VIRGINIA
EPIDEMIOLOGY BULLETIN

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July 1994

Volume 94, Number 7

Recommendations of the U.S. Public Health Service Task Force on the Use of Zidovudine to Reduce Perinatal Transmission of Human Immunodeficiency Virus*

Summary

These recommendations update the interim guidelines developed by the U.S. Public Health Service for the use of zidovudine (ZDV) to reduce the risk for perinatal transmission of human immunodeficiency virus (HIV) infection. The recently reported results of AIDS Clinical Trials Group Protocol 076 demonstrated that ZDV administered to a selected group of HIV-infected pregnant women and their infants can reduce the risk for perinatal HIV transmission by approximately two-thirds. The regimen used in this trial included antenatal oral administration of ZDV beginning at 14-34 weeks of gestation and continuing throughout pregnancy, followed by intrapartum intravenous ZDV and postnatal oral administration of ZDV to the infant for 6 weeks after delivery.

This document summarizes the results of the trial, discusses limitations in the interpretation of the results, reviews the potential long-term adverse effects of this ZDV regimen for infants and women, and provides recommendations for the use of ZDV to reduce perinatal transmission and for medical monitoring of pregnant women and infants receiving this therapy. Because the clinical status of many HIV-infected women may differ from that of the women in this trial, the recommendations should be tailored to each woman's clinical situation. The potential benefits, unknown long-term effects, and gaps in knowledge about her specific clinical situation must be discussed with the woman. This information is intended to provide a basis for discussion between the woman and her health-care provider so that the woman can weigh the risks and benefits of such therapy and make informed decisions about her treatment.

Introduction

Worldwide, perinatal (i.e., mother-to-infant) transmission accounts for most human immunodeficiency virus (HIV) infections among children. In the United States, approximately 7,000 infants, 1,000-2,000 of whom are HIV infected, are born to HIV-infected women each year. In the United States, HIV is currently the seventh leading cause of death in children 1-4 years of age and the fourth among women 25-44 years of age.

The ideal approach to reducing perinatal transmission is to prevent HIV infection among women. However, despite ongoing efforts to provide education about HIV prevention, the incidence of infections among women of reproductive age in the United States is increasing in some areas. In the United States, where safe alternatives to breast milk are available, HIV-infected women are advised to refrain from breastfeeding to avoid postnatal transmission of HIV to their infants. However, refraining from breastfeeding will not prevent transmission occurring in utero or intrapartum, and strategies to reduce transmission during these periods are being evaluated.

The recently reported interim results of the Acquired Immunodeficiency Syndrome (AIDS) Clinical Trials Group (ACTG) Protocol 076, a clinical trial sponsored by the National Institutes of Health in collaboration with the National Institute of Health and Medical Research and the National Agency of Research on AIDS in France, indicate that zidovudine (ZDV) administered to a selected group of HIV-infected pregnant women and their infants can reduce the risk for perinatal HIV transmission by approximately two-thirds. This use of ZDV has the potential to substantially reduce the rate of perinatal transmission, which would reduce overall child mortality. However, the results of this study are directly applicable only to HIV-infected women with characteristics similar to those of the women who entered the study, and the long-term risks of ZDV used in this manner are not known.

On June 6-7, 1994, the U.S. Public Health Service convened a workshop, "Use of ZDV to Prevent Perinatal HIV Transmission (ACTG Protocol 076): Workshop on Implications for Treatment, Counseling, and HIV Testing." The medical, scientific, public health, and legal communities and interested professional, community, and advocacy organizations were represented. The workshop addressed two issues related to the results of ACTG Protocol 076: a) treatment recommendations for the use of ZDV to reduce perinatal transmission of HIV and b) the implications of the trial results for HIV counseling and testing.

This report summarizes the conclusions of the workshop with regard to the use of ZDV to reduce perinatal transmission, provides recommendations for treatment options for HIV-infected pregnant women and their newborns and medical monitoring for pregnant women and neonates receiving ZDV, and discusses issues related to long-term follow-up of women and their children who have received ZDV.

Background

Summary of Results of ACTG Protocol 076

On February 21, 1994, the National Institute of Allergy and Infectious Diseases (NIAID) and the National Institute of Child Health and Human Development announced the interim results of a randomized, multicenter, double-blind, placebo-controlled clinical trial, ACTG Protocol 076. Eligible participants were HIV-infected pregnant women at 14-34 weeks of gestation who had received no antiretroviral therapy during their current pregnancy, had no clinical indications for antepartum antiretroviral therapy, and had CD4+ T-lymphocyte counts greater than or equal to 200/uL at the time of entry into the study (see Table_B1). The study began in April 1991; as of December 20, 1993, the time of the interim analysis, 477 women had been enrolled and 421 infants born. The racial/ethnic distribution of the HIV-infected women enrolled in the trial was similar to that of the total population of HIV-infected women in the United States.

Enrolled women were assigned randomly to receive a regimen of either ZDV or placebo. The ZDV regimen included oral ZDV initiated at 14-34 weeks of gestation and continued throughout the pregnancy, followed by intravenous ZDV during labor and oral administration of ZDV to the infant for 6 weeks after delivery (see Table_B2). The placebo regimen was administered identically. Blood specimens were obtained for HIV culture from all infants at birth and at 12, 24, and 78 weeks of age. A positive viral culture was considered indicative of HIV infection. Sera from the infants at 15 and 18 months of age also were tested for HIV antibody.

The Kaplan-Meier method was used to estimate the rate of perinatal transmission at 18 months of age among the 364 children whose HIV infection status was known on the basis of culture and who therefore were included in the interim analysis. The estimated transmission rate was 25.5% among the 184 children in the placebo group (95% confidence interval {CI}=18.4%-32.5%), compared with 8.3% among the 180 children in the ZDV group (95% CI=3.9%-12.8%). The difference in the estimated transmission rate between the two groups was statistically significant (p=0.00006). ZDV treatment did not appear to delay the diagnosis of HIV infection.

Observed toxicity specifically attributable to ZDV was minimal among the women in this study. Adverse effects such as anemia, neutropenia, thrombocytopenia, and liver chemistry abnormalities were reported as frequently among women receiving placebo as among women receiving ZDV. Six women -- three in each treatment group -- discontinued therapy because of toxicity attributed to the study drug. The women were evaluated at 6 weeks and 6 months postpartum. A statistically significant increase in CD4+ T-lymphocyte count from baseline to 6 weeks postpartum was observed for women in both ZDV and placebo treatment groups; this increase was greater among women in the ZDV group. At 6 months postpartum, the CD4+ T-lymphocyte counts for both groups had decreased to similar levels. CD4+ T-lymphocyte counts decreased to less than 200/uL in only four women, including one receiving ZDV and three receiving placebo. No women died during the study.

Serial sonographic evaluations for fetal growth and amniotic fluid volume as conducted in the study (at entry and every 4 weeks from 28 weeks of gestation until delivery) demonstrated no differences between pregnancies in women who had received placebo or ZDV. Birth parameters (gestational age; birth weight, length, and head circumference; and Apgar scores) were similar among infants born to women in either group. The median birth weight was 3,160 g (range: 1,040-5,267 g), and the median gestational age at birth was 39 weeks (range: 27-43 weeks). No statistically significant difference was observed between the ZDV and placebo groups in the number of infants with birth weight less than 2,500 g, who were small or large for gestational age, or who were born prematurely. The occurrence of major or minor congenital abnormalities was approximately equal between the two groups, and no pattern in the type of abnormalities was observed.

The infants in the study tolerated the ZDV therapy well. The only adverse effect observed more frequently among infants in the ZDV treatment group was mild, transient anemia. Hemoglobin values for infants in the group receiving ZDV were lower than for the group receiving placebo, with a maximum mean difference of 1 gm/dL occurring at 3 weeks of age. The lowest mean hemoglobin value in infants receiving ZDV occurred at 6 weeks of age and resolved without therapy for anemia after the infants had completed the ZDV treatment. The hemoglobin values of infants receiving ZDV were similar to those of placebo recipients by 12 weeks of age. The incidence of neutropenia and serum chemistry abnormalities was similar between ZDV and placebo groups of infants, and no difference in the pattern of chemistry abnormalities was observed.

Based on these interim findings, NIAID accepted the recommendation of its independent data and safety monitoring board to terminate enrollment into the trial and to offer ZDV to women in the placebo group who had not yet delivered and to their infants up to 6 weeks of age.[†] Follow-up of patients enrolled in the study is ongoing.

Table_B1. Eligibility criteria for HIV-infected pregnant women participating in AIDS Clinical Trials Group Protocol 076

- Pregnancy at 14-34 weeks of gestation.
- No antiretroviral therapy during the current pregnancy.
- No clinical indications for antenatal antiretroviral therapy.
- CD4+ T-lymphocyte count greater than or equal to 200 cells/uL at the time of entry into the study.

Table_B2. Zidovudine regimen from AIDS Clinical Trials Group Protocol 076

- Oral administration of 100 mg of zidovudine (ZDV) five times daily, initiated at 14-34 weeks of gestation and continued throughout the pregnancy.
- During labor, intravenous administration of ZDV in a 1-hour loading dose of 2 mg per kg of body weight, followed by a continuous infusion of 1 mg per kg of body weight per hour until delivery.
- Oral administration of ZDV to the newborn (ZDV syrup at 2 mg per kg of body weight per dose every 6 hours) for the first 6 weeks of life, beginning 8-12 hours after birth.

Limitations in Interpretation and Extrapolation of ACTG Protocol 076 Results

This clinical trial demonstrated that the ACTG Protocol 076 ZDV regimen can substantially reduce perinatal HIV transmission. However, several important limitations should be noted. First, perinatal HIV transmission was still observed despite drug therapy. Second, the efficacy of this therapy is unknown for HIV-infected pregnant women who have advanced disease, who have received prior antiretroviral therapy, or who have ZDV-resistant virus strains. Third, although the ZDV regimen used in this trial was not associated with serious short-term adverse effects, such effects may be observed when this use of ZDV becomes more widespread. Fourth, the long-term risks for the child associated with exposure to ZDV in utero and early infancy have not been determined. Fifth, it is not known if use of ZDV during pregnancy will affect the drug's efficacy for the woman when it becomes clinically indicated for her own health.

FULL REPORT AVAILABLE

"Recommendations of the U.S. Public Health Service Task Force on the Use of Zidovudine to Reduce Perinatal Transmission of Human Immunodeficiency Virus" (MMWR, 1994; 43(RR-11);1-20) also includes:

- **recommendations concerning medical monitoring for pregnant women and neonates receiving ZDV and**
- **a discussion of issues related to long-term follow-up of women and their children who have received ZDV.**

To receive a copy of the full report call the Office of Epidemiology at (804) 786-6261 or contact the Centers for Disease Control and Prevention, National AIDS Clearinghouse, P.O. Box 6003, Rockville, MD 20850; telephone: (800) 458-5321.

Further complicating the incorporation of this ZDV regimen into clinical practice is the fact that some HIV-infected women seek medical care late in pregnancy or when they are already in labor, when the full ZDV regimen used in ACTG Protocol 076 cannot be administered. Moreover, many pregnant women are not aware that they are HIV infected, are not tested before or during pregnancy, and remain undiagnosed. As a result, they do not receive information about therapy that could reduce the risk for HIV transmission to their infants.

Potential Long-Term Adverse Effects of ZDV Administered During Pregnancy

The long-term effects of ZDV treatment during pregnancy solely to reduce perinatal transmission or of fetal and neonatal exposure to ZDV are not known. *(A more thorough discussion of this topic can be found in the complete article "Recommendations of the U.S. Public Health Service Task Force on the Use of Zidovudine to Reduce Perinatal Transmission of Human Immunodeficiency Virus". See box insert for information on receiving a full copy of this report.)*

General Principles Regarding Treatment Recommendations

The following treatment recommendations have been formulated to provide a basis for discussion between the woman and her health-care provider about the use of ZDV to reduce perinatal transmission. HIV-infected women should be informed of the substantial benefit and short-term safety of ZDV administered during pregnancy and the neonatal period observed in ACTG Protocol 076. However, they also must be informed that the long-term risks of ZDV therapy to themselves and their children are unknown. A woman's decision to use ZDV to reduce the risk for HIV transmission to her infant should be based on a balance of the benefits and potential risks of the regimen to herself and to her child.

Discussion of treatment options should be noncoercive, and the final decision to accept or reject ZDV treatment recommended for herself and her child is the right and responsibility of the woman. A decision not to accept treatment should not result in punitive action or denial of care, nor should ZDV be denied to a woman who decides to receive the regimen.

Various circumstances that commonly occur in clinical practice are described and the factors influencing treatment considerations are highlighted in the following discussion (see Table_B3). *(A more thorough discussion of this topic can be found in the complete article.)* All potential clinical situations cannot be enumerated, and, in many cases, definitive evidence upon which to base a recommendation is not currently available. Therefore, each pregnant woman and her health-care provider must consider the potential benefits, unknown long-term effects, and gaps in knowledge relating to her clinical situation. Furthermore, health-caregivers and institutions should provide culturally, linguistically, and educationally appropriate information and counseling to the HIV-infected woman so that she can make informed decisions.

Recommendations for Monitoring the ZDV Regimen for Mothers and Infants

Women and their children should receive care together in a family-centered setting. Care should be coordinated between gynecologic, pediatric, internal medicine, infectious disease, and other health-care specialists to ensure that both mother and child receive appropriate medical follow-up. A comprehensive program of support services is necessary to ensure that both mother and child continue to receive health care. *(A more thorough discussion of this topic can be found in the complete article.)*

Conclusion

The decision by an HIV-infected pregnant woman to use ZDV to reduce the risk for perinatal transmission requires a complex balance of individual benefits and risks that is best accomplished through discussions with her health-care provider. Such discussions should be noncoercive, linguistically and culturally appropriate, and tailored to the patient's educational level.

The recommendations in this report have been developed for use in the United States. Although perinatal transmission of HIV infection is an international problem, alternative strategies may be appropriate in other countries. The policy and practice in other countries may differ from these recommendations and depend on local considerations, such as availability of ZDV, ac-

APIC-VA REMINDER!

The Association for Professionals in Infection Control and Epidemiology - Virginia (APIC-VA) is planning its 20th annual educational conference:

1994 and BEYOND

to be held at:

The Lynchburg Hilton, Lynchburg, Va, September 20 - 23, 1994.

Contact: Kathy Bailey, RN, Coordinator, Infection Control;Virginia Baptist Hospital; 3300 Rivermont Avenue; Lynchburg,Va 24503

804/947-4674

cess to facilities for intravenous infusion during labor, and alternative interventions that may be under evaluation.

These recommendations have been developed in response to the urgent need to provide guidance to women and health-care providers in the United States about the use of ZDV to reduce the risk for perinatal HIV transmission and about the possible adverse outcomes of such ZDV treatment. They have been formulated on the basis of the available data from ACTG Protocol 076 and current information regarding factors associated with transmission.

The information on which these recommendations are based is incomplete, and additional information is needed to optimize use of ZDV for this purpose. The decision to use the ACTG Protocol 076 regimen for preventing perinatal transmission of HIV requires weighing the benefits and potential risks to the HIV-infected woman and her child despite numerous uncertainties. Further research is a high priority and should include a) clarification of long-term risks of the ZDV regimen to the woman and/or her child, b) elucidation of the reasons for transmission despite use of the ZDV regimen, c) delineation of the relative efficacy of the various components of the ACTG Protocol 076 ZDV regimen for reducing transmission, d) evaluation of the efficacy of the regimen in women whose characteristics differ from those enrolled in ACTG Protocol 076, and e) evaluation of other interventions for preventing perinatal transmission. As further information becomes available, these recommendations may need to be modified. In addition, appropriate methods and materials should be developed for communicating treatment options, risks, and benefits to women and healthcare providers so that they can make informed decisions about treatment.

**Adapted from: Centers for Disease Control and Prevention. Recommendations of the U.S. Public Health Service Task Force on the Use of Zidovudine to Reduce Perinatal Transmission of Human Immunodeficiency Virus. MMWR 1994;43(RR-11):1-20.*

† A sumary of the study's findings is available from the AIDS Clinical Trials Information Service at 1(800) TRIALS-A (1(800) 874-2572).

Table_B3. Summary: Clinical situations and recommendations for use of zidovudine [§] to reduce perinatal HIV transmission

I. Pregnant HIV-infected women with CD4+ T-lymphocyte counts greater than or equal to 200/uL who are at 14-34 weeks of gestation and who have no clinical indications for ZDV and no history of extensive (greater than 6 months) prior antiretroviral therapy.

Recommendation:

The health-care provider should recommend the full ACTG Protocol 076 regimen to all HIV-infected pregnant women in this category. This recommendation should be presented to the pregnant woman in the context of a risk-benefit discussion: a reduced risk of transmission can be expected, but the long-term adverse consequences of the regimen are not known. The decision about this regimen should be made by the woman after discussion with her health-care provider.

II. Pregnant HIV-infected women who are at greater than 34 weeks of gestation, who have no history of extensive (greater than 6 months) prior antiretroviral therapy, and who do not require ZDV for their own health.

Recommendation:

The health-care provider should recommend the full ACTG Protocol 076 regimen in the context of a risk-benefit discussion with the pregnant woman. The woman should be informed that ZDV therapy may be less effective than that observed in ACTG Protocol 076, because the regimen is being initiated late in the third trimester.

III. Pregnant HIV-infected women with CD4+ T-lymphocyte counts less than 200/uL who are at 14-34 weeks of gestation, who have no other clinical indications for ZDV, and who have no history of extensive (greater than 6 months) prior anti-retroviral therapy.

Recommendation:

The health-care provider should recommend initiation of antenatal ZDV therapy to the woman for her own health benefit. The intrapartum and neonatal components of the ACTG Protocol 076 regimen should be recommended until further information becomes available. This recommendation should be presented in the context of a risk-benefit discussion with the pregnant woman.

IV. Pregnant HIV-infected women who have a history of extensive (greater than 6 months) ZDV therapy and/or other antiretroviral therapy before pregnancy.

Recommendation:

Because data are insufficient to extrapolate the potential efficacy of the ACTG Protocol 076 regimen for this population of women, the health-care provider should consider recommending the ACTG Protocol 076 regimen on a case-by-case basis after a discussion of the risks and benefits with the pregnant woman. Issues to be discussed include her clinical and immunologic stability on ZDV therapy, the likelihood she is infected with a ZDV-resistant HIV strain, and, if relevant, the reasons for her current use of an alternative antiretroviral agent (e.g., lack of response to or intolerance of ZDV therapy). Consultation with experts in HIV infection may be warranted. The health-care provider should make the ACTG Protocol 076 regimen available to the woman, although its effectiveness may vary depending on her clinical status.

V. Pregnant HIV-infected women who have not received antepartum anti-retroviral therapy and who are in labor.

Recommendation:

For women with HIV infection who are in labor and who have not received the antepartum component of the ACTG Protocol 076 regimen (either because of lack of prenatal care or because they did not wish to receive antepartum therapy), the health-care provider should discuss the benefits and potential risks of the intrapartum and neonatal components of the ACTG Protocol 076 regimen and offer ZDV therapy when the clinical situation permits.

VI. Infants who are born to HIV-infected women who have received no intra-partum ZDV therapy.

Recommendation:

If the clinical situation permits and if ZDV therapy can be initiated within 24 hours of birth, the health-care provider should offer the ACTG Protocol 076 postpartum component of 6 weeks of neonatal ZDV therapy for the infant in the context of a risk-benefit discussion with the mother. Data from animal prophylaxis studies indicate that, if ZDV is administered, therapy should be initiated as soon as possible (within hours) after delivery. If therapy cannot begin until the infant is greater than 24 hours of age and the mother did not receive therapy during labor, no data support offering therapy to the infant.

§ These recommendations do not represent approval by the Food and Drug Administration (FDA) or approved labeling for the particular product or indications in question.

HIV Seroprevalence Study in Women of Childbearing Ages in Virginia

The Centers for Disease Control and Prevention support a national effort to estimate the prevalence of human immunodeficiency virus (HIV) infection among women of childbearing ages. This population-based, blinded seroprevalence study began in Virginia in 1989. The study was designed to take advantage of the fact that all states require testing of newborn infants to rule out the presence of several metabolic diseases. Once the required tests have been run, the samples, minus all identifiers, are tested for the presence of antibodies to HIV. In the newborn, the presence of antibodies indicates infection in the mother but not necessarily infection in the infant. By examining these samples, prevalence rates for HIV infection among women of childbearing age can be estimated.

During 1993 in Virginia, in women between the ages of 15 and 44, the serosurvey detected 92 HIV positive samples out of 80,908 tested, resulting in a prevalence rate for HIV infection in that group of women of 1.14 per 1,000. The transmission rate of HIV from mother to infant is estimated to be between 20 and 30 percent. Therefore, approximately 18-27 HIV-infected infants were born to these women in 1993.

The serosurvey data can be used to estimate the number of HIV-infected women, between the ages of 15 and 44 years, in the geographic regions of Virginia (Table 1) as well as in various demographic groups (Figures 1 and 2).

The results of this survey are used to assist the Virginia Department of Health in determining the need for services in different areas of the state and among different groups. All women using health department maternity clinics are counseled on the importance of being tested for HIV and are strongly encouraged to undergo testing. If the results of the HIV testing are positive, treatment with zidovudine (ZDV) is recommended according to the CDC guidelines set forth. For women who cannot afford to pay for this treatment, the health department will provide the ZDV if they satisfy the following criteria:

- Are certified by a physician to have AIDS or HIV infection (a note to this effect on the physician's prescription blank should suffice).
- Have no third party insurance coverage for the prescribed medication.
- Are ineligible for Medicaid or have a letter from the social service agency that Medicaid is under consideration.
- Have an annual family income not greater than the upper limit of the range for income level E.

For more information on HIV testing and the availability of ZVD for HIV-infected pregnant women or their newborn infants, contact your local health department or call the Virginia Department of Health toll-free Hotline at 1 - (800) 533-4148.

Table 1. Estimate of HIV infections in women between the ages of 15-44 years, Virginia, 1993

Region	# HIV Positive/ # Tested*	Prevalence/ 1,000 (women, 15-44 yrs)	1990 Population (women, 15-44 yrs)	1993 Estimated Infections (rounded) (women, 15-44 yrs)
Central	24 / 13,825	1.74	262,460	460
Eastern	32 / 23,485	1.36	384,707	520
Northern	18 / 18,763	0.96	395,908	380
Northwest	6 / 10,138	0.59	201,078	120
Southwest	10 / 12,205	0.82	289,904	240
State Total	92 / 80,908**	1.14	1,534,057	1,720

**live infants delivered of women between ages 15 and 44 years*
***includes women giving birth in Virginia between ages 15 and 44 years whose residence is unknown*

1993 Estimated Distribution by Age-Group of HIV-Positive Women between 15-44

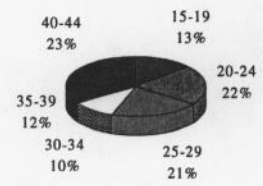

Figure 1

1993 Estimated Distribution by Race of HIV-Positive Women between 15-44

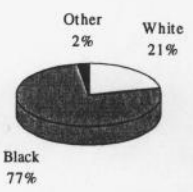

Figure 2

Cases of Selected Notifiable Diseases, Virginia, June 1 through June 30, 1994.*

Disease	Total Cases Reported This Month						Total Cases Reported to Date in Virginia		
		Regions							
	State	NW	N	SW	C	E	This Yr	Last Yr	5 Yr Avg
AIDS	131	11	49	17	35	19	657	903	423
Campylobacteriosis	60	6	12	15	14	13	276	240	249
Gonorrhea†	928	-	-	-	-	-	6246	5698	7932
Hepatitis A	18	1	7	2	2	6	72	66	109
Hepatitis B	13	0	3	4	2	4	60	75	106
Hepatitis NANB	1	0	1	0	0	0	18	20	22
Influenza	3	0	0	3	0	0	819	1020	880
Kawasaki Syndrome	2	0	1	0	1	0	13	13	12
Legionellosis	1	0	0	0	0	1	4	2	6
Lyme Disease	6	1	2	1	1	1	28	25	27
Measles	0	0	0	0	0	0	2	1	25
Meningitis, Aseptic	24	0	3	2	1	18	83	81	88
Meningitis, Bacterial‡	7	0	0	3	0	4	38	49	74
Meningococcal Infections	7	1	0	1	0	5	42	25	29
Mumps	0	0	0	0	0	0	24	16	44
Pertussis	0	0	0	0	0	0	15	13	9
Rabies in Animals	25	5	8	6	2	4	191	189	145
Reye Syndrome	0	0	0	0	0	0	1	0	1
Rocky Mountain Spotted Fever	1	0	1	0	0	0	3	2	3
Rubella	0	0	0	0	0	0	0	0	0
Salmonellosis	64	12	13	5	12	22	389	364	447
Shigellosis	75	4	6	6	34	25	329	231	167
Syphilis (1° & 2°)†	91	4	5	3	14	65	396	312	387
Tuberculosis	35	0	10	4	9	12	176	229	167

Localities Reporting Animal Rabies: Accomack 1 raccoon; Alexandria 1 dog; Amherst 1 raccoon; Appomattox 1 skunk; Arlington 1 bat; Augusta 1 raccoon; Bedford 1 raccoon; Campbell 1 raccoon; Chesterfield 1 raccoon; Fairfax 1 bat, 1 raccoon, 1 skunk; Frederick 1 raccoon; Grayson 1 cow, 1 skunk; Hanover 1 raccoon; King William 1 raccoon; Loudoun 1 skunk; Louisa 1 skunk; Prince William 1 bat, 1 raccoon; Rappahannock 1 fox; Richmond County 1 raccoon; Warren 1 raccoon; York 1 cat.

Occupational Illnesses: Asbestosis 15; Carpal Tunnel Syndrome 47; Coal Workers' Pneumoconiosis 17; Lead Poisoning 1; Loss of Hearing 15; Mesothelioma 1.

*Data for 1994 are provisional.

†Total now includes military cases to make the data consistent with reports of the other diseases.

‡Other than meningococcal.

Published monthly by the
VIRGINIA HEALTH DEPARTMENT
Office of Epidemiology
P.O. Box 2448
Richmond, Virginia 23218

Telephone: (804) 786-6261

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