RABIES VIRUS ISOLATION FROM A BAT IN MONTANA IN MIDWINTER

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RABIES virus has been isolated from 8 of the 13 species of insectivorous bats found in western Montana. Thirty-six rabid bats have been diagnosed in our laboratory since 1954; others have been diagnosed in the laboratories of the Livestock Sanitary Board in Bozeman, Mont. All infected bats identified prior to the one discussed in this paper were obtained in summer and early fall (see table).

On December 14, 1965, a big brown bat (*Eptesicus fuscus*) was taken from a large old house that was undergoing extensive restoration and remodeling. Barking of a dog drew attention to the bat which was on the floor at the entrance to a stair well leading to the second floor and attic. The houseowner thinks that she may have stepped on it. The bat was taken without difficulty.

When brought into the laboratory, the bat had no obvious injury, but it did not accept food as readily as most of its species. Subsequently the bat ate very well for weeks, less well for a few days, and then ate well again until it died on January 5, 1966.

The day after the bat was received, its saliva was collected and injected into white mice. The same day the bat was also induced to bite the thighs of 15-day-old mice. None of these mice became ill.

About 3 days before it died, the bat lost large areas of fur from its chest and back, an unusual occurrence in our experience with keeping this species in captivity. Death occurred suddenly and unexpectedly on the 22d day of captivity; there were no suggestive premonitory signs, such as the coarse tremor sometimes seen in both natural and experimental infection.

Nothing remarkable was found at necropsy; there were no signs of trauma. Suspensions of brain, salivary gland, and brown fat were injected into mice and, starting on the ninth day, mice of each group became ill. Characteristic Negri bodies and specifically fluorescing material were seen in Sellers-stained and FA-stained imprints of mouse brain. The bat's brain was not examined.

In parts of North America where the hibernacula of bats are well established and well known, congregations of many thousands of several species have been studied for years. However, in Montana the winter quarters of only small numbers of a few species are known. In view of the large numbers of hibernating species in the area in summer, and the lack of reports that bats banded in western Montana have been captured in other places, we assume that large groups of bats spend the winter in undetected or unreported hibernacula in this

Seasonal distribution [1] of acquisition of rabies-infected bats at the Rocky Mountain Laboratory

Bats	May	June	July	August	September	October	Total
All species	2	1	4	14	9	5	35
Eptesicus fuscus	1	1	2	5	3	1	13

[1] Earliest capture date May 19, latest capture date Oct. 25.

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area. Consequently, very little is known of the epizootiology of chiropteran rabies in this area in winter.

In areas where overwintering populations have been studied, *Eptesicus* usually hibernates within a few miles of its summer roost because it can find adequate shelter in buildings (*1*). It also hibernates in caves.

Contrary to common belief, hibernation in bats is not necessarily a prolonged state of complete inertia. There is much evidence of movement from one site to another, of eating, and of breeding in midwinter, even in areas as far north as Minnesota (*1*, *2*). Bats (*Myotis* species) have been seen apparently hawking insects in the Centennial Valley in southeastern Montana in November (J. F. Bell and W. Jellison, unpublished data). The temperature registered on the porch of Fish and Wildlife Service Headquarters there at the time was 26° F.

Although the body temperatures of hibernating bats may be identical with ambient temperatures, body temperature can be increased very rapidly in many instances by slight stimuli (*2*). Ordinarily, temperature rise parallels the degree of arousal from torpidity. Thus, the body temperature may be increased as a result of increased environmental temperature or as a result of autonomous increase in metabolism.

It is important to recognize the excursions of activity that occur during hibernation. Various studies have attempted to define the effects of hibernation of bats upon viremia, antibody response, and other events of virus infection (*3*). Undoubtedly, determining these relationships will result in better understanding of the potentials of bats as vectors and reservoirs of infection. However, there are so many variations of conditions within suitable habitats and so many possible responses to varied conditions and stimuli that no artificial conditions can adequately represent the complete range found in nature. We can only hope that other occurrences of rabies in bats in natural hibernacula can be studied more extensively. The occurrence reported here is not unique, since Hitchcock (*1*) also found a rabies-infected *Eptesicus* in New England in December 1964. Thus, it is evident that bat rabies is not strictly a warm season event, but may be encountered at any time of year, even in the North Temperate Zone.

REFERENCES

(*1*) Hitchcock, H. B.: Bat rabies in New England. Proc Northeast Wildlife Conference, Harrisburg, Pa., Jan. 19, 1965.

(*2*) Swanson, G., and Evans, C.: The hibernation of certain bats in Southern Minnesota. J Mammal 17: 39–43 (1936).

(*3*) Sulkin, S. E., Allen, R., Sims, R., and Taylor, S. K.: Bats in relation to arthropod-borne viruses: An experimental approach with speculations. Amer J Public Health 55: 1376–1385 (1965).

Artificial Kidney Demonstration Centers

Awards totaling $743,895 for the establishment of community artificial kidney demonstration centers have been made by the Public Health Service to the University of Louisville School of Medicine, Louisville, Ky.; Wayne County General Hospital, Eloise, Mich.; and University of Mississippi Hospital, Jackson, Miss. With these grants, the number of such programs receiving partial Federal support is raised to 14.

The centers, which will provide additional experience with the life-saving artificial kidney treatment, will also play a major role in training professional and technical personnel in its use. In addition, the centers will do developmental research directed toward reducing the cost of artificial kidney treatment from the present $10,000–$15,000 annual cost per patient.

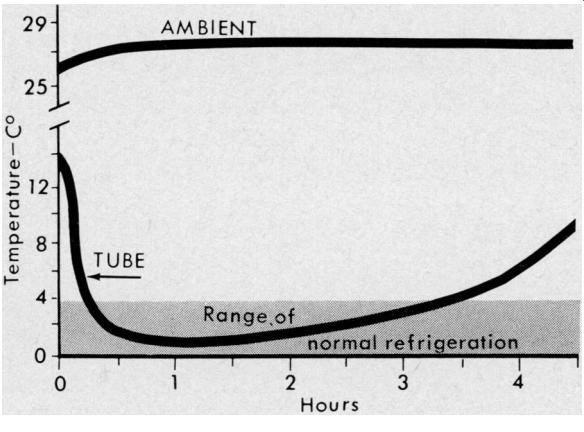
GRANTEE INVENTIONS

Portable Test Tube Cooler and Rack

The device is a modification of a test tube rack manufactured by Endicott Seymour Co., Ann Arbor, Mich. Its function is to maintain tubes containing heat-labile substances at refrigerator temperature in a nonrefrigerated room. The device is constructed by filling a test tube rack consisting of a polyethylene shell with a substance of high specific heat, such as one of the new liquid plastics. The bottom is sealed with a sheet of polyethylene so that the gel does not escape and a lip is formed around the base to collect water of condensation. Construction is simple and should present no problems to the ordinary laboratory.

The test tube racks are stored in a deep freezer or in the freezer portion of a refrigerator at a temperature of about −15° C. When required, they are removed and loaded with tubes, which can be used at ordinary room temperatures or transported from building to building with assurance that the contents will remain cold for several hours.

The graph illustrates the efficiency of the unit. A tube containing 10 ml. of warm water (25° C.) was placed in a chilled rack at time zero and the temperature of the water was checked frequently. After 15 minutes, the water had cooled to a temperature of 0 to 4° C. and remained within these limits for more than 3 hours. This period is adequate for most manipulations, but if the tubes must be exposed for a longer time, they can simply be transferred to another chilled rack.



Pilot models of the rack have proved successful. Many operations such as serial dilution, titration, transportation, filling and changing of centrifuge tubes, and serologic manipulation do not require a cold room and, therefore, can be performed with increased operator comfort and convenience.—CHARLES W. DANIEL, *assistant professor of biology, University of California, Santa Cruz. This invention was developed under Public Health Service grant No. 2 TI-CA-5045.*

Manually Operated Memory Drum

The manually operated memory drum is a 4½-inch square plastic box with a depth of 1½ inches, including base and overlapping lid. In the lid is an aperture 5/16 inch wide and 3 inches long located 1½ inches from one edge.

A plastic dowel 4½ inches long and 0.955 inch in diameter is situated under the aperture in the base of the box. Spaced evenly around the circumference of one end of the dowel are six V-shaped cuts ⅜ inch long. The dowel is held in position by ¼-inch brass rods, 1½ inches long, which extend approximately ½ inch outside the base of the box. Attached to these protruding ends are 1-inch knurled plastic knobs, which are used to rotate the dowel.

A plastic rachet fastened inside the base of the box engages the V-shaped grooves in the end of the dowel. As the dowel is turned, the rachet provides a positive stop for every ½-inch movement along the circumference of the dowel.

Items are typed (double spaced) on 3-inch adding machine tape which is placed in a roll in front of the dowel. The tape runs between a pressure roller which bears on the surface of the dowel, preventing tape slippage, and the aperture. The tape is then fastened to a ¼-inch

wooden dowel which serves as a takeup reel. A small rubber band looped between the plastic and wooden dowels provides takeup tension.

The memory drum may be used for group data collection for the following learning tasks: (*a*) free recall, each subject receives a different list or a different order of the items of a list; (*b*) paired-associate learning, recall method; and (*c*) any situation when subjects are required to give successive responses to material presented via a projector or tape recorder.—BURTON H. COHEN, Ph.D., *associate professor of psychology, Lafayette College, Easton, Pa.* *This invention was supported under Public Health Service grant No. MH–07095.*

Automatic Slit Control System

This system controls the slit opening of a single-beam infrared spectrometer so the background energy reaching the sample remains approximately constant as the wavelength of the spectral radiation reaching the detector is varied. It utilizes simpler electrical circuits, is easy to use, and is less expensive than other slit-control systems. Developed for use with a Perkin-Elmer model 12–C spectrometer, the system can be adapted for use with other spectrometers.

The wavelength drum of the spectrometer is coupled by a gear to the shaft of a 10-turn linear helipot, which is part of the wavelength helipot circuit. As the wavelength drum rotates during scanning of the spectrum, this circuit generates a d.c. input signal voltage varying nonlinearly with rotation. The input signal voltage is compared with the measuring voltage generated in the slit helipot circuit and any difference between the two is fed into the electrical chopper (vibrator) as an error signal.

The chopper converts the d.c. error signal into an a.c. balancing signal, which is amplified and used to drive the servomotor. When the input signal voltage exceeds the measuring voltage, the servomotor drives the slits open through a gear train and at the same time turns the shaft of the linear 10-turn slit helipot. This increases the measuring voltage generated in the slit helipot circuit, thus reducing the error signal and bringing the slit opening to the desired value.

This system is a modification of the servo unit of a commercial Varian G–10 recorder (Instruments Division, Varian Associates, Palo Alto, Calif.). It was built on the Varian recorder chassis, maintaining unchanged the Varian chopper, a.c. amplifier, and servomotor. The linear Varian measuring circuit was modified to obtain the nonlinear characteristic desired for the wavelength helipot circuit, and a nonlinear slit helipot circuit was added.—DR. DONALD E. DEGRAAF, *associate professor, department of physics, Flint College, University of Michigan, Flint, Mich.* *This invention was developed under Public Health Service grant No. AM–4095.*

PHR SYNOPSES

ABELES, HANS (New York City Department of Correction), PLEW, RALPH, LAUDEUTSCHER, IRVING, and ROSENTHAL, HARVEY M.: ***Multiple drug addiction in New York City in a selected population group. A statistical review. Public Health Reports, Vol. 81, August 1966, pp. 685–690.***

Among 7,855 men admitted to three detention institutions of the Department of Correction of New York City during the 2-month period July 1–August 31, 1965, a total of 759 (9.7 percent) were drug users. Among 1,277 women admitted, representing all female detention cases in New York City during the same period, a total of 480 (37.6 percent) were drug users. Of the 1,231 drug users of both sexes for whom adequate information was available, 523 used two drugs and 101 used three or more drugs. Thus, approximately 50 percent of all drug users were addicted to more than one drug.

Heroin addiction was found in 93 percent of the drug-using inmates. The most common second drug used was a barbiturate; 490 (40 percent) of the drug users took barbiturates. Combined heroin and barbiturate addiction was more often found in male drug users above the age of 20 than in female drug users of the same age group. Approximately 20 percent of the female drug-dependent inmates used amphetamine-type drugs, compared with only 3 percent of the male drug-dependent inmates.

Addicts to multiple drugs, particularly when one of the drugs is a barbiturate, may present various syndromes during drug withdrawal. In the barbiturate user, these withdrawal symptoms may include life-threatening convulsive seizures which require immediate and appropriate treatment.

NESBITT, ROBERT E. L., Jr. (Upstate Medical Center, State University of New York), SCHLESINGER, EDWARD R., and SHAPIRO, SAM: ***Role of preventive medicine in reduction of infant and perinatal mortality. Public Health Reports, Vol. 81, August 1966, pp. 691–702.***

The relatively stationary perinatal mortality rates in the United States during the past decade or more emphasize dramatically the need for broadening and intensifying the medical care of females and for providing such care on a continuing basis. Care should preferably begin in childhood, or at least at pubescence, so that groups at high risk in pregnancy and at childbirth may be identified and given intelligent workups and therapy and pregnancies can be planned in relation to the health status of the prospective mother.

Traditional patterns of prenatal care and care of the newborn need to be reorganized and elevated. The total medical resources of the community need to be rallied by bringing together all maternal and child health workers in an effective way so that broad service programs can be established in line with the changing patterns of American life. Professional and lay education must be intensified to assure successful implementation of such communitywide programs and an equal opportunity for successful childbearing among all segments of the population.

Wider dissemination of what is now known about maternity care and care of the newborn, the rapid monitoring of vital records to detect events at variance with the anticipated, and prompt translation of new knowledge into applied service programs are essential features of this intensified effort to break the stalemate which has arisen in the fight against reproductive waste.

PHR SYNOPSES

WEBSTER, DANIEL P. (Public Health Service): *Skin and scuba diving fatalities in the United States. Public Health Reports, Vol. 81, August 1966, pp. 703–711.*

At least 86 Americans, above average in athletic and aquatic ability, drowned in underwater diving in 1965. Newspaper reports studied by a staff member of the Public Health Service's Division of Accident Prevention revealed peaks in drownings in periods May through August, during weekends, and at ages 21 to 25. Thirteen victims were under age 18. Florida with 21 victims and California with 19 led 28 States in the number of victims. Of the 86 victims, 26 were skin divers (24 male) ages 11 to 49, and 60 were scuba divers (58 male) ages 14–59. Almost half of the drownings took place in oceans, gulfs, and bays; inland waters were next in the number of incidents; three drownings occurred in swimming pools.

Violations of accepted safe practices included diving alone, not diving in pairs, diving under adverse weather or water conditions, and lacking or failing to use emergency equipment. Revival chances were poor; 30 minutes elapsed before two-thirds of the victims were found.

FREDERIKSEN, HARALD (U.S. Agency for International Development): *Determinants and consequences of mortality and fertility trends. Public Health Reports, Vol. 81, August 1966, pp. 715–727.*

Review of the case histories of Ceylon, Mauritius, British Guiana, the United States, France, and Japan, in early or late stages of demographic transition, confirms and extends the validity of the findings of a cross-national study of the dynamics of transition in 21 more developed or less developed countries for which comparable data on economic and demographic variables are available over a period of time as well as at a point in time in the postwar era.

After logarithmic transformation of the variables, mortality varies inversely with economic indicators of the levels of living. In a balancing movement, fertility tends toward approximate equilibrium with mortality; that is, toward a rate of net reproduction above the replacement level, but near unity.

The feedback mechanism of this rational system of homeostasis has been obscured by relating the reduction in fertility to improvements in economic components of the levels of living when, in fact, a deliberate reduction in fertility is a sequel to a reduction in mortality which develops individual and collective motivation as well as the need for a commensurate restraint of fertility. Moreover, the extension of health services provides facilities for the extension of family planning.

With increased longevity increasing the returns from the development of human resources and decreased fertility decreasing the burdens of dependency, the maximum improvement in the levels of living as well as the desired changes in mortality and fertility will result from the synergism of optimum efforts in the demographic as well as the economic aspects of economic and demographic transition.

PHR SYNOPSES

SULZER, ALEXANDER J. (Public Health Service), and CHISHOLM, EMILY S.: ***Comparison of the IFA and other tests for Trichinella spiralis antibodies. Indirect fluorescent antibody tests for parasitic diseases. Public Health Reports, Vol. 81, August 1966, pp. 729–734.***

The indirect fluorescent antibody (IFA) test for detection of antibodies to *Trichinella spiralis* has been evaluated and found reproducible, sensitive, and specific. Of 1,302 serums from suspected human cases of trichinosis tested at the Communicable Disease Center, Public Health Service, 24 percent were positive by the indirect fluorescent antibody test, and 20 percent were positive by the bentonite flocculation (BF) test. Twenty-two serums that were negative by IFA were positive by BF; 66 that were positive by IFA were negative by BF.

A statistical study of internal reproducibility of the IFA and BF tests showed the IFA to be at least the equal of the BF in this respect. With 48 rat serums, 18 from animals not infected with *T. spiralis* and 30 from animals with infections proved by autopsy, both BF and IFA tests gave negative results on the 18 serums from unexposed animals. Of the 30 serums from known positive rats, 18 were positive by BF and 28 positive by IFA. On serums of pigs with known *T. spiralis infections*, the IFA test detected antibodies 1 week earlier than the Suessenguth-Kline, charcoal agglutination, bentonite flocculation, and latex tests; only the charcoal agglutination test continued to give positive results as long after infection as the IFA test.

These results, supplemented by those of Labzoffsky (1964) and Sadun (1962), indicate that the IFA test is better than any other serologic procedure for detection of antibodies to *T. spiralis* in animal serums and for detection of such antibodies in both animal and human serums during the early stages of infection.

ANDERSON, URSULA M. (Erie County Health Department), and WINKELSTEIN, WARREN, Jr.: ***Immunization status of school children in Buffalo, N.Y., 1953 and 1963. Public Health Reports, Vol. 81, August 1966, pp. 755–759.***

Because artificially induced immunity can alter community and personal susceptibility to disease, knowledge of the immunization status of the population is important. Children entering school offer a good opportunity for study. A sampling by the Erie County Health Department of children entering six city of Buffalo public schools in 1963 showed that they were adequately immunized against diphtheria, tetanus, whooping cough, and poliomyelitis, but inadequately protected against smallpox.

The school immunization program is an effective means of establishing immunity against smallpox and of maintaining immunity against diphtheria, whooping cough, tetanus, and poliomyelitis. Comparison of the cohorts of children who entered six Buffalo public schools in 1953 and 1963 showed that for diphtheria and tetanus the level of protection remained about the same. Protection against whooping cough increased, but protection against smallpox decreased. The decreased protection against smallpox is a matter of concern and reveals the need for public education. A matter of equal concern is the difficulty encountered in obtaining information on the immunization status of each child. Central files and record-linkage systems are suggested for improved recordkeeping.