Communitywide Campaign on Rabies in Dumaguete City, Philippines

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RABIES is responsible for more suspected or actual cases of human exposure requiring medical attention than any other zoonotic disease in the Philippines (*1*). It ranks among the 10 most frequent causes of animal mortality from infectious diseases (*2*) and among the 20 most prevalent reportable infectious diseases in man (*3a*). The primary animal host of rabies in the Philippines is the dog; probably 25,000 dogs die of the disease each year. Rabies occurs sporadically in cattle, swine, cats, and other domestic animals, but such cases can usually be traced to exposure to rabid dogs.

Wildlife rabies is rarely reported in the Philippines. Extensive hunting and destruction of wildlife habitats by the expanding population have greatly reduced populations of monkeys, wild pigs, deer, and other medium-size to large-size wild mammals. Mongooses have been reported only from Palawan and adjacent islands, and even there populations are small (*4*). Rats and bats are the most numerous of Philippine mammals. Rabies, however, is rarely reported in rats, and there have been no reports of human rabies following bat bites in the Philippines. Preliminary results of a survey now being conducted by Silliman University, Dumaguete City, on free-living and cave-dwelling bats have demonstrated neither rabies virus nor antibodies against this virus in 80 bats collected in Negros Oriental Province nor in 293 bats collected in Davao Province. The vampire bat has not been reported in mammalian surveys conducted throughout the Philippines (*4*, *5*).

Annual reported incidence of human rabies in the Philippines has ranged between 210 and 310 cases; during the period 1958–62, a total of 1,248 human deaths were reported (personal communication from Dr. J. Dizon, Disease Intelligence Center, Manila, 1964). The human mortality from rabies for the year 1964 was the highest on record, with 307 reported deaths (*6*). In 1958, a total of 145,439 persons began human antirabies prophylactic vaccinations following animal bites (*3b*). In nearly all of these series, 2 percent inactivated vaccine of goat-brain origin was used. Approximately 90 percent of the human rabies vaccination series followed dog bites, approximately 5 percent followed cat bites, and 1 percent or less followed bites by each of four groups—monkeys, pigs, rats, and other mammals. Approximately 5 percent of patients receiving vaccine reported mild reactions—malaise, headache, nausea, and vomiting—in descending order of frequency. Paralytic reactions were rarely reported, although fatal paralytic reactions have been known to occur.

Negros Oriental, the eastern section of Negros

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Island in the central Philippines, has an area of approximately 4,570 square kilometers and a population of about 600,000 people. The capital, Dumaguete City, has a population of about 35,000. Before the rabies control program described here was initiated, approximately 1,500 series of human antirabies vaccinations were begun annually in the province and approximately 400 additional series in Dumaguete City. Annual incidence of human rabies in the province was about five cases per year; one human case was reported approximately every 2 years among Dumaguete City residents. These statistics revealed an incidence of antirabies vaccinations and of rabies cases in Negros Oriental Province and Dumaguete City that, based on population, was approximately average for the Philippines for the same period.

Although vaccination of individual dogs had been practiced for a number of years in Dumaguete City, less than 1 percent of the dogs were properly immunized at the start of our antirabies campaign. The municipal sanitary code required annual vaccination against rabies and the licensing of dogs, but this provision was not enforced. Similarly, no adequate dog vaccination or control measures were in effective operation in the province.

Rabies Control Ordinance

The need for an adequate rabies control program in Dumaguete City was brought to the attention of the municipal board on March 4, 1964, following three human deaths from rabies in a neighboring town during December 1963 and January 1964. All three decedents had been bitten by a single rabid dog during October 1963 and had received proper post-exposure antirabies prophylactic vaccination.

The Mayor of Dumaguete City appointed a committee comprised of personnel from private and city public health agencies and of members of the municipal board to investigate further the need for a rabies control program in the city and to make recommendations. In addition to stating the need for effective rabies control, the committee report, presented on March 31, 1964, included a recommendation that a dog vaccination and control campaign be conducted in Dumaguete City. The committee recommended use of imported attenuated live-virus vaccine of chick-embryo origin. This vaccine is effective for 3 years (*7*) compared with the 6 to 12 months effectiveness (*8*) of the 10 percent vaccine of goat-brain tissue produced locally. Because of the cost of administering the vaccine, the longer period of immunity was considered important. The committee recommended drafting and passing a specific ordinance on antirabies vaccination and animal control within the city and submitted an outline for such an ordinance, based in part on similar measures which communities in other countries had successfully implemented.

On April 22, 1964, the Dumaguete City Municipal Board passed an ordinance modeled on the committee's proposal. Essential provisions of the ordinance were the following:

1. All dogs more than 5 months of age must be vaccinated with the prescribed attenuated live-virus vaccine at 3-year intervals.
2. Vaccination may be done by private veterinarians or by representatives of the city health office.
3. Following vaccination or upon certification of vaccination by a veterinarian, an official certificate shall be prepared by representatives of the city health office and a license tag issued, which shall be carried by the dog.
4. To initiate the program and whenever necessary thereafter, a citywide dog vaccination campaign may be conducted by the city health office in conjunction with the city livestock inspector's office.
5. The vaccination and licensing fee shall be P 1.50 (U.S. $0.38) for each dog except that persons certified as indigent by the city treasurer's office may receive the service without charge.
6. A program of capturing and impounding stray animals shall be instituted by the city police department.

Antirabies Campaign

Preparations for the antirabies campaign began immediately following passage of the ordinance. The Van Houweling Laboratory for Microbiological Research of the private Silliman University Medical Center was invited by the city health office to join in the initial phase. The medical center supplied technical guidance and training for vaccinators, as well as personnel and instruments for the campaign.

The service clubs of the city were asked to participate in the campaign. The Lion's Club supplied posters depicting the need for dog vaccination and also brochures for public distribution illustrating and describing the campaign. These brochures, prepared as coloring books, were persuasive and cheery, not frightening. The Inner Wheel of the Rotary Club sponsored pre-exposure immunization against rabies as a protective measure for all personnel who would be engaged in vaccination and handling of dogs during the campaign. Inactivated rabies vaccine of duck-embryo origin was administered in 3 doses at 1-week intervals (*9,10*).

Also voluntarily participating in the campaign were three local movie theaters which, between features, showed slides publicizing the program; the two local radio stations, which carried spot announcements and schedules of the campaign, as well as public service interviews on rabies; and the audiovisual units of the Presidential Assistant on Community Development and of Silliman University, which showed the film "Rabies Control in the Community" throughout the city. In all instances, publicity was conducted bilingually, in the Cebuano dialect and in English. A translation of the sound track of the film was prepared in Cebuano and used in the showings. Personnel of the city health office and Silliman University Medical Center made an estimate of the dog population in the commercial area (poblacion) of the city. In the urban residential area, officials (captains) of the subdivisions (barrios) conducted the census. The calculated number of dogs in the commercial-residential area, where about one-half of the city's residents live, was 2,200. A re-evaluation of the dog population in the rural barrios within the Dumaguete City limits, which was made near the end of the vaccination campaign, indicated an additional population of about 1,600 dogs. At two meetings called by the mayor of Dumaguete City, the barrio captains were requested to aid in promoting the vaccination campaign in the rural areas of the city.

Primary emphasis in the vaccination campaign was on the densely settled commercial-residential area; secondary emphasis, on the sparsely settled rural areas. Two teams of three vaccinators each worked from July 1 to September 30, 1964, either in health centers to which owners brought their dogs or by visiting from house to house to vaccinate dogs at the residences of the owners. In most instances, each neighborhood was visited twice during the campaign period to afford dog owners greater opportunity to have their animals vaccinated.

Results of Antirabies Campaign

From 1,750 to 1,800 dogs in the commercial-residential area of Dumaguete City were vaccinated between July 1 and September 30, 1964, or approximately 80 percent of the dog population. Eighty percent is the proportion considered necessary to control the spread of rabies in a community (*11*). An additional 500 to 550 dogs were vaccinated in the rural barrios. Control of rabies in the downtown area was achieved in the year following the campaign. The rabies surveillance program of the Silliman University Medical Center, which had formerly recorded approximately 25 animal rabies cases per year from this commercial-residential area, did not confirm a single case for the period October 1, 1964–October 1, 1965.

Since the intensive vaccination campaign, publicity has been directed toward encouraging dog owners to present newly acquired animals and puppies for vaccination as they reach 5 months of age. The city police department is developing a control program for stray animals.

Discussion

The Dumaguete City rabies control program was organized as a cooperative private-public venture, initiated and supported at the community level. Success was achieved in this program by education and publicity extensive enough to reach every dog owner in the city. Effective use of mass communications helped the city reach this goal. Representatives of voluntary and public service agencies enthusiastically contributed their time and facilities. Their efforts built up a nucleus of people who discussed rabies in the marketplaces and other public gathering points. From there news traveled by word of mouth throughout the city, even attracting national interest in the project. The program was financed at the community level. Approximately 25 percent of the cost came from fees collected from dog owners and the rest from municipal funds and private agencies. Dog owners cooperated in the campaign, feeling that the vaccination effort was their own program and a part of their responsibility to their community; virtually no governmental force was applied. A sense of community pride in the campaign was evident from its inception to its completion.

Problems arose throughout the campaign, but many were resolved by anticipating them or by dealing with them as they appeared. Initially we had hoped that holding vaccination clinics in health centers would prompt dog owners to bring their pets in for vaccination. It soon became apparent that, although owners could easily handle their dogs at home, many animals became apprehensive when removed from familiar surroundings. Therefore the vaccinators, who soon became highly proficient in catching and vaccinating dogs, were sent to the homes of the owners. We found that few dog owners, especially in rural areas, had collars for their dogs. Used plastic venocylysis tubes from the city's Red Cross blood bank were donated to the campaign and served adequately as collars for attachment of the numbered dog tags. Sterilization of syringes and needles during house-to-house visits was difficult, and the supply of glass syringes was small. Used disposable plastic syringes from the Silliman University Medical Center, however, were available in large numbers. Laboratory personnel sterilized the plastic syringes and the attached needles each evening by soaking them at least 30 minutes in a 1:1,000 solution of Zephiran Chloride ®, then rinsed them once with sterile distilled water and dried them overnight under a germicidal lamp. The next morning they wrapped these syringes and needles in sterile towels and packed them for the day's use.

Several problems remain. Chemical sterilization of syringes and needles used with live virus vaccine is undesirable but was the only practical method for this campaign. A study is being planned to measure the inactivation, if any, by possible residual chemical on the attenuated rabies virus. Tags of vaccinated dogs have frequently been lost. To provide ready identification of vaccinated dogs in any subsequent campaign, injection of a colored dye in the dog's thigh at the time of vaccination is under consideration. Earnotching is too dangerous for the vaccinator since many of the dogs encountered in rural areas are only partially domesticated. Quarantining and vaccinating dogs as they enter the community is difficult. It is also difficult to vaccinate all dogs in the community as they reach the age of 5 months. Conducting local or citywide campaigns as cases of rabies appear, so that the susceptible dog population is again reduced, will help in controlling the disease. We are currently promoting the expansion of the dog vaccination program to neighboring towns, hoping to create an ever-widening circle of immune dogs until eventually the entire island on which Dumaguete City is located is participating in the control program.

Rabies control programs in Japan (personal communication from Dr. M. Kitaoka, National Institute of Health, Tokyo, Japan, 1964) and in Taiwan (*12*), as well as the small program in Dumaguete City, have been successful with vaccination programs confined to dogs. The natural division of the Philippines into islands provides an excellent basis for concentrated efforts progressing from island to island. The apparent lack of wildlife reservoirs of rabies in the Philippines, especially if adequate proof is obtained that rabies is not enzootic in Philippine bats, may make eradication of rabies possible through complete control of the disease in dogs.

Summary

A community-sponsored dog vaccination campaign conducted in 1964 in Dumaguete City, south central Philippines, broke the endemic pattern of rabies. Essential to the success of this campaign, in which the community was the operating unit, was the voluntary cooperation of the city health office, other governmental agencies, Silliman University Medical Center, service clubs of the city, and local radio stations and movie theaters. Representatives of these organizations publicized the rabies control program and succeeded in vaccinating 80

percent of the dogs in the commercial-residential area of Dumaguete City—the proportion considered necessary if the spread of rabies in a community is to be controlled. It is hoped that this program may be used as a pilot project for more extensive efforts.

Rabies in the Philippines appears to depend essentially on a single host—the dog. The natural division of the republic into islands favors a program of step-by-step canine control and quarantine to eradicate this disease which in the Philippines each year kills more than 250 persons and an estimated 100 times as many animals.

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Conference Calendar

March 2–4, 1966. Air Pollution Medical Research Conference, Los Angeles, Calif., Ambassador Hotel. Information: Department of Environmental Health, American Medical Association, 535 North Dearborn Street, Chicago, Ill. 60610.

March 18–19, 1966. National Conference on Rural Health, Colorado Springs, Colo., Broadmoor Hotel. Information: American Medical Association, 535 North Dearborn Street, Chicago, Ill. 60610.

April 14–16, 1966. Conference on Health Education of the Public, Chicago, Ill., LaSalle Hotel. Information: American Medical Association, 535 North Dearborn Street, Chicago, Ill. 60610.

June 13–17, 1966. Society for Applied Spectroscopy, Chicago, Ill., Sheraton-Chicago Hotel. Information: Borg-Warner Corp., Roy C. Ingersoll Research Center, Wolf and Algonquin Roads, Des Plaines, Ill.

June 20–24, 1966. National Conference on Campus Safety, Campus Safety Association. University of Washington, Seattle. Dugald Pinyan, arrangements chairman, Division of Safety, University of Washington, Seattle.

October 23–29, 1966. Ninth International Cancer Congress, Tokyo, Japan. Prof. Tomizo Yoshida, M.D., Chairman, National Organizing Committee, Ninth International Cancer Congress, Secretariat, % Cancer Institute, Nishisugamo, Toshima-ku, Tokyo.

Announcements for publication should be forwarded to Public Health Reports 6 months in advance of meeting.

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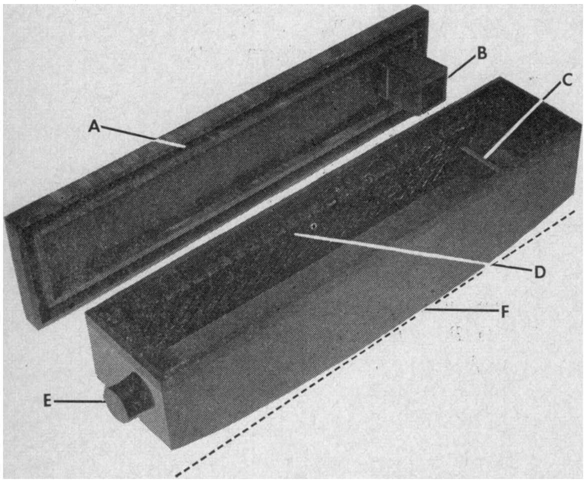
GRANTEE INVENTIONS

Developing Tank for Electron Microscope Plates

This tank was built to develop at least 24 plates in a small space using a single tank; to use a minimum amount of fluid while assuring that the plates are adequately covered and could be agitated as required; and to develop plates in a lighted room after the initial loading.

The tank was built of plexiglas and molded together with plastic weld. The lid was made lightproof by groove A into which the body of the tank fitted. From a hole in the lid, shaft B was built to act as a lightproof filling tube. Across the bottom of the tank small shelf C was raised to insure that no light entered the tank from this filling tube. The body of the tank has 24 grooves, D, 1/8 inch wide and 1/4 inch apart to hold the plates. These are at an angle to enable a minimum amount of fluid to be used. Outlet E is for the fluid and a No. 6 rubber stopper is fitted into the outlet. The floor of the tank is flat, but the base, F, is curved to allow the tank to be rocked during developing and fixing of the plates.



Photograph by E. Kaufman

The tank has been used successfully in our darkroom, and we found no difference between plates developed in this tank and those developed in the routine manner using different containers for developer and fixer and a basin for washing. We hope that it will serve as a prototype for the manufacture of a tank for general use in electron microscope laboratories.—R. E. Yodaiken, M.D., *department of pathology, State University of New York and Buffalo General Hospital and* William Tanski, *medical workshops, State University of New York. This invention was developed under Public Health Service grant No. 50–680A.*

A New Intravascular Infusion Pump

An intravascular infusion pump has many uses in clinical and experimental medicine and physiology. It must be mechanically reliable, compact, inexpensive, and safe. The pump must be able to run for extended periods of time without overheating or mechanical failure. The output of the pump should be constant after the flow is determined and the rate is set. The output should be independent of the head of pressure against which the machine is pumping so that during intra-arterial infusions the output will not fluctuate with changes in arterial pressure. There must be no possibility that air will be pumped into a vessel if air happens to get into the pumping system. The intravascular infusion pump shown in figure 1 has been used clinically for more than 2 years and satisfies all these requirements.

The Pump

The pump is a rotary roller type. Gum rubber tubing (1/8-inch inside diameter) fits into the pump head and is compressed by the rollers as the shaft rotates. The rollers are designed to be totally occlusive; therefore, the output of

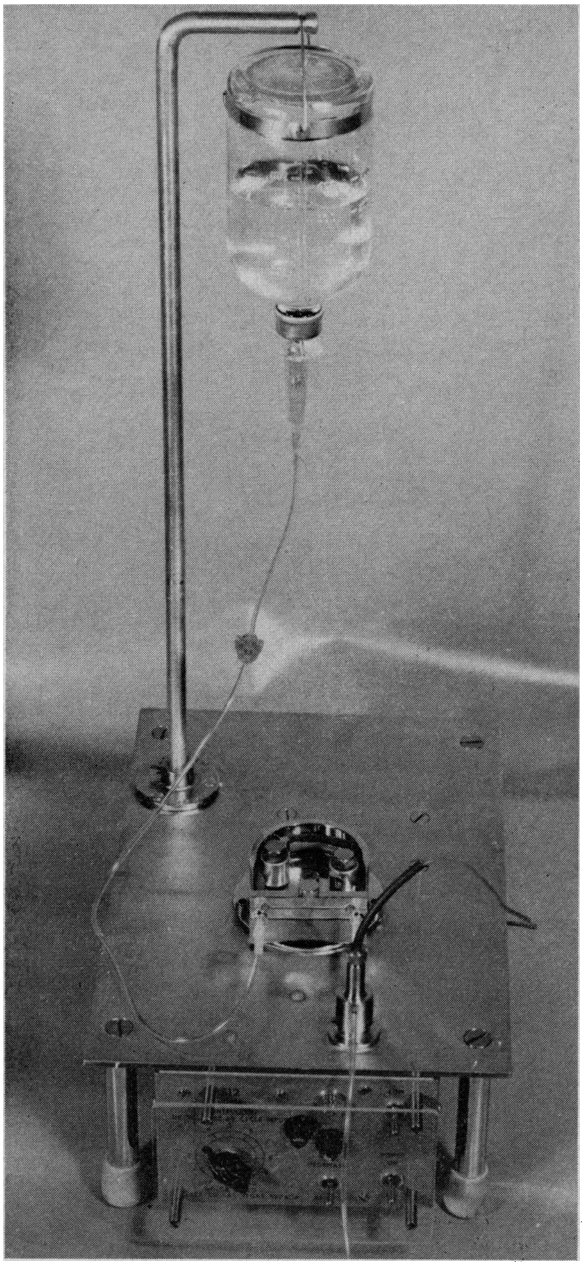


Figure 1. Overall view of the infusion pump

NOTE: The housing for the photocell is on the tabletop in the foreground.

the pump is independent of the head of pressure against which it is pumping. The rollers are driven by a 1/70-horsepower, direct-current motor, which is controlled by an infinitely variable speed control (0 to 3 revolutions of the shaft per minute).

The output can be varied between a minimum of 24 ml. per hour (0.4 ml. per minute) and a maximum of 228 ml. per hour (3.8 ml. per minute). The pump head, with tubing in place, is illustrated in figure 2. The head is designed so that two lengths of rubber tubing can be pumped simultaneously and produce outputs within 5 percent of each other.

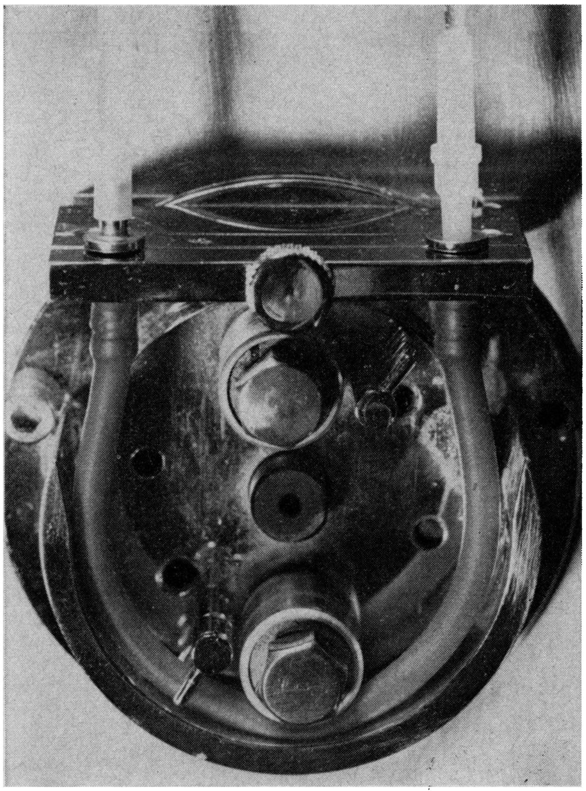


Figure 2. Close view of the pump head with a single length of rubber tubing in place

The Safety Device

To prevent the intravascular infusion of air, a safety device designed for the machine will immediately stop the pump if air bubbles (as small as 1.5 to 2.0 mm. in diameter) are detected in the plastic tubing. The plastic tubing from the output side of the pump goes through a small housing and passes between a light source and a photocell. When fluid is in the tubing, it acts as a lens and increases the intensity of light striking the photocell. However, when a bubble passes through, the intensity of the light decreases, the photocell is not activated, and the pump stops.

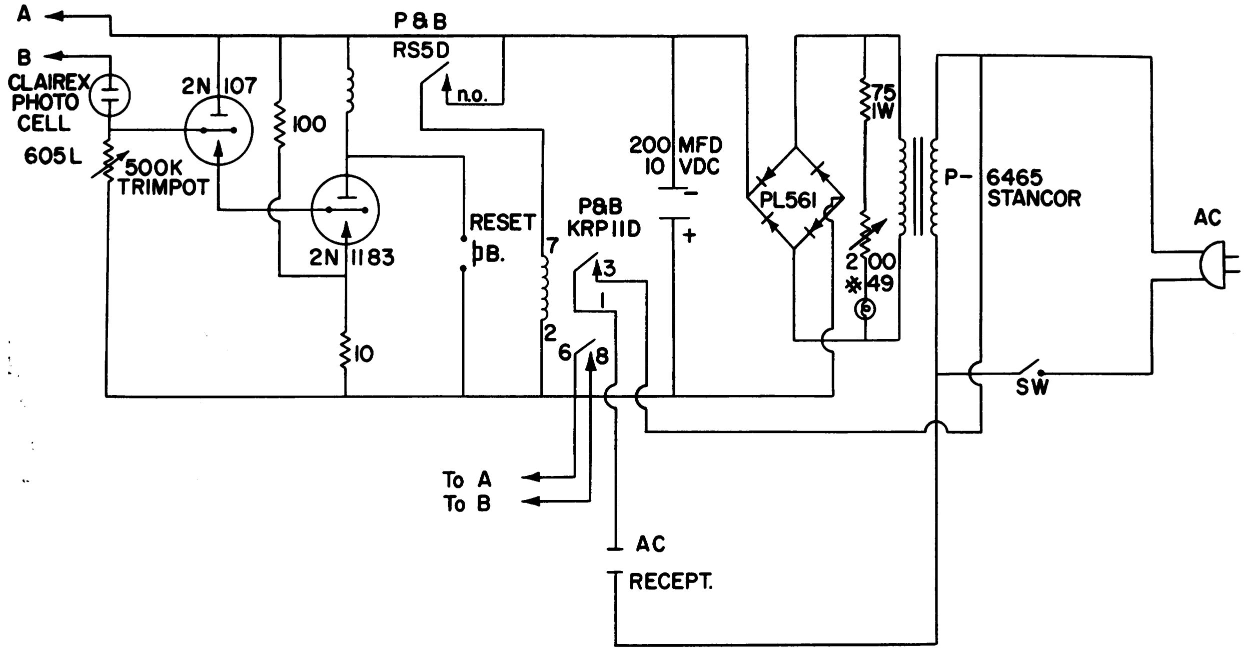


Figure 3. Diagram of the circuit of the photocell safety device

The unit will always "fail safe," since any failure in the circuit (transistor, diode, or light) will stop the pump. The motor will not start again until the tubing is filled with liquid and a reset button is pushed. A diagram of the electrical circuit is shown in figure 3—DR. ROBERT A. GAERTNER, *assistant professor, department of surgery, Johns Hopkins University School of Medicine and Hospital, Baltimore, Md. This work was suported by Public Health Service grant No. 5-K3-CAX17, 919-03.*

Photoelectric Air Plethysmograph

GRANTEE INVENTION

The photoelectric air plethysmograph allows transduction of small volume changes (that is, finger pulse volume) at low amplification. It differs from similar instruments in that it uses a variable cylindrical lens to produce changes in the illumination of a photocell. Changes in volume of an air chamber surrounding the finger are transmitted by an airfilled tube to an upright glass U-tube (5 mm. inside diameter) open to the air at one end and partially filled with water. A beam of light from a battery-operated source passes through one limb of the U-tube and strikes a vertically oriented slot (2.5 by 12 mm.) in an opaque mask. This slot is backed with translucent paper and rests against the side of the tube where the light exits. A photoresistor is directly behind the slot. The water level at balance is near the center of the slot. As the water level rises, the illumination of the slot is increased by the focusing action of the cylindrical lens. A low concentration of detergent reduces undesirable surface tension effects. A side arm in the tube between the finger chamber and the U-tube allows intermittent venting of the system to return the water level to its original midposition.—DR. ROBERT EDELBERG, *professor of psychophysiology, University of Oklahoma Medical Center, Oklahoma City. This invention was developed under Public Health Service grant No. MH-01904.*