to Oro virus with titers ranging from 1:4 to 1:80 were demonstrated in the CSF of each of 10 patients tested. No bacteria or fungus was noted or cultured from 16 CSF examined. All patients recovered without sequellae.

A rash is also occasionally observed on the trunk, arms, and less commonly the thighs; it usually appears between the third and sixth day of illness and lasts 2-3 days.

Virtually all patients are viremic during the first two days of illness. Oro virus was detected in about 72 per cent and 44 per cent of patients on the third and fourth days after onset of symptoms, respectively, but in only 23 per cent on the fifth day.

Prior to 1980 all outbreaks of Oro fever occurred exclusively in Pará, with a wide geographic distribution in this State. In 1980, however, Manaus, the capital city of the State of Amazonas, and Barcelos were affected by the virus, as was the town of Mazagão in Amapá territory. The outbreak in Manaus started late in 1980 and lasted until the beginning of 1981; approximately 97,000 persons were infected. Serologic studies in Manaus revealed a low (1.8 per cent) antibody prevalence rate for the virus prior to the outbreak.

In the epidemics from which a sufficiently large number of sera were tested, there were no striking differences in attack rates within different age groups. In some localities a proportional difference between men and women of 3:1 or 2:1 was observed. No significant differences in the infection rates of males and females were noted, however, in other outbreaks. A follow-up study undertaken in 1979, involving 97 families with 537 persons, revealed that at least 63 per cent (49/79) of persons infected during an outbreak in the town of Santa Isabel developed clinical manifestations.

In some epidemics the distribution of the virus in large cities is markedly uneven, whereas studies in small villages showed the agent to be spread throughout. This pattern seems to correlate with the distribution of the insect *Culicoides paraensis,* which is the main vector of Oro virus.

All outbreaks occurred during the rainy season, and in several localities their decline coincided with the end of this period. In some places virus activity was detected for six months.

Oro virus probably occurs in nature in two distinct cycles: a jungle cycle (vector still unknown), which is responsible for maintaining the virus in nature, where primates, sloths, and possibly certain species of wild birds are implicated as vertebrate hosts; and an urban cycle during which man may be infected and, once infected, probably serves as an amplifying host of the virus among hematophagous insects. Two insect species have been implicated as Oro vectors in urban settings: the ceratopogonid midge *Culicoides paraensis* and the mosquito *Culex quinquefasciatus.* Transmission studies from hamster to hamster have demonstrated that the former was the more efficient of the two vectors. Furthermore, recent findings showed that *C. paraensis* can transmit the virus from man to hamster, thus providing conclusive evidence of the insect's role as a vector of this important arbovirus disease. Methods for the control of *C. paraensis* will have to be developed in order to prevent or interrupt epidemics, particularly in view of the increasing activity of Oro virus in urban centers of the eastern Amazon region and the first report of an epidemic in the western part, where the large city of Manaus was extensively affected. It is also possible that Oropouche fever may spread to other areas, since *C. paraensis* is widely distributed throughout South America, Central America, Mexico, and the eastern United States.

(*Source:* Viral and Rickettsial Diseases, Communicable Diseases Control, Division of Disease Prevention and Control, PAHO.)

Genital Herpes Infections in North America

All the countries in the Region have limited their concept of sexually transmitted diseases (STDs) to the traditional venereal diseases which include gonorrhea, syphilis, chancroid, lymphogranuloma venereum, and granuloma inguinale. Available information on the severity of STDs in the Region is incomplete and there is a lack of case reporting in many countries. Although a number of countries maintain statistics on reported cases of gonorrhea and syphilis, many do not furnish PAHO with detailed information such as cases by age, or, in syphilis cases, by stage of development.

Determination of the true magnitude of the STD problem is restricted by the coverage and quality of data available on the occurrence of cases and related complications. The importance of these diseases as a public health problem stems from their serious chronic and weakening ef-

fect. New data suggest that other STDs may cause similar or more serious complications than those traditionally recognized. Recent advances indicate the existence of an association between herpes infection and cervical cancer, and between infection by *Chlamydia* and conjunctivitis and pneumonia in the newborn.

Genital herpes infection has received increasing attention in part because of its recurrent nature, the lack of specific definitive therapy, its epidemiological association with cancer of the cervix, the serious consequences of the disease in newborn infants, and the absence of methods to control its spread.

Canada

Because genital herpes is not a notifiable disease in Canada, the incidence of sexually transmitted herpetic infection is relatively unknown. The WHO Virus Reports sent to the Bureau of Microbiology, Laboratory Centre for Disease Control (LCDC), Ottawa, from 26 Canadian laboratories are, however, one source of information on these infections. Although not all physicians send specimens to the laboratories, the highly accurate and detailed diagnostic data contained in these reports have very useful epidemiological applications.

Throughout Canada in 1981 there were 4,542 reports of herpes viruses, almost double the 1980 total of 2,584. Included in these totals are herpes group, herpes simplex virus untyped, herpes simplex type 1, and herpes simplex type 2. Specific identifications of cytomegalovirus, Epstein-Barr virus, and varicella-zoster virus are not included. The "herpes group" category may include some of these viruses as well as herpes simplex.

A total of 2,520 reports involved females and 1,855 males, a 15 per cent difference (167 were unspecified as to sex). The largest percentage involved young adults: 20.4 per cent of the total sample (926) from 20 to 24 years of age, 15.6 per cent (709) from 25 to 29 years of age, and 16.6 per cent (753) from 30 to 39 years of age. The only major difference in the sexes occurred in the age group 15 to 29 where reports involving females predominated.

In Canada, STDs are reported most frequently during the summer months. An analysis of the month of onset of all herpes virus infections showed a low of 6.7 per cent in January and a peak of 10.0 per cent in November. However, when only the reports of specimens from the genital tract were analyzed, there was a low of 5.2 per cent in December and a high of 10.8 per cent in June, a seasonal pattern which follows that of other STDs.

The number of herpes virus reports by the site from which the specimen was taken and the virus type are presented in Table 1. Note that only 10.2 per cent of the reports indicated the type, with approximately the same percentage occurring for both (50.1 for type 1 and 49.9 for type 2).

The site from which the specimen was taken provides important epidemiological information. Over 40 per cent of the specimens were from the genital tract, suggesting a sexually transmitted infection. Some of the specimens isolated from a skin vesicle or wound may also have been sexually transmitted. Not surprisingly, 60.8 per cent of the specimens from the genital tract came from young adults 15 to 39 years of age, the group at the highest risk for acquiring STDs. Therefore, pregnant females in this age group are at greatest risk for transmitting the disease to their offspring.

While herpes simplex type 2 is often associated with genital tract infections and type 1 with nongenital infections, these data demonstrated a crossover effect between the type of virus and the source of the infection: 75.7 per

Table 1. Number of herpes virus reports by site of specimen and virus type, Canadian Virus Laboratories, 1981.

Site of specimen	Herpes group	Herpes simplex not typed	Herpes simplex type 1	Herpes simplex type 2	Total	
					Number	Percentage
Genital tract	55	1,649	35	109	1,848	40.70
Skin: vesicle/wound	189	580	90	76	935	20.60
Nasopharynx	70	160	48	2	280	6.20
Feces	17	20	0	0	37	0.80
Urine	2	8	1	0	11	0.20
Blood	0	4	0	1	5	0.10
Eye	1	3	1	0	5	0.10
Central spinal fluid	1	3	0	0	4	0.10
Postmortem: brain, spinal cord	1	9	4	1	15	0.30
Liver	0	1	0	0	1	0.02
Lung	0	3	0	0	3	0.07
Other (including serology)	106	1,197	53	42	1,398	30.80
Total						
Number	442	3,637	232	231	4,542	99.99
Percentage	9.7	80.1	5.1	5.1		

cent of the typed genital tract specimens were type 2 and 24.3 per cent were type 1.

A total of 25 (0.6 per cent) reports recorded a fatal outcome, but there may have been more than one report from the same fatality. Seven (29 per cent) of the reports with fatal outcomes involved infants less than six months of age, a figure which represents 17.5 per cent of the 40 reports involving infants. Another seven fatalities occurred among those 60 and older. The remaining 11 reported deaths were distributed among the other age groups. Further investigation of the 40 reports involving infants with herpes virus infection is currently under way.

United States

In the United States several attempts have been made to quantitate the magnitude of the problem. However, few States require reporting of herpes infections. In an attempt to measure the problem, the Centers for Disease Control (CDC) obtained data on genital herpes infections from the National Disease and Therapeutic Index (NDTI).

The NDTI survey is a nongovernment national, stratified, random sample of data from patient consultations with physicians in fee-for-service office-based practice in the United States (excluding Hawaii and Alaska). Included in the sample are all consultations between patients and physicians in an office, hospital, or nursing home, or in the form of a house call or telephone conversation. The survey procedures do not include confirmation of the physician's diagnosis. Patients with genital herpes may seek care from other health care facilities and providers, such as hospital emergency rooms, neighborhood health centers, STD clinics, and community hospital out-patient departments which are not included in the survey. Data were available for analysis from the NDTI survey for the years 1966-1979 inclusively.

CDC's *Morbidity and Mortality Weekly Report* (31 (11): 137-139, March 1982) published a report which analized NDTI data. The number and rate of consultations with fee-for-service office-based physicians for genital herpes infection from 1966 to 1979 increased markedly from 29,560 in 1966 to 260,890 in 1979. The rate increased almost nine-fold from 3.4 per 100,000 consultations in 1966 to 29.2 per 100,000 in 1979 (Figure 1).

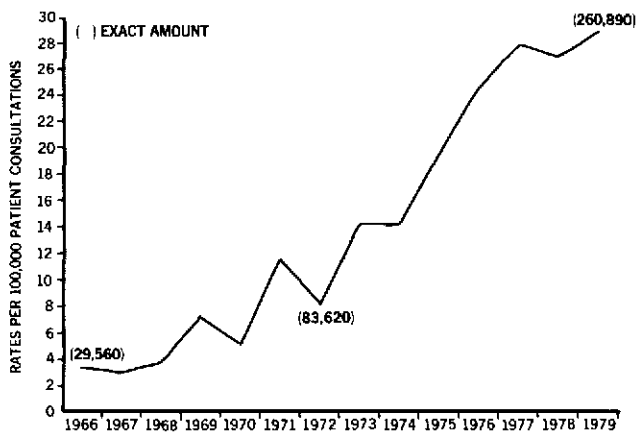
In contrast, the NDTI survey showed a less than two-fold increase in the rate of consultations for oral herpes infection (comprised of conditions cited as herpes labialis and herpetic stomatitis) and for ocular herpes infection. Three other codes used in the NDTI survey are herpes febrilis, herpes simplex, and herpes "not otherwise stated." The trend in the rates of these physician contacts was stable from 1966 through 1979.

The only other national data set available for estimating the number of consultations with U.S. private physicians for herpes infection is the National Ambulatory Medical Care Survey (NAMCS), a study conducted by the National Center for Health Statistics. NAMCS first used a separate code for genital herpes in 1979. The NAMCS estimated number of consultations for all types of herpes infection increased from 838,000 in 1973 (earliest data available) to 937,000 in 1979 (latest data available), an 11.8 per cent increase. For that same period (1973-1979), the NDTI data showed an increase in all types of herpes infection of 9.9 per cent.

The observed increase in the rate and number of consultations for genital herpes infection supports the widely held point of view that the disease has reached epidemic proportions in the U.S. The data do not permit differentiation of first infections from recurrences, and sometimes the atypical nearly asymptomatic nature of some first infections makes this distinction even more difficult. Nevertheless the CDC estimated that some 200,000 to 500,000 new cases occur annually.

To date no drug, vaccine, diet, or other therapy has proven effective in preventing recurrences of the disease. Smallpox, poliomyelitis, BCG, yellow fever, and heat inactivated herpes simplex type 2 (Lupidon G) vaccine have not been effective in decreasing the number of recurrences. Although no clear defects in the immune systems of infected patients have been demonstrated, immune system stimulants or immune regulators, such as L-tetramisole, isoprinosine, and interferon, have been tried without success. Ethyl ether, vitamins B_{12}, C, and E, lactobacilli, 2 deoxy-D-glucose, zinc, lysine, and betadine applied topically may provide some local symptomatic relief, but these agents are likewise ineffective in preventing recurrences. Among antiviral compounds such as idoxuridine, ribavirin, vidarabine, and acyclovir, only

Figure 1. Estimated rates of consultations with private physicians as a result of genital herpes infections, United States of America, 1966-1979.*



*SOURCE: IMS AMERICA, NDTI.

the latter two have some use in the treatment of herpes infections. Vidarabine has been successfully used intravenously and topically for herpes encephalitis and ocular infections, respectively, provided therapy is initiated early in the course of illness. Recently concluded randomized placebo-controlled clinical trials with topical acyclovir demonstrated that the drug does alleviate symptoms and hastens healing of the lesions of first infections. To date, however, it has not been shown to be effective for recurrent infections or that recurrences are prevented.

In summary, available data indicate that an epidemic of herpes simplex type 2 infections is currently taking place in the United States. The lack of a specific cure and methods to control its spread preclude any attempts to interrupt transmission and control the epidemic. Furthermore, the limited available information does not estimate the personal costs in terms of human suffering or the economic costs incurred by desperate patients searching for a cure for their repeated infections.

(*Sources:* Sexually Transmitted Diseases and Treponematoses, Communicable Diseases Control, Division of Disease Prevention and Control, PAHO, and *Canada Diseases Weekly Report* 8(32), 1982, and *MMWR* 31(11):137-139, March 1982).

Rotaviruses

Introduction

Acute diarrheal diseases have long been recognized as a major public health problem throughout the world. Recent technological advances during the past decade, however, have now permitted the identification of viruses in feces during the acute stage of disease. This breakthrough has enabled scientists to assign a viral etiology to many diarrheal episodes in infants, young children, and adults in developed and developing countries.

Rotaviruses have emerged as the single most important worldwide cause of diarrhea in infants and young children requiring admission to hospitals for the treatment of gastroenteritis. Infection with these viruses also accounts, to some extent, for malabsorption and malnutrition in infants, especially in developing countries. Identification, characterization, and a clearer understanding of rotavirus diarrheas is necessary in order to find measures to prevent their transmission and, most importantly, to develop suitable vaccines and appropriate technologies which can be effectively adapted to the needs of all countries.

This article is the first of a two-part series which reviews new knowledge and understanding of many aspects of rotavirus diarrheas. Part I deals with the clinical features and epidemiology of rotavirus. Part II will present laboratory methods for the detection and identification of rotaviruses.

The Virus

In 1973 rotavirus was first detected in a human reservoir in Melbourne, Australia, by thin-section electron microscopic examination of duodenal biopsies obtained from children with acute diarrhea. Shortly afterwards, in Australia, Canada, the United Kingdom, and the United States, it was detected by electron microscopic examination of diarrheal stool specimens. The virus is 70 nM in size, contains RNA, and has an inner and outer capsid. The name is derived from the Latin word "rota," meaning wheel, which it resembles in appearance. It has also been referred to as "orbivirus," "duovirus," "reovirus-like agent," and "infant gastroenteritis virus."

Clinical Features of Rotavirus

The incubation period of rotavirus enteritis ranges from one to seven days, and is usually less than 48 hours. Excretion of rotavirus frequently precedes the onset of symptoms; however, in severe infection this has been observed more frequently in males than in females, as is the case with many other diseases in the early years of life.

The symptoms of enteritis vary according to the age of the patient and present similar characteristics to those seen in infections with other enteric pathogens. In newborn babies, diarrhea may be minimal with mild transient temperature elevation. In this case, treatment is usually not required, although infected babies may be slow to regain their birth weight. In infants and young children, the onset of disease is usually marked by explosive and watery diarrheas, often accompanied by mucus which is found in the stool in approximately 25 per cent of cases. Vomiting is often a prominent early symptom and may precede diarrhea. In addition, mild temperature elevation occurs