

Prevention and Control of Zoonotic and Foodborne infections

Tactics available for Prevention and Control of Zoonotic and Foodborne infections

Infection	Measures
Influenza	Vaccination in man Avoid crowds in epidemic periods Sanitation at animal houses
Buffalopox	Personal hygiene Examination of animals for lesions
Rabies	Control in domestic animals (and wildlife) by vaccination Laboratory diagnosis of animal infections Reduction of reservoir population density and movement International quarantine regulations Vaccination of high risk groups Health education
Chlamydiosis	Quarantine and tetracycline treatment (medicated feeds) of imported psittacine and other birds Personal hygiene in handling sick and well pet birds Prevent aerosol generation in poultry processing plants
Q fever	Vaccination of high risk personnels Laboratory precautions High temperature pasteurisation of milk Tick control in livestock raising areas Chemotherapy with tetracyclines
Anthrax	Proper disposal of unopened animal carcasses by deep burial with disinfection or total incineration Disinfection of animal products, wool and hair Dust control in factories Vaccination of animals and high risk personnels Therapy
Brucellosis	Pasteurization of milk Vaccination of cattle, sheep and goat Laboratory precautions Personal hygiene Eradication from livestock by test and slaughter of reactor animals
Campylobacter infection	Personal hygiene Hygiene in milk handling Pasteurisation of milk
Salmonella infections	Hygienic slaughter, processing and handling of milk Pasteurisation or boiling of milk Personal hygiene Hygienic waste handling Therapy of infected animals to control carrier state
Leptospirosis	Occupational protection for persons at risk Avoid swimming in contaminated water Rodent control Drainage of wet areas Vaccination for animals
Plague	Rodent control Vaccination of high risk groups Isolation and treatment of patients Flea control on cats Chemoprophylaxis Health education

Toxoplasmosis	Cooking of meats Personal hygiene Hygiene at slaughtering place
Tuberculosis	Testing and slaughter of reacting animals Eliminate infected pets BCG vaccine and chemotherapy used in man only
Tularaemia	Rodent and arthropod control Occupational and personal hygiene in high risk areas Avoid drinking from possibly contaminated streams Live attenuated vaccination of populations at risk
Trichinosis	Reduction and eventually eradication of infection from swine Adequate heat or cold processing of pork products (77°C; -15°C, 20 d; -30°C, 6 d) Cooking of garbage and offal (100°C) before feeding to swine Education as to the need to cook all fresh pork Rodent control
Hydatidosis	Prevent dog access to infected animals' offal Treatment of infected dogs Dog population control Personal and environmental sanitation Education of public
Japanese encephalitis	Human vaccination Mosquito and mosquito bite control Laboratory precautions
Kyasanur forest disease	Avoid tick infested areas, Protective clothing and repellent Control cattle ticks

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Text Prepared by
Dr. S. B. Barbudde
Senior Scientist
(Veterinary Public Health)

Dr. Z.B. Dubal
Scientist
(Veterinary Public Health)

Dr. N. P. Singh
Director

Published by
Dr. N. P. Singh
Director, ICAR Research Complex for Goa, Old Goa

For details, please contact
Dr. N. P. Singh
Director
ICAR Research Complex for Goa
Old Goa 403 402, Goa
Ph.: (0832) 2284678 / 79 • Email: director@icargoa.res.in / www.icargoa.res.in

Secretarial Assistance: Mr. Sidharth Marathe
T-5 (PME Cell)

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Hydatid cyst on spleen

Tuberculous nodule on liver

Splenomegaly in anthrax



ICAR RESEARCH COMPLEX FOR GOA,
(INDIAN COUNCIL OF AGRICULTURAL RESEARCH)
OLD GOA 403 402, NORTH GOA, GOA, INDIA

Animal Husbandry plays a vital role in providing household nutritional security, increased income, and employment especially for women and in rural transformation. Human health is closely linked to animal health and production systems, particularly in agrarian country like India. The spread of the zoonoses related pathogens are more likely to transmit through foods of animal origin including milk, meats, fishes and related products. Also, animals directly in contact with humans contribute for zoonoses and foodborne diseases.

The infectious diseases or their agents naturally transmissible between animals and human beings are collectively referred to as “zoonoses”. According the latest information, out of a total of 1405 infectious diseases that affect human beings, approximately 58% (817) are zoonotic in nature; and out of 177 infections that are emerging or re-emerging, about 73% (130) are Zoonoses. The importance of zoonotic diseases can be gauged from the fact that 64% (14/22) of the major etiological agents for infectious diseases identified between 1973 and 1994 are zoonotic in nature.

The basic principle of veterinary public health (VPH) programmes is to deliver fundamentals of public health programmes as close as possible to the individual, small group or community. These include basic hygiene principles, quarantine and isolation, biosecurity as well as more sophisticated priorities such as surveillance systems, diagnostic capability, and treatment options.

In India, approx. 40 zoonotic diseases that have been commonly reported include Bird flu, Swine flu, Rabies, Japanese encephalitis, Brucellosis, Plague, Anthrax, Tuberculosis, Leptospirosis, Salmonellosis, Campylobacteriosis, Glanders, Kyasanur forest disease (KFD), Listeriosis, *Chlamydophilla* spp., verotoxic *Escherichia coli* and clostridial infections, Chikungunya, Dengue and FMD. Of these, zoonotic pathogens such as *Brucella*, *Listeria*, *Campylobacter*, *Leptospira*, *Coxiella burnetii* and *Chlamydophilla* spp. are not only important from reproduction and economical standpoint as these are associated with cases of infectious abortion, repeat breeding and infertility in animals but also potentially hazardous to human health.

The basic approach in controlling or preventing a disease is to identify the weak linkages in the chain of their transmission. This requires sound knowledge of epidemiology of disease, i.e. its magnitude, spatial and temporal distribution, multifactorial causation, sources of infection and the dynamics of transmission. Veterinarians play an important role in prevention and control of zoonoses by virtue of their ability to destroy diseased animals and also controlling the movement of domestic animals.

Prevention: “Prevention implies all measures taken to exclude a disease from an unaffected (healthy) population. It is the first line of defense against disease”.

1. Quarantine
2. Immunization, environmental hygiene and chemoprophylaxis.
3. Education of people about disease prevention.
4. Early diagnosis.

Control : This is a strategy which employs all tactics useful for reducing the frequency of illnesses which are already present in a population. It aims to reduce the morbidity and mortality caused by the disease.

Eradication: Eradication of a disease implies termination of all transmission of infection by extermination of the infectious agent.

Approaches for prevention and control of disease:

Quarantine.

Quarantine is the restraint placed upon the movement of lower animals, man, plants, or goods which are suspected of being carriers or vehicles of infections or of having been exposed to infectious agent(s). Quarantine may be international, interstate or local. Office Internationale de Epizootics (OIE) was established in Paris in 1924 with a view to make uniform procedures for veterinary quarantine and develop appropriate regulations that are applicable throughout the world. The period of quarantine depends on the incubation period of the agent, the time taken for the infection to be confirmed, i.e., isolation and identification of the pathogen and the time taken for an infected animal to become infectious.

Test and Slaughter: If a disease is infectious, affected animals can be a source of infection to others. In such circumstances it may be economically and technically expedient to slaughter an ill minority of animals to protect a healthy majority. A recent outbreak of avian influenza in Hongkong and India was tackled by depopulation of the poultry birds.

Environmental hygiene: Implementation of farm hygiene practices improves the sanitary environment of animals. The practices include excrement treatment and disposal, ventilation, availability of clean water, pest control, improvement of housing and general cleanliness. Environmental hygiene plays an important role in control of mechanical vectors, for example, house flies. Systematic antemortem and postmortem examination of slaughter animals has led to a substantial reduction in the risk of transmitting meat borne pathogens.

Mass immunization: Immunization reduces the number of susceptibles in the population and thus augments herd immunity making the infection more difficult to spread. Immunization programme must be epidemiologically relevant, immunologically effective, operationally feasible and socially acceptable.

Vector control: An integrated approach that includes control of vectors has become extremely popular among the public health experts. The approach consists of activities concerned with environment management and source reduction, chemical control, biological control, genetic control, personal protection and health education.

a) Environmental measures: Measures to be applied for environmental management are source reduction, filling and drainage operations, planned water management, and proper disposal of refuse and other wastes.

b) Chemical measures: A wide range of insecticides belonging to organochlorine, organophosphate and carbamate groups are available for vector control. Indiscriminate use of insecticides results in the development of insecticide resistance by vectors.

1. Contact poisons:

Natural : pyrethrum, rotenone, derris, mineral oils
Synthetic : organochlorine - DDT, HCH, lindane
organophosphates- chlorthion, dichlorvos, parathion.
carbamates - carbaryl, dimetilan

2. **Stomach poisons :** paris green, sodium fluoride
3. **Fumigants :** hydrogen cyanide, methyle bromide, sulphur dioxide

c) Biological measures: (i) Fish : Several species of fish such as *Gambusia affinis*, *Aplochilus panchax*, *Paecelia holbrooki* are effective as predators of anopheline (ii) Fungi: Extremely studied fungi is *Coelomomyces* (iii) Protozoa : *Nosema algerae*, *Thelohania*, and *Vorticella* (iv) Bacteria : *Bacillus thuringiensis*, *B. sphaericus*.

Reservoir control: Reservoir is defined as “any person, animal or non-living thing in which infectious agent lives and multiplies and can be transmitted to a susceptible host”. It is helpful against rats, stray dogs and other noxious reservoir hosts of infections such as leptospirosis, plague, typhus and rabies. Poison baiting and trapping have been among the most commonly employed techniques against reservoir hosts. Anti-rodent measures include environmental sanitation, use of rodenticides and fumigation.

Early diagnosis: In veterinary medicine the techniques of early detection have been successfully applied in the diagnosis of tuberculosis, brucellosis, mastitis, glanders and salmonellosis. Application of tuberculin skin test in domestic animals and human population, and mallein test for glanders are classic examples in this regard. The development of various immunological and molecular techniques such as enzyme linked immunosorbent assay (ELISA), radio immunoassay (RIA), immunofluorescence (IF), restriction fragment length polymorphism (RFLP), sequence analysis, DNA probes and polymerase chain reaction (PCR) has revolutionized diagnostic procedures with their wide applicability.

Treatment: Mass treatment of an affected population may be carried out under an emergency or when the disease prevalence is very high. Mass treatment is given either prophylactically or curatively. Use of coccidiostats to poultry in drinking water and routine incorporation of anthelmintics in the ruminant salt licks or feeds are some of the examples of mass treatment.

Genetic improvement: It has been shown that the incidence of some infectious diseases can be reduced by selective breeding. For example, certain breeds of cattle in tsetse zone of Africa are known to be tolerant to trypanosomosis.

Health education: The health education envisages to make community aware of the cause and mode of disease transmission, prevention and treatment of disease, and the role of community in combating diseases. Health education through mass media such as newspapers, radio, cinema, wall slogans, television can be very effective.

Epidemiological diagnosis: In epidemiological diagnosis the frequency of the population event (disease), its time and place pattern of occurrence and associated factors or circumstances are ascertained. The primary purpose of epidemiological diagnosis is to determine immediate and long term needs for purposeful action against the disease.