should be stirred with a stick before sitting down on the rocks.

Of the many traditional methods of dealing with rattlesnake bite (scarification and suction—whiskey), short of specific antitherapy, only one has any semblance of value and that is the use of a tourniquet to obstruct lymphatic drainage from the area of the bite. The venom is absorbed by the lymphatics and passes through the adjacent lymph nodes to reach the general circulation. A narrow tourniquet (e.g. a shoe string) tied sufficiently tight to compress the skin against the underlying fascia, but not interfering with the arterial circulation, will occlude the lymphatics and delay absorption of the venom. This procedure is worth using. Associated with this is the importance of keeping the limb and the patient quiet. Movement greatly accelerates the flow of lymph and the arterial circulation.

The mainstay of treatment of rattlesnake bite is the polyvalent Antivenin, Wyeth. Acknowledgment should be made of the contribution of Wyeth Laboratories which alone among the North American pharmaceutical houses has developed a high-titre antivenin polyvalent for most species of rattlesnakes. The development of this product must have been a difficult technical problem and it can scarcely be a source of great profit to the manufacturer.

While the polyvalent antivenin is the only specific treatment for rattlesnake bite, it must be used with caution. Like all antisera, it is harmful to those individuals who are sensitive to horse serum. Dr. Finley, in a communication published elsewhere in this issue of the Journal (p. 1457), stresses the necessity for sensitivity testing and instituting methods of desensitization when necessary. This procedure should never be omitted.

There is some evidence that corticosteroids may be of value in the treatment of certain aspects of snake bite. This is an impression based upon meagre clinical experience and at present it is unsupported by experimental evidence. Corticosteroids can hardly be expected to neutralize the action of the histolysins, hemolysins and neurotoxins of snake venom but could be of value in combating the shock and anaphylaxis which often accompany snake bite.

WORLD PATTERNS OF DISEASE

PERHAPS one of the surprising things about medicine is not the things we do not know but the quite basic nature of some of our ignorance. For example, we really do not know what is the best climate for a man to live and work in, although air conditioning engineers act as if they did. We know very little about the behaviour of such an ancient disease as leprosy, and we are baffled by extraordinary patterns of incidence of cancer.

Recently two most entertaining and informative books by a distinguished geographer, Dudley Stamp, have appeared in Britain and pointed up the elementary state of our knowledge of medical geography. One, "Some Aspects of Medical Geography",[1] is addressed to doctors; the other, "The Geography of Life and Death",[2] is for the laity. In both, the author demonstrates the enormous gaps in our knowledge of patterns of morbidity in particular. While killing diseases such as plague and cholera have been carefully mapped, the patterns of merely debilitating or uncomfortable disorders such as respiratory disease or dental caries are much less well known. The physical background to health or disease (temperature, humidity, wind strength and so on) is also *terra incognita*. As Stamp says, "Many apparently simple concepts are scientifically unresolved and some popular beliefs may be without foundation. Even some medical shibboleths seem doomed; it is probable that we are likely to suffer from too much fresh air rather than too little."

Stamp is especially concerned with the geographer's tool, the map, and notes the fallacies inherent in medical maps. A blank area on a world map for a particular disease may merely mean that there are no doctors or recording arrangements there, or that the disease has been overlooked or wrongly diagnosed. How this sort of thing can happen even in a country with a National Health Service is well illustrated by maps of England showing prevalence of schizophrenia. Thus, if you live in the East Sussex area you apparently have twice as great a chance of becoming schizophrenic as if you prudently retreat into West Sussex, an area with exactly similar characteristics. Obviously someone has gone astray. It is also hard to believe that Liverpool has as many schizophrenics as recorded psychoneurotics of all kinds, while neighbouring Manchester has a 1:4 incidence for these two disease groups. Yet one would expect maps covering a smaller geographical area such as a county or city to be more accurate.

When areas have been mapped with some degree of accuracy, puzzling observations keep cropping up. Why should Wales have much more gastric cancer than England? The diet is roughly the same, so that the nutritional explanation given for the high incidence of carcinoma of the stomach in Japan can scarcely be accepted. Why is the