

Communicable Diseases and Their Effects on Public Health in Indonesia

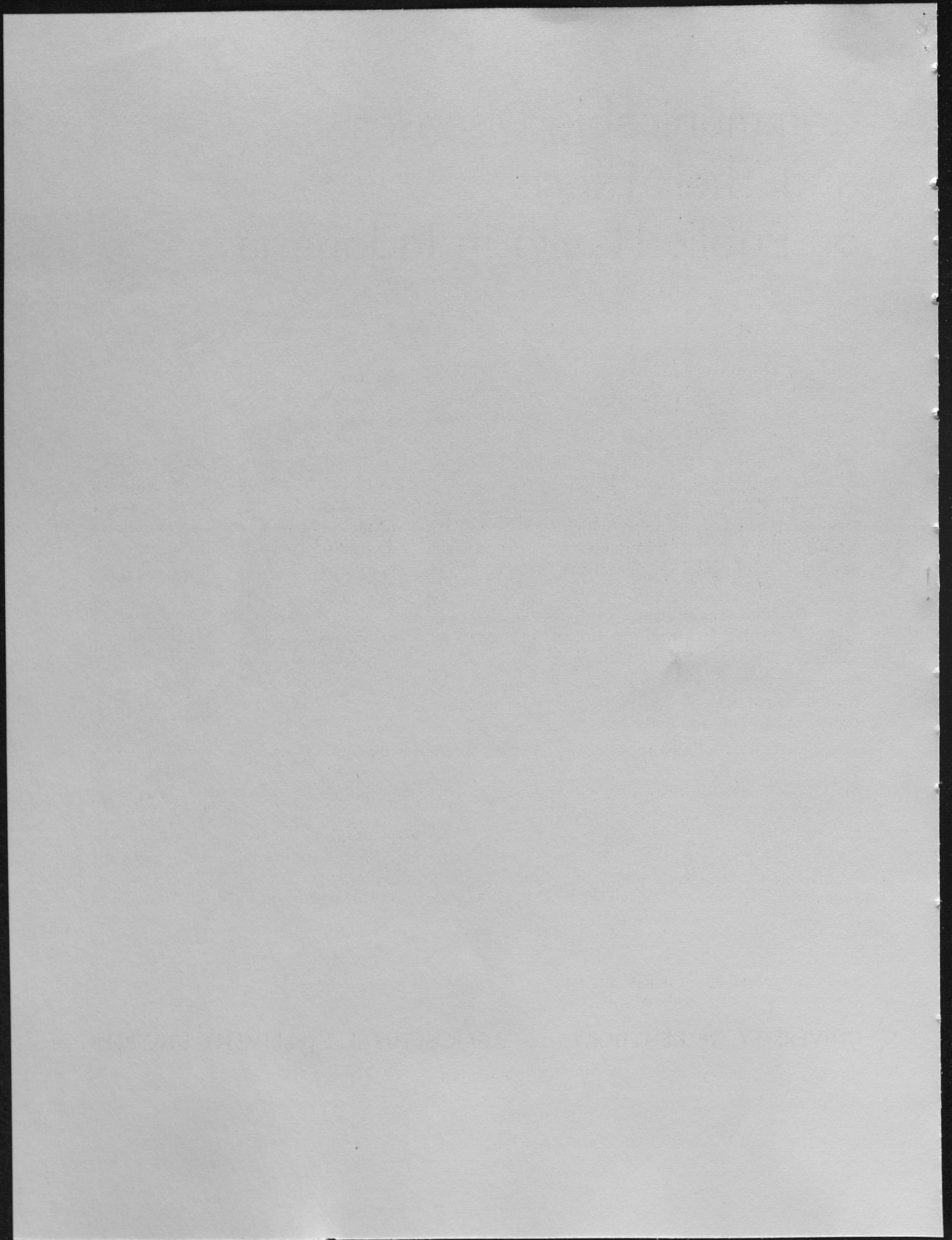
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FOREWORD

The organization of classroom teaching received priority over other activities during the first years of the University of Kentucky's affiliation (which began in 1957) with the College of Agriculture and the College of Veterinary Medicine and Animal Husbandry, University of Indonesia. Later, professors working together under the affiliation were able to turn some of their attention to the exploration of research needs and to fields of possible public service.

At the College of Veterinary Medicine and Animal Husbandry in Bogor (1960-62). Drs. Titkemeyer and Ressang together reviewed the public health implications of communicable diseases in Indonesia transmitted by animals to men, notably rabies, anthrax, and food poisoning. This publication is a status report on the current situation, and it sets the stage for continuing efforts in public health and research and in the development of control programs by specialists at the institutions concerned.

Dr. Ressang is head of the Department of Pathology, College of Veterinary Medicine and Animal Husbandry. Dr. Titkemeyer is Professor of Anatomy, Michigan State University. The affiliation involved was arranged by contract within the system of cooperation between the American International Cooperation Administration, later the United States Agency for International Development, and overseas universities established by the United States.

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Howard W. Beers
Chief of Party,
Kentucky Research Team
Bogor, Indonesia
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COMMUNICABLE DISEASES AND THEIR EFFECTS

ON PUBLIC HEALTH IN INDONESIA

By C. W. Titkemeyer, D. V. M. , Ph. D, and A. A. Ressang, D. V. M. , Ph. D

Communicable diseases are those diseases of which the causative agent may be transmitted from one susceptible host to another. Because of the magnitude of the problem, this report will cover only the three most important diseases in Indonesia which are transmitted from animals to man, either directly by contact or indirectly through contamination of animal products.

In addition, as is the case in most tropical areas, living is comparatively easy. Weather is such that minimal housing affords little discomfort. Since no significant seasonal changes occur, crops can be grown throughout the year obviating the need for elaborate storage facilities. An abundance of rain assures adequate currents in most streams, thereby reducing the necessity for modern sewerage systems. These ideal natural conditions lead to complacency and to an apathy toward modernizing existing facilities. When this apathetic attitude is combined with such factors as tropical climatic conditions, dense population, insufficient facilities (transportation, communication, refrigeration), and the retention of ancient unsanitary customs, the problem of disease reaches giant proportions. In order of their importance in Indonesia, rabies, anthrax, and food poisoning are the three most important disease conditions transmitted from animals to man.

RABIES

Importance in Public Health

In spite of its relative unimportance as the causative agent of human mortality, rabies ranks foremost among diseases communicable from animals to man in Indonesia. Incomplete statistics indicate that 103 persons succumbed to this malady in the 12-year period from 1949 through 1960 (10, 15)*. The significance of rabies is measured not in the human deaths it causes, but in its psychological effect on exposed individuals, in the inconvenience and danger associated with the Pasteur treatment, and in its potential as a lethal agent in heavily populated areas (16). During the same 12-year period, 33,312 persons received the Pasteur treatment (10, 15). It is impossible to measure the panic, anxiety, and worry experienced by these people or the pain, inconvenience, and time loss caused by the inoculations. Not to be ignored is the potential that rabies has for causing deaths, especially in certain areas. The Island of Bali, a world-famous tourist attraction, has a very large population of susceptible stray dogs. At the present time, it is rabies-free. One rabid dog, however, could change this island paradise into a major disaster area.

*Numbers within parentheses refer to reference citations. See page 17.

Economic losses from rabies among animals are great. In the 5-year period from 1954 through 1958, 5,855 cases of rabies in dogs were positively identified (10). Many cases were also reported among the meat, milk, fiber-producing animals, and some wild-animal species in Indonesia.

Jointly Conducted Research on Rabies

Aid from A. I. D. In order to facilitate this very important project, the Kentucky Contract Team under the Agency for International Development has purchased essential equipment for rabies research. A Strycher autopsy saw for removal of the brain, a large Spencer sliding microtome for making brain microsections, and numerous other pieces of laboratory equipment have been purchased. Dr. Soehardjo Hardjosworo, a graduate student in the Pathology Department, has been sent, by the Agency for International Development Participant Program, to the University of Georgia to obtain advanced training in viral pathology. Upon the completion of his Master's Degree, he will be sent to the Communicable Disease Center at Chamblee, Ga., to specialize in rabies research.



Fig. 1-DR. NANI SAWARNI CUTTING BRAIN MICROSECTIONS ON A MICROTOME PURCHASED THROUGH THE KENTUCKY CONTRACT TEAM. DR. SAWARNI IS NOW IN THE UNITED STATES, STUDYING SALMONELLOSIS AT THE UNIVERSITY OF MINNESOTA.

Rabies and Its Control in Man. All rabies vaccine for human use in Indonesia is produced at the Pasteur Institute at Bandung (Semple vaccine). The base tissue for this vaccine is monkey brain rather than the sheep brain commonly used in other countries. Post-vaccinal side effects have rarely been observed in Indonesia as compared with findings elsewhere. During the past 10 years, only three post-vaccinal complications have been recorded, one of which was a mild case of meningitis (10).

All three cases responded to treatment. The reason for this low incidence of complications is not understood. It is felt that the use of monkey brain instead of sheep brain may have certain advantages. Other possible causes are the decreased psychoneurotic effect (most Indonesians do not know the possible danger) and a racial tolerance to the vaccine. The routine regimen of daily subcutaneous injections of 2 milliliters of the vaccine for 14 days is followed. Investigations are being conducted on purification of the vaccine to decrease even further possible side effects.

The greatest stride made in rabies control in Indonesia has been the recent establishment of rabies control centers. Before 1945, all Pasteur treatment was administered at Bandung. It was almost impossible to transport individuals from the outer islands to this one center for treatment. Rabies centers have been established in Djakarta, Surabaya, and Djogjakarta in Java; in Medan and Padang in Sumatra and in Makassar in the Celebes Islands. These centers will ship the vaccine to other cities provided qualified medical personnel and adequate refrigeration facilities are available.

Rabies and Its Control in Animals. Rabies vaccine for animals is produced at the Central Veterinary Institute at Bogor. It is the Flury strain and is attenuated by chick embryo passage. Our experimental tests indicate that this vaccine confers immunity for only 1 year. The same strain produces immunity for from 3 to 5 years in the United States. Tests are now underway to determine the cause of this reduced period of immunity. It is hoped that this will lead to the production of a vaccine which will confer a longer period of immunity or, ideally, a lifetime immunity.

As is the case in most countries, dogs and cats are the most important source of rabies. In Djakarta, a plan is in effect whereby a mobile rabies vaccination station moves from area to area within the city throughout the year. All areas of the city are covered biannually to give dog owners the opportunity of having their pets vaccinated at a minimal cost. Unfortunately, the Semple vaccine, effective for only 6 months, is sometimes used. We have highly recommended that this vaccine be replaced by the longer-acting Flury strain, and that such plans be instigated in all of the larger cities.

Our research work on rabies in the domestic cat is still in progress. Findings to date indicate that it is very difficult to challenge a cat with the virus except intracerebrally. Intramuscular injections with normal dosages do not routinely produce an infection as they do in the dog and monkey. In diagnosing rabies in cats, emphasis should be placed on the anamnesis since negri-like bodies may be found in the normal cat brain (18). Inoculation of white mice is very important for positive diagnosis in this species (4).

Wild animals, as reservoirs of rabies infection, are of great importance in the control of this disease (5, 7). In West Java are wild dogs which might significantly contribute to its dissemination. This species, which resembles a jackal, is either the original wild dog or is a domestic species gone wild. It is exceedingly wary and elusive, thus very difficult to trap for wildlife rabies investigation. Other wild animal species which

may be involved in rabies dissemination include tigers, civet cats, and wild monkeys. Wild monkeys are almost as important as are dogs in the spread of rabies. Thousands of them live in the wooded areas of Indonesia and are susceptible to the disease. They constitute a serious reservoir of infection because they frequently come in contact with human communities in their quest for food.

Vectors in Rabies Dissemination. Considerable work is in progress on those species which show few if any symptoms but which might serve as hosts for the infection. Some very interesting work on bats as vectors has been nearly completed. In the United States, South America, and in some European countries, both the vampire and the insectivorous bats have been implicated in the transmission of rabies (2, 3, 8).

Indonesia has many varieties of insectivorous and frugivorous bats. In Bogor, thousands of huge frugivorous bats, Pteropus vampyrus, migrate from the famous Bogor

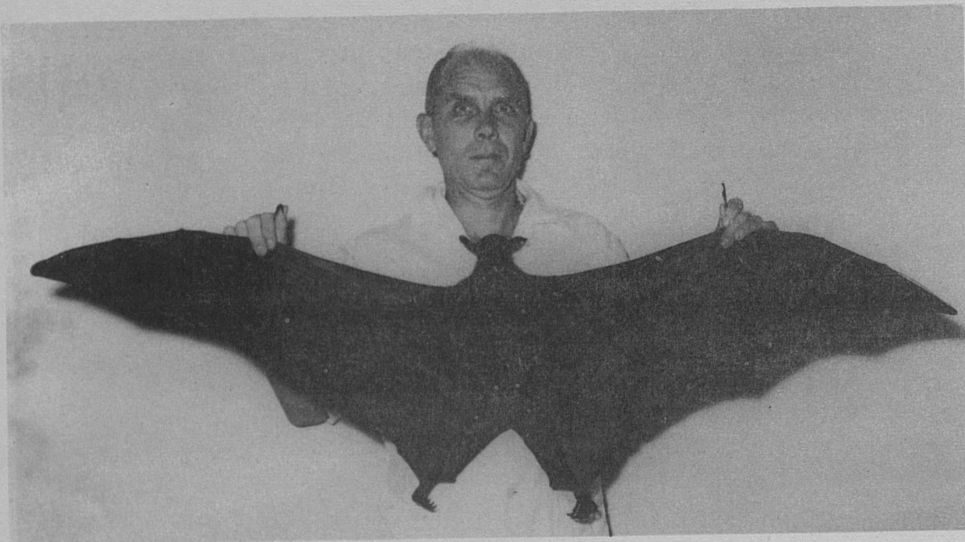


Fig. 2-THIS FRUGIVOROUS BAT (PTEROPUS VAMPYRUS) HELD BY DR. CHARLES TITKEMEYER HAS A WINGSPAN OF 56 INCHES AND A BODY LENGTH OF 18 INCHES. THOUSANDS OF THESE FLYING FOXES LIVE IN THE BOGOR BOTANICAL GARDENS NEAR PRESIDENT SOEKARNO'S PALACE.

Botanical Gardens to neighboring fruit farms every evening. Although these flying mammals can be readily killed by various routes of exposure to rabies, our present opinion is that they play little or no part in rabies transmission. Numerous cold-blooded species have also been used to investigate the biological properties of the rabies virus. Among them have been snakes, land turtles, lizards, and alligators. Incomplete tests confirm the opinions of other authors that large dosages of rabies virus do not kill these reptiles, that rabies virus does not live long in their brains, and that they are not important in rabies control.

Diagnostic Tests. Diagnostic tests for the identification of rabies must be improved. At the present time, the agar precipitin test and the complement-fixation test show great promise when used in conjunction with the identification of negri bodies in the brain (1).

The complement-fixation test is a laboratory procedure and is not so readily adaptable to field conditions as is the agar precipitin test. The latter test, because of its simplicity, should be used more widely by men in the field where only a simple laboratory is available. The biological test with white mice is the most conclusive diagnostic test,



Fig. 3-DR. RACHMAT NABIB REMOVING THE BRAIN FROM AN ALLIGATOR (VARANUS SALVATOR) WITH A STRYCHER AUTOPSY SAW TO STUDY THE PROPERTIES OF RABIES VIRUS IN REPTILES. DR. NABIB SPENT A YEAR STUDYING POULTRY PATHOLOGY AT THE CALIFORNIA AGRICULTURAL EXPERIMENT STATION, DAVIS, UNDER THE PARTICIPANT PROGRAM.

especially in cats where negri-like bodies in the normal brain may confuse the issue (18). However, this test takes a minimum of 5 days for completion, and if a quick diagnosis is essential, the agar precipitin and the complement-fixation tests are more advantageous.

Recommended Measures for Rabies Control. 1. A compulsory vaccination and licensing program for all dogs 3 1/2 months of age or older should be initiated.

2. The judicious elimination of unlicensed dogs should be practiced. The present program for the control of stray dogs in Indonesia is neither effective nor judicious. When a rabies scare occurs, poisoned meat is indiscriminately distributed throughout the area. This results in the destruction of vaccinated dogs and of expensive, well-cared for dogs as well as strays. As soon as the rabies scare is over, stray dogs are again allowed to roam the streets. Thus, the problem is never solved. A dogcatcher should be appointed as a member of the town's health team and should have the complete

cooperation of law enforcement agencies. All unlicensed dogs should be impounded for a few days. If they are claimed by the owner, they should be released only after a rabies vaccination. If they are not claimed in that period, they should be either humanely destroyed or turned over to a medical or veterinary school for teaching and research purposes.

3. All warm-blooded animals brought into the country should be quarantined for 30 days.

4. Research on rabies should be encouraged, especially in the preparation of better vaccines and in the improvement of diagnostic techniques.

5. Extension work in educating the public to the dangers of rabies should be increased.

ANTHRAX

Importance in Public Health

Anthrax is primarily a disease of animals, but in Indonesia it is frequently observed in man. The causative organism, Bacillus anthracis, is an aerobic sporulating species. Spores, which are formed in abundance when the organism is growing in the presence of oxygen, remain viable in the soil for many years. Thus soil that is seeded by improper carcass disposal is a potential reservoir of infection.

Customs Which Contribute to Its Dissemination. Many habits and customs contribute to its dissemination. People, incidentally, eat the meat from anthrax-infected animals which have been illegally slaughtered. This is very dangerous and may result in the rapidly fulminating septic form or the less-dangerous gastro-enteric form of the disease. Indonesians frequently eat "sate," small pieces of meat skewered on a bamboo stick and grilled over a charcoal burner. The meat farthest from the center of the fire remains relatively rare. The consumption of this poorly cooked meat if it is from an animal that was infected with anthrax may cause a serious outbreak. In the Krawang regency of West Java, 246 cases of human anthrax were attributed to the consumption of "sate" in 1955 alone (6). The eating of raw, unwashed cucumbers also is a source of infection if the cucumbers were harvested from fields where the ground had been seeded by improper carcass disposal. In 1916-17 such a severe outbreak occurred from this cause that all the cucumbers from one contaminated area were condemned and destroyed (6).

Environmental Contributory Factors. Because of a shortage of trucks, meat is frequently carried on the bare shoulders of porters. Skins of animals are often used as linings for wearing apparel such as bamboo hats. In any case where meat or skin from an anthrax-infected animal comes in contact with the broken human skin, anthrax lesions of the carbuncle type occur (6). Insufficient numbers of trained personnel make adequate antemortem and postmortem inspection impossible in remote areas;

therefore the enforcement of existing regulations governing the condemnation and disposal of diseased carcasses is reduced. Inadequate communication between scientists and the general public leads to a misunderstanding of the dangers of this disease and to an apathetic attitude toward control measures. The shortage of meat encourages people to consume uninspected meat, and sometimes, illegally slaughtered meat animals. These are the factors which must be considered in any program for eradicating anthrax.

Jointly Conducted Research on Anthrax

Recommendations. Our primary work in this field has been directed toward prevention rather than treatment. We have encouraged and aided the government program for mass vaccination of meat- and milk-producing animals against hemorrhagic septicemia and anthrax. Whenever an outbreak is reported, vaccination of all animals in the surrounding area is compulsory. We have instigated a reporting service for communicable diseases. We have suggested that the existing official regulation concerning the disposal of an anthrax-infected animal (all carcasses must be burned or covered with lime and buried at least 2 meters deep) is not sufficient. We have recommended that such carcasses be destroyed by trained personnel using a mobile incinerator, that not only the carcass be burned but that the soil containing any discharge from the body openings also be burned, that the stable be chemically sterilized, and that the owner be given instructions concerning the danger to himself, his family, and his livestock. We continually warn our veterinary students to inspect anthrax in any case where an animal dies suddenly, is edemic (swine and wild animals), and bleeds from natural body openings. We have impressed upon them the necessity for incineration of the carcass whenever there is a possibility of this communicable disease. We have recommended the Ascoli test for detecting anthrax on skins and other animal products used for wearing apparel.

Work in Progress. In spite of our vigilance in detecting and preventing anthrax, the condition is still prevalent. During the past few months, the Djakarta Zoological Garden has lost several valuable animals by unknowingly feeding them anthrax-infected meat. A tiger and a panther died within a few hours of each other and were sent to our necropsy laboratory for diagnosis. They showed the extensive edema in the ventral neck region so characteristic of anthrax in swine and wild animals. History revealed that they had been fed meat from a young ruminant which had died suddenly. A valuable orangutang died the following day with similar symptoms.

Dr. Mohammed Mansjoer of our faculty has made an extensive study of anthrax in man and animals in Indonesia (6). He has outlined the areas where this condition is prevalent and hopes to introduce a program for human vaccination in these anthrax-infected areas. Much work remains to be done in anthrax control in Indonesia. As more trained personnel are made available, we hope to reduce the seeding of the soil with viable spores, the consumption of uninspected meat, and the exposure of the human body to infected animal products. We can now do little more than "hold the line" until the many factors which contribute toward the spread of this disease are partially eliminated.

FOOD POISONING AND FOOD INTOXICATING AGENTS

Importance in Public Health

Many factors contribute to food poisoning in Indonesia. The most important one is the antiquated method of food handling. Because of the inadequacy of Indonesian transportation facilities, much of the food is transported in baskets supported by a pole which is carried on the shoulder of a porter, on bicycles, or in open vehicles. The food item, whether it is meat, pastry, or vegetable, is often exposed to the weather, flies, and dirt and filth of the highway. Much of the food is retailed in an open market without benefit of refrigeration, screens, or protective covering. The retailer is satisfied that he is being sanitary if he occasionally chases the flies from his product. Food inspection is poorly enforced or non-existent. Thus food which may have been entirely wholesome at its point of origin is often contaminated through its long exposure to tropical weather conditions, dust, flies, and the hands of prospective customers.

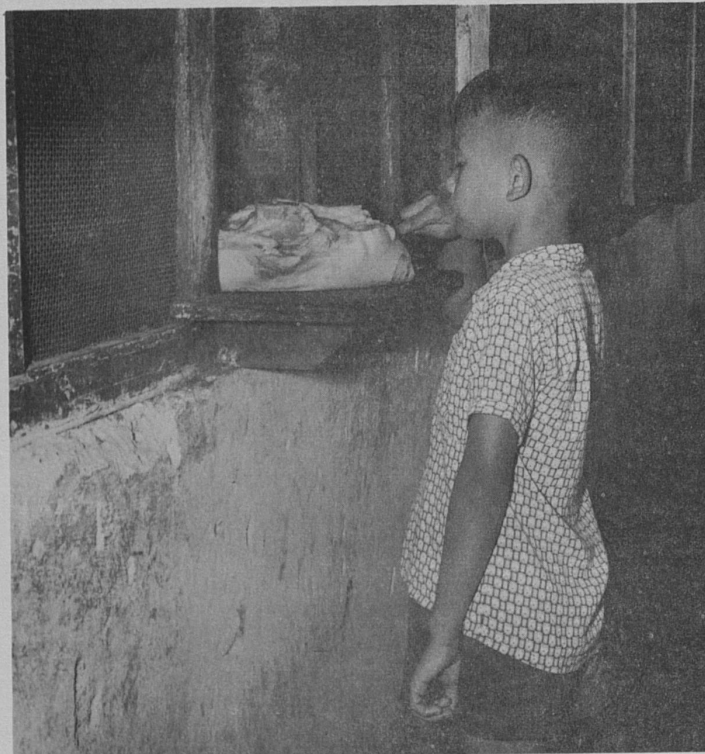


Fig. 4 -MEAT IS OFTEN LEFT OUTSIDE THE SCREENED AREA FOR INSPECTION BY CUSTOMERS. THIS BOY IS VIGOROUSLY PUNCHING THE MEAT TO TEST IT FOR TENDERNESS.

Many other unsanitary practices contribute to possible food poisoning. In the poorer districts, streams serve as public bathrooms. It is not unusual to see individuals brushing their teeth, laundering clothes, urinating, defecating, bathing themselves, or even washing a water buffalo all in the same area of one stream. The extreme density of the

population and the lack of an adequate sewerage system make conditions ideal for the dissemination of food poisoning agents.

Jointly Conducted Research on Food Poisoning

Food Poisoning in the Krawang Regency. Most cases of food poisoning and food intoxication are handled by the Ministry of Health. There is a very critical delimitation of authority for each particular ministry in Indonesia, thereby, limiting the number of groups which may participate in solving a public health problem. Since the College of Veterinary Medicine is under the Ministry of Education, it is infrequently consulted on public health matters even though the food in question is of animal origin, and the suspected etiological agent is that of a common animal disease. If animal deaths occur simultaneously with or prior to a food poisoning outbreak, the veterinary college may be consulted. Such a coincidence occurred in an outbreak of food poisoning in October 1960, and Dr. A. A. Ressang was asked to investigate. On October 6, an outbreak of severe sickness occurred in a kampung in Kedung Waringin. By the night of October 7, a total of seven persons had died. The endemic lasted 10 days, with 130 total cases and 78 deaths occurring. Coincidentally, an endemic among swine in the kampung caused the deaths of 53 pigs beginning about the middle of August and lasting for 2 weeks. Necropsy of one of the dead pigs at our Department of Pathology revealed a hemorrhagic septicemia caused by an organism of the *pasteurella* species.

Since these pigs were raised under very unsanitary conditions among the houses in the kampung and had access to human excreta, it was suspected that there might be some connection between their contagion and that of the people. To help establish or refute this assumption, 10 interns from the College of Veterinary Medicine were sent to the area to investigate all possible transmitters. They collected numerous species of insects and parasites and made bacteriological and virological cultures in an attempt to find the

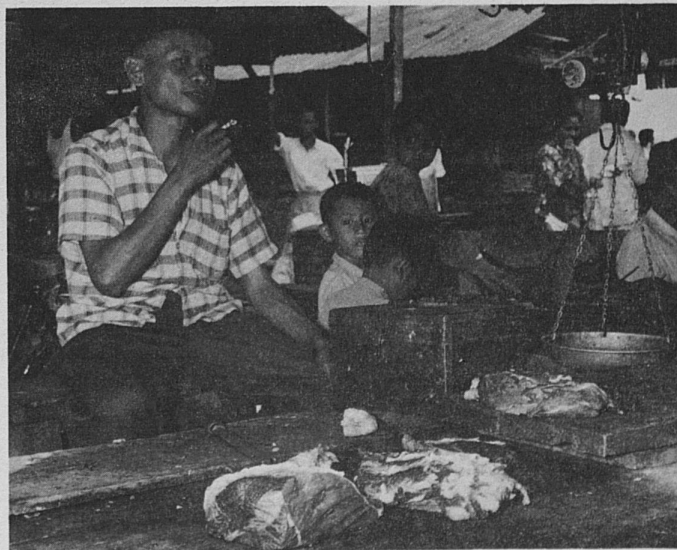


Fig. 5 -A TYPICAL OUTDOOR BUTCHER'S STAND. THE SELF-SATISFIED EXPRESSION ON THE FACE OF THE PROPRIETOR IS BECAUSE HE HAS JUST CHASED THE FLIES FROM HIS MEAT.

etiological agent. Results were negative insofar as an endemic-producing agent was concerned. Further anamnesis revealed that the human victims were of the Moslem religion and had not consumed any of the pork. The majority of those affected had attended a feast 4 days before the outbreak and had consumed sweet cakes either at the feast or subsequently in their homes. This history plus the fact that the endemic stopped spontaneously indicated a food poisoning. Laboratory tests conducted by the Medical College at Djakarta implicated Clostridium welchii as the causative agent. The very high incidence of death is still unexplained.

Food poisoning is of far greater importance in human morbidity and mortality than our meagre statistics indicate. There is approximately one medical doctor per 30,000 population in Indonesia. Among the kampung people, deaths frequently occur without a doctor in attendance and without a diagnosis. Moslem law permits autopsies, but very few are conducted because of the people's revulsion at molesting the human body. In the superficial investigation we have made, the primary symptom before death has been severe abdominal pain. When we combine this symptom with such environmental factors as tropical temperature, insufficient refrigeration, inadequate transportation, and the unsanitary customs of the people, we suspect that many of the undiagnosed ailments and some of the unexplained deaths are due to food poisoning.

Work in Progress. There is little that veterinary scientists can do concerning the contributory environmental factors, but there is much that can be done in research, in educating the public, in improving control measures, and in recommending specific measures that will improve the situation. During the past few years, our veterinary scientists have published numerous articles to alert the public officials and the general public to the dangers of food poisoning. These articles have covered case reports of salmonellosis from eating pickled duck eggs (17), clostridium intoxication from eating sweet cakes, bongkreng poisoning (a food made from coconut offal and peanuts), djenkol bean (Pithecolobium lobatum) poisoning and HCN poisoning from eating the roots and leaves of the manioc plant (11). We have strongly recommended complete cooperation among all ministries associated with public health, have instigated a veterinary communicable disease reporting service and have suggested that a new milk code be written to replace the current one which has been in existence since 1922. We have recently sent Dr. Nani Sawarni, a graduate assistant in our public health department, to the United States to receive further training in salmonellosis. The graduate training she will receive under the Participant Program of the Agency for International Development should be very valuable in this phase of our public health work.

Future plans include a project to determine the bacterial flora and parasite population of our streams, a study of the partial immunity acquired by exposure to unsanitary conditions, and further extension work to disseminate public health knowledge to the people. Several other communicable diseases are being investigated, or would be if sufficient funds were available. Among them are cysticercosis, trichinosis, Q fever, brucellosis, and ancylostomiasis (14, 15).

CONCLUSIONS AND SUGGESTIONS

There are many communicable diseases in Indonesia. Of those transmitted from animals to man either directly by contact or indirectly through animal products, the three most important are rabies, anthrax, and food poisoning. The importance of rabies is based more on its psychological effect on exposed individuals, its potential as a lethal agent in heavily populated areas, the inconvenience and danger associated with the Pasteur treatment, and the loss of domestic animals than upon the number of human deaths it causes. Anthrax is significant both in human and animal losses. It will continue to be a major problem until transportation methods, inspection systems, carcass disposals and local customs are changed. Food poisoning and food intoxication are probably far more important in human morbidity and mortality than our statistics indicate. Contributory factors include the lack of medical facilities, inadequate transportation and refrigeration, unsanitary customs of the people, poor enforcement of health regulations, the density of the population, and the humid tropical weather conditions.



Fig. 6-THOUSANDS OF FISH ARE SOLD DAILY ON THE OPEN MARKET. AT THE PRESENT TIME, REGULATIONS CONCERNING FOOD HYGIENE DO NOT COVER THE SALE OF FISH.

Jointly conducted efforts in the control of these health problems include the purchase of equipment and the training of Indonesian graduate students in the United States through the Agency for International Development, the diagnosis of communicable diseases, the publication of scientific articles, the education of the public, research, and recommendations for control measures. Much more work remains to be done on communicable diseases in Indonesia. It is fervently hoped that outside agencies will realize the advantages of investing their research money in this country. The climate is ideal for research in many fields, reasonably priced labor is abundant, laboratory animals (especially monkeys) are very inexpensive and many naturally existing conditions are available for study. Parasitic conditions, tropical diseases, nutritional disorders, and all the problems associated with overpopulation can be studied under field conditions. Such an exotic condition as leprosy in cattle (*Lepra bubalorum*) is found only in Indonesia (9, 12, 13). Because of a lack of research funds, little work has been accomplished on this rare condition or the possibility of its transmissibility. Indonesia



Fig. 7 - A WATER BUFFALO WITH LEPROSY, SHOWING HUNDREDS OF NODULES CAUSED BY ACID-FAST BACILLI. ALTHOUGH THIS DISEASE RESEMBLES TUBERCULOID LEPROSY IN MAN, NO RELATIONSHIP BETWEEN THE TWO CONDITIONS HAS BEEN ESTABLISHED.

is a newly developing nation and needs all its available public funds for the development of its natural resources and its industry in order to provide the facilities for the education, communication, transportation, and health of its people. Only through such outside organizations as the Agency for International Development, World Health Organization, Ford Foundation, Rockefeller Foundation and many others can the potential of the Afro-Asian nations be realized. The health of the world may be vastly improved through cooperative research accomplished among our newly developing nations.

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