

WORLD HEALTH ORGANIZATION
Regional Office
for the Eastern Mediterranean
ORGANISATION MONDIALE DE LA SANTE
Bureau regional de la Mediterranee orientale



مِنظَرُ الصِّحَّةِ الْعَالَمِيَّةِ
الكَتَابِ الْإِقْسَامِي
لشَرْقِ الْبَحْرِ الْمَتَوَسِّطِ

**REGIONAL COMMITTEE FOR THE
EASTERN MEDITERRANEAN**

**EM/RC39/7
June 1992**

Thirty-ninth Session

ORIGINAL: ENGLISH

Agenda item 10(a)

Technical Paper:

ZOONOTIC DISEASES

CONTENTS

	<u>page</u>
1. Introduction	1
2. Zoonotic Infections and their Public Health Importance	1
3. Factors Affecting the Occurrence of Zoonoses	3
3.1 Personal factors	3
3.2 Socio-cultural characteristics of human populations	4
3.3 Types of livestock and husbandry practice	4
3.4 Importation of animals and animal products	4
4. Epidemiology of Important Zoonoses in the EMR	5
4.1 Brucellosis	5
4.2 Rabies	7
4.3 Echinococcosis/hydatidosis	9
4.4 Leishmaniasis	10
4.5 Salmonellosis	11
4.6 Bovine tuberculosis	12
5. Prevention and Control of Zoonotic Diseases	13
5.1 Organizational principles of national zoonoses control programmes	13
5.2 The regional zoonoses control programme	15
5.3 Collaborative activities in zoonoses control	16
6. Conclusions	22
7. Recommendations	24
Annex - Recommendations of the Regional Consultation on Organization and Management of National Public Health Programmes	25

ZOONOTIC DISEASES

Agenda item 10(a)

1. Introduction

Zoonotic diseases are defined as those diseases of vertebrate animals that can be transmitted to humans. These diseases continue to cause significant morbidity in urban, peri-urban and rural areas all over the world.

The significance of zoonotic diseases, and their role in the economic development in Member States of the Eastern Mediterranean Region (EMR), was discussed in September 1970 during the Twentieth Session of the Regional Committee (RC) for the Eastern Mediterranean.

Regional Committee resolution EM/RC20A/R.14, entitled "The problems of main zoonotic diseases in the Eastern Mediterranean Region", called on Member States to draw up long-term plans and to implement programmes for the prevention and eventual elimination of the important zoonoses. The RC resolution considered sound epidemiological surveillance to be the basis for these actions. Special emphasis was given to the main zoonotic infections, namely brucellosis, rabies, echinococcosis and bovine tuberculosis.

Some steps have been taken by the governments to implement the resolution, however, steps taken so far have not been sufficient to overcome some important problems behind the increasing occurrence of zoonoses in the Region. There is an urgent need to assess existing technology and control strategies in the Member States in light of scientific developments and, hence, to adopt measures to control more effectively zoonotic diseases.

2. Zoonotic Infections and their Public Health Importance

Zoonotic infections are classified according to their causative agent: viral, bacterial or parasitic. Table 1 lists the most important zoonotic diseases.

Zoonotic diseases are also sometimes divided into three categories according to their socioeconomic and health impact:

- zoonoses that have serious effects on animal production (e.g., bovine tuberculosis);
- zoonoses that have serious consequences for humans and for "economically important" animals (e.g., brucellosis, salmonellosis, echinococcosis); and
- zoonoses that have serious consequences for humans, but that are much less serious in "economically important" animals (e.g., rabies and leishmaniasis).

TABLE 1: Important zoonotic diseases according to their causative agent

<u>Parasitic zoonoses</u>	<u>Bacterial zoonoses</u>
Leishmaniasis	Anthrax
Toxoplasmosis	Borreliosis (Lyme disease)
Trichinosis	Streptococcal disease
Taeniasis (cysticercosis)	Tuberculosis
Diphyllobothriasis	Campylobacteriosis
Trypanosomiasis	Salmonellosis
Hydatidosis	Tetanus
Fascioliasis	Staphylococcal enterotoxigenesis
	Leptospirosis
<u>Viral zoonoses</u>	Listeriosis
Vaccinia	Brucellosis
Yellow fever	Murine typhus
Rift Valley fever	Botulism
Lassa fever	Yersiniosis
Rabies	Q fever
Crimean-Congo haemorrhagic fever	Bubonic plague

From a public health point of view, zoonotic infections cause various kinds of adverse effects on public health. They cause considerable morbidity, resulting in overall deterioration of human health and loss of working ability of affected people. Some zoonoses, even though they do not cause significant morbidity, are important due to their serious effects (e.g., rabies). The economic impact of such illness, in terms of direct and indirect costs, can be considerable.

It is difficult to quantify the direct and indirect monetary losses due to zoonoses infections in the national economies of the Region, owing to the lack of reliable data in this area. However, based on analysis conducted on a few zoonotic diseases, the cost-benefit ratio of zoonoses control programmes is very favourable. For example, in one major city in the Region, the cost of treating patients hospitalized with brucellosis exceeded the cost of what it would have been to produce an animal vaccine for that disease. In general, however, the effects of zoonoses in animals and on animal production are easier to quantify than its effects on human health.

Zoonoses not only affect human health, but animal health and, as a consequence, their productivity output (e.g., meat, milk and egg production). According to an FAO estimate, zoonotic diseases contribute significantly to the loss of over 30 million tons of milk annually. Converting this into a human consumption average, it means the loss of milk enough to provide 200 million children with two glasses of milk daily. This loss and its contribution to malnutrition and lowering of resistance in children are very significant.

Another important effect caused by zoonoses is on lost export opportunities, and as a consequence, lost foreign exchange earnings.

3. Factors Affecting the Occurrence of Zoonoses

3.1 Personal factors

Although all segments in the population are exposed to zoonoses, certain occupational groups are at special risk of contracting zoonoses, because of their close contact with animals or animal products. These include:

Group I (Agricultural)

Farmers, other agricultural workers, veterinarians, livestock inspectors, transporters of livestock, and frequently their families, who are in close contact with animals at home or at work.

Group II (Animal product manufacture)

Butchers, slaughtermen, abattoir and freezing-plant workers; processors and handlers of meat, milk, eggs, hides, furs, and other animal products; processors and handlers of animal by-products, wastes and dead animals.

Group III (Sylvan and campestral)

Wildlife workers, hunters, trappers, fishermen, naturalists, ecological researchers, surveyors, resource explorers and developers (e.g., petroleum and minerals), project construction workers (e.g., dams, highways, pipelines), campers and tourists.

Group IV (Recreational)

Those in contact with pet animals or wild animals in an urban environment, e.g., pet-dealers (in domesticated and wild animals), pet-owners, their families, and visitors, zoological garden and wildlife park employees and visitors, and veterinarians. Exotic pets and captive wild animals may present particular dangers.

Group V (Clinical/laboratory)

Physicians, nurses, and other health personnel handling patients, and laboratory workers concerned with the diagnosis of animal or human diseases (e.g., processing diagnostic specimens, performing autopsies on animals, or keeping laboratory animals for diagnosis or research, or for biologicals manufacture or product safety assay).

Group VI (Epidemiological)

Professional public health workers, veterinarians, other health professionals and paramedical personnel in contact with sick animals or people or highly contaminated surroundings during performance of epidemiological field investigations.

Group VII (Emergency)

Refugees, disaster victims, participants in major pilgrimages, other congregations of persons living under temporarily crowded and stressful conditions or in absence of usual feeding, housing, sanitary or other amenities - all of which might facilitate the spread of infection.

3.2 Socio-cultural characteristics of human populations

Local habits, social customs, standards and methods of processing of food stuff are important factors affecting the occurrence of zoonoses. Some examples include:

- drinking fresh, non-pasteurized milk and eating fresh, soft cheese prepared from sheep's milk can be sources of brucella and salmonella;
- the presence of local, small slaughter houses, often attached to meat shops and bazaars, where sanitary measures are not maintained and meat is not inspected. Under such situations, animal remains are not disposed of in a sanitary manner, resulting in environmental contamination and in further spread of zoonotic diseases. The health risks associated with disposal of such remains, i.e., offal and carcasses, can be a serious threat to human health.
- uncontrolled population movements and settlements, particularly congregation of human settlements in and around towns, often without adequate sanitary conditions. This usually results in an increasing number of rats, stray dogs and cats, as well as insects which can transmit zoonotic diseases. Pollution of the environment with animal faecal waste can also present a serious hazard to the human population, particularly to children who can become infected with toxocara, toxoplasma and other zoonotic parasites.

3.3 Types of livestock and husbandry practice

The number of livestock in EMR Member States in 1990 was estimated at 64 178 000 dairy cows, 17 565 000 buffaloes, 12 326 000 camels, 178 906 000 sheep and 108 944 000 goats. Traditionally, herds were rather small and dispersed. A recent development has been herd concentrations. The increasing contact between herds and their concentration has made the transmission of zoonotic infections more probable and, hence, an increased risk to humans of contracting zoonotic diseases.

3.4 Importation of animals and animal products

Most countries of the Region are presently importers of animals and animal products, despite various efforts to become self-sufficient in the production of animal protein.

The importation of large numbers of sheep, goats and cattle may be a source of introduction of zoonotic diseases, which may not have been present in the community. The importation of meat and animal products may

also be a source of introducing zoonoses, especially when such importation is not controlled by suitable food safety standards, as is the case in many countries of the Region where, due to economic reasons, products of cheaper quality and value are imported, and usually are not up to the acceptable international standard.

4. Epidemiology of Important Zoonoses in the EMR

Brucellosis, rabies, echinococcosis/hydatidosis, leishmaniasis, salmonellosis and bovine tuberculosis continue to be the main zoonotic diseases in the Region.

4.1 Brucellosis

Brucellosis is a systemic bacterial disease with acute or insidious onset, characterized by continued, intermittent or irregular fever of variable duration, headache, weakness, profuse sweating, chills, arthralgia, depression, weight loss and generalized aching. Localized suppurative infections may occur. The disease may last for several days, months or occasionally a year or more. The case fatality rate without treatment is less than 2%.

Although brucellosis is a notifiable disease in some countries of the Region, it is often unrecognized and unreported. In many countries, the awareness of medical specialists in relation to brucellosis is very weak, and in most of the cases, public health laboratories are not carrying out diagnostic tests. Cases of brucellosis very often remain unrecognized and are treated as other diseases. They are often labelled "fever of unknown origin". Most of the identified cases are clinically advanced as well.

For these reasons, the actual number of cases of brucellosis is unknown and is believed to be far more than the officially reported figures. Table 2 presents available data obtained from selected EMR Member States of cases of human brucellosis during 1985-1990. There is a very clear underreporting which parallels the absence of laboratory services for diagnosis.

The age distribution of reported brucellosis cases from several countries of the Region indicates that children are particularly at risk. The incidence has a seasonal pattern with a maximum number of cases during the spring and early summer period.

B. abortus, *B. melitensis* and *B. ovis* are the main species of the genus *Brucella* causing the disease. The main reservoirs of infection in most countries are sheep and goats, and to a lesser extent cattle, camels, horses and buffaloes.

Infection is transmitted from the infected animal by ingestion of raw milk or dairy products, especially cheese. Transmission also occurs through contact with tissues, blood, vaginal discharges, aborted fetuses through abrasions in the skin, or through mucous membranes, especially among those attending to infected animals.

TABLE 2. Number of reported cases of human brucellosis in selected EMR Member States, 1985-1990

Member States	1985	1986	1987	1988	1989	1990
Afghanistan	0	7	16	-	-	3
Bahrain	0	0	0	0	0	0
Cyprus	0	0	0	0	0	0
Egypt	34	51	51	45	19	148
Iran, Islamic Republic of	-	42 485	54 874	71 051	92 205	72 218
Iraq	-	447	-	1187	1 803	-
Jordan	39	803	503	460	628	729
Kuwait	1 168	1 051	747	396	-	-
Libyan Arab Jamahiriya	691	98	335	287	262	-
Oman	260	186	229	292	224	183
Qatar	94	102	84	59	17	16
Saudi Arabia	488	2 301	5 229	8 373	7 893	9 025
Sudan	22	45	-	-	-	-
Syrian Arab Republic	77	157	769	1 053	1 691	988
Tunisia	-	-	4	3	59	-

- = Data not available or received.

TABLE 3. Reported prevalence (%) of brucellosis among animals from selected EMR Member States

Member States	Year	Cow bovine	Sheep	Goats	Buffaloes	Camels
Djibouti	1986	2.3	0.7	-	-	-
Egypt	1988	1.2	0.7	-	0.1	-
Iran, Islamic Republic of	1987	-	7.8	-	-	-
Morocco	-	-	2.5	-	-	-
Oman	1985	2.9	1.6	0.9	-	3.6
Saudi Arabia	1984	18.7	6.5	9.7	-	8.0
Somalia	1987	3.5	0.4	-	-	1.0
Syrian Arab Republic	1988	2.5	1.8	-	-	-
Tunisia	1988	2.5	1.7	1.9	-	-

Data from serological studies of domestic animals in the Region (Table 3) indicate that the incidence of brucellosis is quite significant. Many of the countries of the Region have started initiating control measures which are being reflected in a lower incidence rate among humans.

The growing demand for meat and milk in countries of the Region has led to intensification of animal production and the increasing importation of animals for slaughter and breeding. A large number of modern commercial dairy farms have been established with indigenous cattle or introduced breeds.

The importation of a large number of sheep and goats from countries where brucellosis is endemic, adversely affects the situation and facilitates the spread of brucellosis to previously unaffected areas. High incidence rates of brucellosis have been reported in some of these farms from several countries. Infection in these farms is caused by *B. abortus*, but also by *B. melitensis*, which is highly pathogenic in humans.

4.2 Rabies

Clinically, rabies is an almost invariably fatal, acute viral encephalomyelitis. Onset is often heralded by a sense of apprehension, headache, fever, malaise and indefinite sensory changes, often referred to the site of a preceding animal bite wound. The disease progresses to paresis or paralysis. Muscle spasms of deglutition on attempts to swallow leads to fear of water (hydrophobia), and delirium and convulsions follow. Without medical intervention, the usual duration is two to six days, sometimes longer, with a very high fatality rate. Death is often due to paralysis of respiratory muscles.

Rabies in the countries of the Region occurs in two epidemiological forms: urban (canine) rabies, with dogs as the principal reservoir and transmitter; and sylvatic rabies, which is a disease of wild carnivores with sporadic spill over to dogs, cats and livestock, or directly to humans from foxes.

According to available information, canine rabies is the major pattern of the disease in the Region. Recently, wildlife sylvatic rabies appeared as a problem on the Arabian peninsula, particularly in Oman, Saudi Arabia, United Arab Emirates and Yemen. Bahrain, Cyprus, Kuwait, Libyan Arab Jamahiriya and Qatar are reported to be free from rabies.

The number of cases of human rabies reported from countries of the Region have been rather limited. However, annually about 50 000 to 70 000 persons receive post-exposure treatment for suspicion of having been bitten by rabid animals. Children account for the largest group receiving such treatment.

The real prevalence of rabies among animals is not exactly known. However, every year several hundred cases of animal bites on humans are found to be rabid.

Table 4 summarizes available information on rabies in humans and animals and on post exposure treatments from some Member States of the Region.

A satisfactory surveillance system in many countries has not been developed properly, due to an insufficient laboratory network, paucity of well-trained field and laboratory personnel, weakness in reporting systems and lack of intersectoral cooperation.

TABLE 4. Recorded data on rabies from selected
EMR Member States, 1987-1990

Member State	Human cases				No. post-exposure treatment				Animal cases			
	1987	1988	1989	1990	1987	1988	1989	1990	1987	1988	1989	1990
	Iran, Islamic Republic of	12	11	10	24	18305	15189	24608	28032	444	520	556
Iraq	7	16	42	-	4932	960	3955	-	24	22	35	-
Jordan	0	0	0	0	198	279	571	-	199	249	6	-
Morocco	28	27	17	16	15000	-	-	-	432	935	820	-
Oman	0	0	0	1	-	100	-	-	-	-	-	-
Pakistan	0	0	0	0	28000	-	-	-	69	37	35	-
Saudi Arabia	0	5	0	8	-	-	-	5660	75	37	29	-
Sudan	-	-	-	-	14000	15000	15000	15000	-	-	-	-
Syrian Arab Republic	8	-	4	8	4041	5000	5000	3341	9	-	14	-
Tunisia	1	0	3	5	21061	22039	23259	24105	45	48	108	166
United Arab Emirates	-	-	-	-	-	-	-	-	-	-	-	17
Yemen	-	9	7	7	-	2020	2914	2660	430	361	513	-

4.3 Echinococcosis/hydatidosis

Echinococcosis is a disease in humans produced by the larval stages of the tape worm *Echinococcus*, producing cysts of varying sizes. The adult worms are found in dogs and other carnivores.

There are three related species of *Echinococcus* causing different clinical manifestations:

- *Echinococcus granulosus* (cystic hydatid disease);
- *Echinococcus multilocularis*, causing multilocular echinococcosis (alveolar hydatid disease); and
- *Echinococcus vogeli*, causing polycystic hydatid disease.

Echinococcus granulosus is the type present in countries of the Region. It is usually identified by X-ray, CAT (computerized axial tomography) scanning and sonography, supported by positive serologic tests, preferably those detecting antibodies against genus-specific antigens. Definitive diagnosis is made by microscopic identification of parasitic tissue from cyst fluid obtained surgically, or, for example, from sputum after rupture of pulmonary cysts.

The signs and symptoms vary according to the size, number and location of the cysts. They are commonly found in the liver, lung and, less frequently, in the kidney, spleen, bone marrow or central nervous system.

Transmission occurs usually by hand to mouth transfer of tape worm eggs from dog faeces, or through contamination of food or water by dog faeces. Eggs can survive for several months in the environment.

The exact data on the prevalence of human hydatid disease in the Member States of the Region is not regularly available. The disease is notifiable in only a few countries, but in many cases, information consists only of the number of cases operated on in the major hospitals. According to these data, the prevalence of operated cases during the last few years was 4.5 per 100 000 population in the Islamic Republic of Iran, 3 per 100 000 in Iraq, 5 per 100 000 in Jordan, 32 per 100 000 in the Libyan Arab Jamahiriya, 20 per 100 000 in Morocco, 3.4 per 100 000 in the Syrian Arab Republic and 16 per 100 000 in Tunisia.

With the use of diagnostic techniques (radiology, serology, ultrasound scanning) in some institutions in the Region, it has become evident that asymptomatic cases of hydatid cysts are common, and symptomatic hospital cases represent only a fraction of total infections.

The prevalence of echinococcosis among domestic animals in several countries of the Region is high, particularly among dogs. This is partly explained by the lack of proper slaughter facilities in rural areas, settlements, small townships and in sub-urban areas of large townships, where dogs have free access to infected offal. This may explain the results of surveys on *E. granulosus* in the dog population, which

TABLE 5. Prevalence of echinococcosis among domestic animals in selected EMR Member States (percentages)

Member States	Year	Dog	Cattle	Sheep	Goats	Buffaloes	Camels
Egypt	1989	2-12	0.3-0.5	0.2-0.3	-	-	2.3-8.0
Iraq	1988	38	13-20	29-42	26-40	45-50	49-75
Iran, Islamic Republic of	1988	3-50	8.3	5-6	3-4	75	64
Jordan	1985	11-20	5-11	1.3-4.5	0.5-3.6	-	8.8-26.7
Kuwait	1988	23	17.2	12.8	-	-	39.8
Libya	1985	27-40	5.4	12.7	1.5	-	35.9
Morocco	1988	24-58	24	8.5	8.3	-	-
Sudan	1981	17	3.8	3.2	2.5	-	44.5
Tunisia	1986	22	12-17	0.1-70	1-16	-	7-62

points to the dog as the main source of infection to humans. Table 5 presents a summary of available data from some countries of the Region on the prevalence of echinococcosis among domestic animals.

4.4 Leishmaniasis

Leishmaniasis is an important public health problem in many countries of the Region. It is of special concern in the Islamic Republic of Iran, Iraq, and the Syrian Arab Republic. It also exists to a lesser degree in Afghanistan, Egypt, Jordan, Lebanon, the Libyan Arab Jamahiriya, Morocco, Oman, Pakistan, Saudi Arabia, Somalia, Sudan and the Republic of Yemen. In Bahrain, Kuwait, Qatar and the United Arab Emirates only a few cases, mostly imported, have been reported.

The two proven zoonotic forms of leishmaniasis in the Region are visceral leishmaniasis (VL) and zoonotic cutaneous leishmaniasis (ZCL). Also, some cases of the cutaneous forms due to *L. infantum* have been reported mainly from countries in North Africa.

4.4.1 Visceral leishmaniasis

The incubation period of visceral leishmaniasis (VL) ranges between two and six months. Usually, the transmission period occurs in summer, and most cases are seen in winter. The onset of the disease is gradual, with spells of fever and periods of apyrexia for months. The diagnosis is suggested when the three following symptoms are observed in a patient: fever, pallor and splenomegaly. Splenomegaly is marked by a smooth, firm and painless spleen. Other symptoms are moderate hepatomegaly, lymphadenopathy and wasting. Complications are haemorrhages, diarrhoea or respiratory symptoms. Untreated cases are usually fatal.

VL, in most foci, is a zoonoses caused by *L. infantum*, with canines as the animal reservoir. The sandfly vector varies from one region to another. It is *Phlebotomus perniciosus* in North Africa, *P. langeroni* in Egypt, *P. orientalis* in Iraq. Their seasonal activity extends from April to November, with the peak from June to September.

The distribution of VL is scattered, and most cases occur in rural areas. However, some countries have reported endemic foci with a significant numbers of cases.

There are, on average, 1000-1500 cases reported annually in Iraq, a few hundred cases annually in the Islamic Republic of Iran, Morocco, Saudi Arabia and Tunisia, and a limited number from the Libyan Arab Jamahiriya and Pakistan.

An outbreak of Kala-azar was reported in southern Sudan in 1989-1990, with more than 1500 registered cases. All age groups were affected. The outbreak may have been caused by a combination of factors: the introduction of the parasite from an endemic area to a non-immune population, the presence of malnutrition, and possibly an ecological change in favour of the breeding of the sandfly vector.

4.4.2 Zoonotic cutaneous leishmaniasis

Zoonotic cutaneous leishmaniasis (ZCL), caused by *L. major*, produces lesions that are often severely inflamed and ulcerated and heal in 2-8 months. Frequently, the lesions are multiple, especially in non-immune immigrants, becoming confluent and secondary infected. Such lesions are often slow to heal and may leave large, disfiguring or disabling scars. The incubation period is often less than four months.

The rodent reservoir varies between foci. The main species are *Rhombomys opimus*, *Psammomys obesus*, *Meriones spp.*, *Mastomys erythroleucus*, *Arvicanthis niloticus*. Proven vectors are *P. papatasi* and *P. duboscqi*.

ZCL due to *L. major* is becoming a public health problem of considerable magnitude. The transmission of ZCL is accelerated in many areas with the introduction of a non-immune population into the sylvatic cycle of leishmaniasis among rodents. In most of the affected countries, outbreaks have occurred from time to time.

Accurate information on the distribution of ZCL in many countries is incomplete and needs more epidemiological studies. Endemic foci exist in Afghanistan, the Islamic Republic of Iran, Iraq, Jordan, Pakistan, Saudi Arabia and the Syrian Arab Republic, and in the countries of North Africa. Several thousand cases are reported annually from Afghanistan, the Islamic Republic of Iran and Iraq, and a few thousand are reported from Morocco and Saudi Arabia. Jordan, the Libyan Arab Jamahiriya, Pakistan and Yemen report a few hundred cases every year. An outbreak of cutaneous leishmaniasis in Sudan in 1986 numbered over 100 000 cases.

Leishmaniasis cases are grossly underreported due to low attendance of patients at medical centres, and faulty diagnosis and information gathering.

4.5 Salmonellosis

Salmonellosis is recognized as one of the most important zoonotic diseases in the Region. Epidemiological studies indicate that *Salmonella* is one of the major causes of severe diarrhoea among children, although persons of all ages may be affected.

Many of the salmonellae are zoonotic organisms carried in the intestinal tract and associated organs of infected farm and wild animals. The excreta from infected animals and humans is an important source of contamination of the environment and the food chain.

During slaughter, faecal contamination of the carcass occurs, and this is carried through the processing of meat products. Contaminated raw products may cross-contaminate working surfaces, cloths and utensils. A further complication is the frequent inadequate thawing and cooking of contaminated frozen foods.

In addition to this common foodborne chain of transmission, salmonella may be spread by contaminated water, by direct contact person-to-person or animal-to-man spread. Cereals, salad and other vegetables are occasionally contaminated with salmonellae, but the prevalence and contamination levels are much lower than in meat, poultry and eggs.

The most commonly isolated *Salmonella* serotypes in any country are usually characteristic of that country. They are not subject to extreme fluctuation of isolation frequency over short periods of time, although their rank in frequency of isolation may change. Occasionally a serotype will suddenly appear in a region where it has never been isolated. Such isolation may be solitary, but sometimes the new serotype causes a public health problem (e.g., the drug-resistant strain of *Salvien* imported from Algeria to France where it has remained).

The reported incidence of salmonellosis varies from country to country, but, in part, this may be a reflection of used diagnostic techniques and reporting systems.

4.6 Bovine tuberculosis

The main agent of zoonotic tuberculosis is *Mycobacterium bovis*. The principal reservoir of *M. bovis* is cattle, which can transmit the infection to many mammalian species, including humans. Humans contract the infection by ingesting the agent in raw milk and milk products, and secondarily by inhaling it.

The most prevalent forms caused by *M. bovis* in humans are extra-pulmonary, with young children being the most affected age group.

Pulmonary as well as extra-pulmonary cases of human tuberculosis of animal origin continue to be a public health problem in the Region, especially in areas where the prevalence of infection in cattle is high and raw milk or its products are consumed.

In the EMR, the incidence and prevalence of human tuberculosis due to bovine strains seems to be steadily decreasing in countries where the implementation of pasteurization/sterilization of milk is being carried out on a large scale and where there are ongoing national control campaigns of bovine tuberculosis, which are invariably being carried out in some countries.

Suitable and efficient eradication measures among cattle, good sanitation, pasteurization of milk and strict inspection of meat are the main pillars to prevent the transmission of tuberculosis from animal to humans. It should also be recognized that a good continuous programme of health education and health control of milk handlers could be of considerable value. In addition, in countries where the risk of infection is high and infant tuberculosis is a problem, the widest possible coverage with BCG vaccination should be ensured as early in life as possible. This is of particular importance in the Eastern Mediterranean Region, as young children are the most affected age group with *M. bovis*.

5. Prevention and Control of Zoonotic Diseases

5.1 Organizational principles of national zoonoses control programmes

Priority areas in the control of zoonotic diseases in countries of the EMR depend on the epidemiological pattern of these diseases and on the availability and the structure of health care service. It is interrelated with farming practices, habits of the people and levels of urbanization, as well as trade of animals and animal products.

Success in the prevention and control of important zoonoses depends on the capability to mobilize resources in different sectors and on coordination and intersectoral approaches, especially between national veterinary and public health services. Only comprehensive national approaches may lead to a reduction or elimination of the public health significance of zoonotic diseases.

Cooperation and coordination should include: community participation, intersectoral cooperation and international cooperation.

5.1.1 Community participation

Community participation in the activities related to the prevention and control of zoonotic infections is vitally important in order to achieve good results. First of all, the programme itself is formulated and executed for the benefit of the people, and this should be clearly understandable by the community. The role of the public health sector in the transmission of this message is of utmost importance. Furthermore, since the socio-cultural aspects of community life may directly influence the level of transmission of zoonotic diseases, the promotion of healthy life-styles is an important duty of health service personnel. One of the constraints in this activity is the lack of health education materials on zoonoses in national languages, using examples from local habits and situations. Therefore, efforts to produce or adapt health education materials and distribute them to schools, consumer groups, religious entities, professional association, cooperatives, and the mass media, should be given priority by the countries of the Region.

Community participation in prevention and control of zoonotic infection is especially needed in the control of stray dogs, cats, rodents, prevention of environmental pollution, and the protection of animals by vaccination, and in establishing and maintaining correct human-animal relationships.

The relevant community education programmes should concentrate on what people can do themselves to protect their own health. Community members should also be involved in the planning and implementation of programmes in their communities.

5.1.2 Intersectoral cooperation

To be successful, zoonoses control programmes should involve all concerned sectors, at least veterinary, medical, animal husbandry, agriculture, environment and education. In some administrations, other sectors may be involved (e.g., municipalities and the Ministry of Interior and the Army).

Problems facing national zoonoses control programmes are partly due to the organizational weakness resulting from insufficient cooperation among the services dealing with human and animal health.

The establishment of zoonoses control committees, with the main functions of planning, monitoring and evaluation of veterinary public health activities, is essential. All concerned ministries should be represented. While such interministerial committees may be able to prepare the technical background and plans for a national zoonoses control programme, concerned ministries should bear jointly the full responsibility for executing it.

Coordination committees must be set up at all administrative levels, namely state, provincial, district, municipal, etc., in view of the fact that zoonoses surveillance and control programmes need to be implemented at all levels.

5.1.3 International cooperation

Close cooperation exists between WHO and the Food and Agriculture Organization of the United Nations (FAO) and its collaborating centres: in Berlin, Germany (FAO/WHO Collaborating Centre for Research and Training in Food Hygiene and Zoonoses); in Weybridge, England (FAO/WHO Collaborating Centre for Reference and Research on Brucellosis), and in Rome, Italy (WHO/FAO Collaborating Centre for Research and Training in Veterinary Public Health). This collaboration is mainly in the form of training and technical advice.

The Middle and Near East Regional Animal Production and Health Project (**MINEADEP**) is a FAO project which plays an advisory role in the formulation and implementation of policies in animal production and health. It promotes interdisciplinary collaboration, especially between the veterinary and medical professions for the control of zoonotic diseases. Collaboration of WHO Member States with MINEADEP is mainly in the form of exchange of information and research. Also, valuable information on the distribution of zoonotic diseases is provided by the Bureau International des Epizooties (OIE) in Paris, particularly through the publication of the FAO/WHO/OIE *Animal Health Yearbook* and an OIE volume on statistics.

Another form of such cooperation is the Mediterranean Zoonoses Control Programme (MZCP), which was initiated in 1978 by a number of countries and WHO. Its objective is to foster countrywide programmes for the control of zoonoses and related foodborne diseases, as an integral part of national health programmes and to strengthen cooperation between national veterinary and public health services in improving surveillance, prevention and control of zoonotic diseases.

The programme exchanges among the Member States the most recent available information on the epidemiological situation, technical guidelines and documents, organizes meetings and training courses and provides technical assistance.

It includes 12 participating countries, including seven countries of the Eastern Mediterranean Region (Cyprus, Egypt, Jordan, Saudi Arabia, Sudan, Syrian Arab Republic and Tunisia). However, some countries later on failed to pay their annual contributions to the programme, and have thus been excluded from the benefits of the MZCP. There is an urgent need to strengthen the activities of the MZCP in Member States where zoonotic diseases constitute a significant public health problem, and to have more Member States join the MZCP.

There are also other forms of international cooperation between some countries of the Region (e.g., between Maghreb countries in the control of rabies, echinococcosis and leishmaniasis).

5.2 The regional zoonoses control programme

The regional zoonoses control programme has the objective of reducing suffering and death from zoonoses and related foodborne diseases in humans by reducing their incidence, severity and transmission from animals to humans.

The following programme targets are to be achieved, it is hoped, by 1995:

- All Member States will have developed national control programmes for at least two of their major zoonotic and related foodborne diseases; and
- at least half of the countries will have eliminated human rabies, and the other half will have controlled it, to the extent that it will no longer be a public health problem.

The approaches to achieve the targets are divided into two levels:

a) Country level

WHO will collaborate with Member States and promote:

- initiation and improvement of national control programmes on major zoonotic diseases;

- establishment of national intersectoral committees to promote coordination and collaboration;
 - human resource development in veterinary public health;
 - public health education and strengthening of community participation;
 - initiating and supporting operational research on cost-effective control measures and on epidemiological aspects of major zoonoses.
- b) Regional level
- Coordinate efforts for control of major zoonoses among countries of the Region;
 - strengthen the existing Mediterranean Zoonoses Control Programme (MZCP) and promote establishment of national centres in specific zoonotic diseases of major public health importance in Member States. These centres would be later designated as WHO collaborating centres to extend their services in the Region;
 - coordinate activities with food safety programmes;
 - disseminate information on the technical standards for international trade concerning animals and animal products for human use.
 - initiate and collaborate with other interested agencies in boosting regional control programmes for major zoonotic diseases;
 - cooperate in the production of safe and effective vaccines for the control of major zoonoses.

There is growing awareness among Member States on the need for developing programmes for the control of zoonoses and foodborne diseases.

5.3 Collaborative activities in zoonoses control

During the last few years the following activities were implemented to control the major zoonoses in the Region.

5.3.1 Brucellosis

The emphasis has been on adopting comprehensive approaches to control brucellosis through active cooperation between veterinary and public health sectors. WHO consultants assisted in the preparation, or revision, of national plans of action for the control of human and animal brucellosis in Afghanistan, Egypt, Djibouti, Jordan, Kuwait, Oman, Qatar, Saudi Arabia, Somalia and the Syrian Arab Republic.

Assistance was given to study the national epidemiological situation in Member States, upgrade national systems for case detection and reporting, provide laboratory equipment and diagnostic reagents, and train national personnel locally and abroad.

An Intercountry Consultation on Prevention and Control of Brucellosis was organized in December 1989. The participants from 13 countries of the Region reviewed the status of brucellosis in the Region and updated the regional strategy for prevention and control of brucellosis. They made several recommendations to strengthen national and regional efforts for brucellosis control. The main recommendations were to:

- assess the epidemiological situation of brucellosis in countries of the Region and to develop national systems for surveillance in both humans and animals;
- secure coordinated inputs from various national authorities and international agencies at all stages, from planning to implementation, and to evaluate activities;
- support the development of national skills in the planning, supervision, training, monitoring and evaluation of brucellosis control;
- promote and support national diagnostic and reference laboratories within the countries of the Region;
- facilitate the wide distribution of vaccines in the Region through the most economical means of production and supply;
- strengthen national capabilities for health education through training of personnel, provision of teaching/learning materials and equipment;
- support for applied research to determine solutions to identified problems, and strengthen human resource capability in research;
- cooperate with WHO collaborating centres in all aspects related to control of brucellosis.

Several efforts are being carried out by national authorities for the prevention of brucellosis; they include:

- elimination of infection from milk and milk products by pasteurization and sterilization;
- prevention of occupational infection by health education and periodical examination of populations at risk;
- improvement of laboratory facilities for diagnosis of brucellosis;
- motivation of farmers to control brucellosis in their herds and flocks;
- adaptation of legislative laws on prevention and control of brucellosis.

It must be indicated that the adopted measures are far short of achieving effective control of brucellosis, which remains a very serious problem.

5.3.2 Rabies

WHO consultants assisted in the planning and evaluation of national control activities, including epidemiological surveillance of human and canine rabies, dog ecology and dog control, community education and post-exposure treatment. WHO collaboration was also extended in production of rabies vaccines and in provision of vaccines, laboratory diagnostic equipment and health education material. Fellowships were also awarded in the organization of rabies control and vaccine production.

The Rabies Department, Pasteur Institute, Teheran, is functioning as a WHO Collaborating Centre for reference and research on rabies.

A Regional Meeting on Rabies Control was organized by EMRO in June 1991. Participants from countries where rabies constitutes a public health problem adopted feasible approaches for its control and discussed recent advances in dog ecology studies, diagnosis, vaccination and methods of promotion of multisectoral cooperation.

They stressed, in particular, the following points in relation to epidemiological surveillance and vaccination:

- laboratory diagnosis should be carried out, whenever possible, on suspected animal and human cases of rabies. In this regard, at least one laboratory should be established in each country;
- local services should be provided with appropriate equipment for collection and transportation of brain tissue samples, and the results of laboratory diagnosis must be made available immediately to authorities in rabies treatment centres;
- information from diagnostic and rabies treatment centres should be regularly forwarded to central level for preparation of a quarterly rabies bulletin. The quarterly rabies bulletin should be distributed to local service centres, international zoonotic centres and WHO for dissemination to neighbouring countries;
- special surveys should be organized to determine the rabies incidence in major wildlife animals and domestic animal populations, which are proven or potential reservoirs of the virus;
- nerve-tissue rabies vaccines are reactogenic and might be contaminated with latent viruses (e.g., Rift Valley fever, Crimean-Congo haemorrhagic fever and scrapie agent), therefore, tissue-culture inactivated vaccines are highly recommended for human pre- and post-exposure immunization;
- physicians must follow the WHO recommendations for post-exposure treatment of rabies.

The participants also recommended adoption of the following policies for rabies control:

- dog ecology studies should be carried out before large-scale operations for dog elimination are undertaken;
- there should be strict control of food resources accessible to dogs (garbage, dumping sites), which is the best way to control the dog population size;
- more information should be collected on the biology of wildlife species involved in sylvatic rabies;
- reduction of wildlife population and preventive immunization of livestock (camels and dairy cattle) and animal pets should be organized in countries with a high transmission of sylvatic rabies;
- a rabies task force under national zoonotic committees should be set up in countries where rabies is a danger. It should include members from all bodies concerned (Ministries of Health, Agriculture, Information, municipalities, police, etc.);
- available legislation concerning rabies control must be strictly enforced.

Both approaches for controlling rabies, namely prevention of the disease in humans by applying post-exposure treatment and control of the disease in the animal reservoir, have been adopted by countries of the Region. However, very often the resources at the country level are inadequate for the implementation of effective control measures.

Some national laboratories are producing safe and effective anti-rabies vaccine for humans and for animals. However, the majority of Member States import human anti-rabies vaccine. The National Institute of Health, Pakistan, produces a human diploid cell vaccine for rabies. Capabilities for the production of human cell culture vaccine exist also in some other institutions in the Region, though they are not being utilized for this purpose.

Much remains to be done in regard to the management and control of rabies in the EMR. Most countries have now reached a stage of development that permits them to improve services for rabies surveillance and control. This can be done on the basis of a wider use of modern diagnostic techniques, vaccination of reservoir hosts and application of modern vaccines for post-exposure treatment.

5.3.3 Echinococcosis/hydatidosis

An Intercountry Consultation on Prevention and Control of Echinococcosis/Hydatidosis was held in Jordan in April 1989. Participants from 13 countries of the Region where echinococcosis is considered as a

major public health problem, adopted several recommendations to help control this disease, namely to:

- integrate echinococcosis/hydatidosis control activities into zoonoses control activities, food hygiene, environmental protection and other animal-related problems;
- develop at least one pilot project in the Eastern Mediterranean Region for the control of echinococcosis/hydatidosis in collaboration with WHO. This can serve as an operational model and possibly a training resource;
- apply appropriate technologies for meat inspection and visceral destruction at the community level;
- encourage the construction of small, well-equipped slaughter houses for community use;
- promote health education and community participation for echinococcosis control.

WHO has also supported Tunisia in the formulation and the practical implementation of a echinococcosis control project through the provision of consultants, training of national personnel, supplies and equipment. WHO consultants have also advised the governments of Afghanistan, Egypt, Saudi Arabia and Somalia on approaches for echinococcosis control.

Some measures have been undertaken by Member States in the Region to control echinococcosis. These include the elimination of stray dogs; construction and provision of slaughterhouses and meat inspection services; health education; training; and legislative and administrative measures. However, strong efforts, including the introduction of new approaches, are needed to re-enforce existing activities.

5.3.4 Leishmaniasis

WHO has collaborated, over the years, with governments of all countries of the Eastern Mediterranean Region where leishmaniasis is endemic, in planning and executing control activities adapted to local epidemiological situations. These have consisted primarily of case findings and treatment, limited vector control measures, field research and training.

Technical support in the area of epidemiology and control has been provided by WHO to Afghanistan, Egypt, Jordan, Libyan Arab Jamahiriya, Oman, Saudi Arabia, Syrian Arab Republic and Tunisia. WHO consultants reviewed the epidemiological situation in the countries, advised on control measures, prepared plans of action for the nationals, and conducted applied research.

WHO has supported local training (Afghanistan, Egypt, Morocco, Syrian Arab Republic and Tunisia), and overseas training (Afghanistan, Egypt, Iraq, Syrian Arab Republic and Tunisia), as well as training through symposia and workshops. WHO also has provided drugs, laboratory equipment and reagents to EMR Member States.

Of particular importance was the Symposium on Recent Developments in and Planning for Leishmaniasis Control, held in Islamabad, Pakistan, in 1985. The symposium discussed current information on leishmaniasis in countries of the Region, and reviewed applied control strategies and methods for collecting information on leishmaniasis and its control. Emergency methods for control of epidemics and the assessment of training and research needs for leishmaniasis control in the Region were also outlined.

However, much remains to be done to clarify various factors that influence the epidemiology and control of the disease, such as the role of various sandfly species, their habits and their vectorial capacity. Field studies along this line, with the technical assistance of WHO, are planned so as to improve control methodologies in the affected countries of the Region. The strengthening of the capability of a core of health personnel at national level is another activity receiving priority support from WHO.

The control strategies adopted by countries of the Region include passive and active case detection, followed by treatment, vector control and animal reservoir control. But, in general, they are short of meeting the needs for effective intervention.

5.3.5 Salmonellosis

The prevention and control of salmonellosis requires joint action by the agriculture and food sector industries, as well as by consumers, and should be directed towards all groups, including animals and humans. The essential elements of prevention and control include good food-handling practices in homes and in food-serving establishments, in hospitals, etc. There is a need for more surveillance work. Countries should establish monitoring programmes aimed at recognizing the magnitude of the *Salmonella* problem. Adequate food safety and educational programmes aimed at workers engaged at all levels of the food production sector are one of the important elements in prevention and control of salmonellosis.

The regional veterinary public health programme has continued to strengthen national capabilities in prevention and control of salmonellosis through training of national personnel, provision of teaching/learning materials, and promotion of close cooperation with the FAO/WHO Collaborating Centre for Food Hygiene and Zoonoses, in Berlin, Germany.

An EMR Workshop on Prevention and Control of Salmonellosis and Some Other Bacterial Zoonoses was organized in Cairo, Egypt, in May 1992. The participants developed draft national plans for surveillance applicable to their countries. Recommendations adopted included:

- to intensify efforts to achieve intersectoral collaboration among national authorities for public health, food hygiene, veterinary services, livestock and environmental health sectors;
- to devise and support programmes for education and training of professionals and other groups of workers involved in surveillance and control operations;

- to study existing legislation and, if necessary, revise in order to present effective surveillance and control operations;
- to establish a national system for information exchange;
- to consider ways of involvement of the community in surveillance of salmonellosis both in humans and in animals;
- salmonellosis surveillance mechanisms should essentially be associated with health-care actions, including prevention and treatment of people, with due consideration to drug resistance of prevailing salmonella, food hygiene and animal production hygiene.

5.3.6 Other zoonotic diseases

The Regional Office actively participated in proceedings of the WHO Working Group Meeting on Animal Tuberculosis and in the Congress on Animal Tuberculosis in Africa and the Middle East, Cairo, April 1992. During the meetings, the public health significance of animal tuberculosis was discussed, and recent advances in epidemiology, diagnosis, prevention and control measures were reviewed.

Some EMR Member States expressed concern about the introduction a few years ago of the screw-worm disease from the American continent into a North African country. The Regional Office has kept neighbouring countries informed about the epidemiological situation, and has promoted vigilance in relation to this new disease in the Region. The problem has been largely solved by active cooperation between the national authorities and international organizations such as FAO, in the surveillance and control of the screw-worm.

5.3.7 Other activities

A Regional Consultation on the Organization and Management of National Veterinary Public Health Programmes was organized by EMRO in Limassol, Cyprus, in December 1991. The meeting was attended by representatives from 11 countries of the Region where zoonoses are considered a public health problem, as well as by representatives of MZCP, FAO, WHO and WHO collaborating centres. The participants discussed the organizational and managerial aspects of national veterinary public health programmes and suggested a common policy to prevent and control zoonoses in the Region, particularly as regards intersectoral and international cooperation, surveillance and reporting systems, human resources development, health education, material support, evaluation and monitoring of national programmes, research and legislation.

The full text of the recommendations of this meeting is attached as an Annex.

6. Conclusions

Many zoonotic diseases are important public health problems in some countries of the Region. The significance of zoonoses in the Eastern

Mediterranean Region is increasing due to the increase in animal husbandry practices and the importation of foods and food products of animal origin.

All countries of the Region have acknowledged the need to have veterinary public health activities as an integral part of their health care programmes. Some of them have national plans for the control of specific zoonotic diseases, based on available resources and strategies. Significant progress has been achieved in the prevention and control of some zoonotic diseases, such as Rift Valley fever and screw-worm disease. However, brucellosis, rabies, echinococcosis and salmonellosis still constitute a threat to human health and are a cause of considerable economic loss.

6.1 Problems and constraints

Although Member States have indicated interest in prevention and control of zoonotic infections, there are several common problems facing the development of national veterinary public health programmes, namely:

- lack of information on the magnitude of zoonotic diseases and their impact on health as well as their socioeconomic impact;
- inadequate and, in some cases, inappropriate legislation in relation to zoonoses control;
- lack of, or insufficient coordination among, national authorities responsible for veterinary public health services at district, provincial and country levels;
- inefficient information exchange within and between countries;
- inadequate provision of health services, especially with regard to diagnostic facilities for some diseases, teaching/learning materials, as well as preventive and control services;
- inadequate supervision, monitoring and evaluation of national prevention and control activities;
- insufficient involvement of communities in the control of zoonotic diseases.

7. Recommendations

1. Promote activities that can lead to a better understanding of the epidemiological situation of important zoonoses at country and regional levels, by strengthening epidemiological surveillance, improving diagnostic and information systems, establishing national and regional zoonotic reference centres and by exchanging information.
2. Develop/improve administrative and managerial capabilities of national programmes by ensuring coordination between veterinary health services, at all levels, and allocation of necessary resources.
3. Develop national human resources by training different categories of health and veterinary service personnel, at all levels, in methods of diagnosis, treatment and prevention of major zoonotic diseases.
4. Encourage community involvement in preventive and control activities through better motivation, cooperation and health education.
5. Support the introduction and field applications of alternative methods for prevention and control of major zoonotic diseases suitable to local conditions.
6. Strengthen cooperation and collaboration, interprofessional and intersectoral, intercountry, regional and international (WHO, MZCP, FAO, OIE) in planning, implementation and evaluation of joint preventive and control measures against common zoonotic diseases.

It is evident that with political commitment, allocation of adequate resources, strengthening of intersectoral, intercountry and international cooperation, the public health problem of zoonotic diseases can be substantially reduced and eventually eliminated.

ANNEX

**Recommendations of the Regional Consultation on Organization and
Management of National Public Health Programmes**

Limassol, Cyprus, 9-11 December 1991

A. Intersectoral and international cooperation

1. National programmes for zoonoses control should be based on effective collaboration between all sectors involved in veterinary activities. This collaboration must extend to all levels (international, national, provincial/governorate, district, municipal, local, etc.).
2. Cooperation between the competent services of the countries in the Region, especially neighbouring countries, is necessary and should be established, if not existing already, and strengthened, particularly in view of the widely practised nomadic animal husbandry.
3. WHO and other agencies and institutions, such as WHO collaborating centres, the Mediterranean Zoonoses Control Programme and national participating institutions, should assist Member States by producing and distributing documents, laboratory guides and other relevant materials on methods of surveillance, prevention and control of zoonoses and foodborne diseases; such dissemination of information would be beneficial to both medical and veterinary sectors.
4. WHO and other agencies should assist Member States by convening meetings, seminars, etc., with emphasis on intersectoral collaboration.
5. Closer cooperation should be established between countries and WHO collaborating centres in areas of technical support, training and research. The establishment of regional centres on zoonoses is important and should be supported by WHO. Member States should strengthen collaboration with the Mediterranean Zoonoses Control Programme (MZCP) to obtain full benefit of its activities. Those countries which are not yet members of MZCP are encouraged to join it.
6. For promoting and facilitating international cooperation in the control of zoonoses and foodborne diseases at subregional level, neighbouring countries with similar cultural, geographical and epidemiological conditions should establish subregional committees in order to enable unifying disease surveillance and control strategies.

B. Information and reporting system

1. The collection of information concerning zoonoses and foodborne diseases must be done systematically and continuously so that any further actions (i.e., planning of epidemiological surveys, prevention or control programmes that are based upon this information) can be carried out effectively.

2. The system of reporting must be specified by legislation; this legislation must also identify those who are responsible for providing such information.
 3. Most serious and contagious veterinary public health problems such as salmonellosis, trichinosis, brucellosis, anthrax, echinococcosis, toxoplasmosis and rabies, should be made notifiable diseases through appropriate legislation.
 4. The reporting forms used must be precise, unified and comprehensive.
 5. The staffing of the reporting offices, the qualifications of the staff, the procedures and the channels through which this information and the reporting system will be implemented, should be determined.
 6. Observation at strategic points (i.e., animal markets, abattoirs, dairies, butchers' shops, cow sheds, zoos and game reserves, hospitals and clinics) is recommended. This could be an important source of data for major zoonoses.
 7. Laboratory statistics are a very important source of data for day-to-day work and for special investigations beyond routine procedures. It deserves special attention from national authorities.
 8. Exchange of information among countries of the Region can be improved through the publication of information on zoonotic and foodborne diseases in the *Eastern Mediterranean Region Epidemiological Bulletin*. Countries are encouraged to submit available information for publication.
 9. WHO, FAO and OIE should strengthen activities for the collection, evaluation and dissemination of epidemiological data among national zoonoses control programmes.
- C. Material support and laboratory services
1. Supply of adequate quantities of chemicals and biological reagents should be ensured and spoilage or misuse should be prevented. Proper maintenance, storage, safe utilization and disposal of costly and dangerous chemicals and reagents should be secured and unnecessary wastage of material should be avoided.
 2. Technicians and professional staff should receive necessary training in order to acquire knowledge and skills to operate instruments, machinery and safe handling of hazardous material. Availability of maintenance and service facilities must be ensured.
 3. Heads of laboratories should be provided with catalogues and other relevant documentation for selection and procurement of the most appropriate chemicals, reagents, laboratory apparatus and scientific instruments.

D. Education and research

1. Educational institutions should keep pace with scientific developments and the existing situation concerning the surveillance, prevention and control of zoonoses in the country concerned.
2. Training courses on zoonoses and foodborne diseases for different groups of professionals, including schoolteachers, university staff, epidemiologists and health managers, are recommended to be organized in order to understand the problem better.
3. WHO, through its collaborating centres, should assist in designing health education programmes and materials on the zoonoses relevant to each area.
4. Educational and research institutions should collaborate with national health and veterinary authorities in promoting veterinary public health (VPH) activities within the primary health care system. They may also promote VPH community-based programmes in areas where veterinary and medical services are scarce or lacking.
5. Research to identify the importance of zoonoses as occupational diseases in the area should be initiated.
6. WHO, MZCP and WHO collaborating centers should assist Member States in training in epidemiological surveillance, application of suitable and appropriate diagnostic techniques and measures for prevention and control.

E. Legislation

1. Legislation must keep pace, and be updated when necessary, with developments in science and zoonoses control.
2. Member States should introduce the mandatory notification of the most important zoonoses in humans and animals.

ZOONOTIC DISEASES

Introductory Paragraph

Zoonotic diseases, or those diseases of vertebrate animals that can be transmitted to man, continue to have a public health and socioeconomic impact in many countries of the Eastern Mediterranean Region. They cause considerable morbidity, resulting in overall deterioration of human health and loss of working ability of affected people. Some zoonoses, even though they do not cause mass morbidity, are important in the infection pathology of man due to high percentage of lethal outcomes. Zoonoses cause heavy losses of high-quality protein food and other products of animal origin, and therefore effect the nutritional status of the population.

The variety of causative agents of zoonotic diseases and involvement of animals, vectors and environment in their transmission cycle often complicate the process of prevention and control of this group of communicable diseases, and require coordinative actions from different sectors of human society.

The Technical Paper describes the situation regarding the major zoonotic diseases in the Region and proposes strategy options for the strengthening of control at country and regional levels.

Agenda Item 10(a)

ZOONOTIC DISEASES

Summary of Recommendations

It is recommended that Member States:

1. Provide necessary commitment and support to the prevention and control of zoonotic diseases through the adoption of necessary legislation, and allocation of sufficient resources within the framework of primary health care services;
2. Strengthen cooperation between national veterinary and public health services in surveillance, information exchange, prevention and control of zoonotic diseases;
3. Ensure appropriate development of necessary support services, including diagnostic and training facilities, drugs and vaccines;
4. Strengthen health education about zoonoses prevention, particularly among high-risk groups;
5. Promote operational research on major zoonoses.

It is evident that with political commitment, allocation of adequate resources, strengthening of intersectoral intercountry and international cooperation the public health problem of zoonotic diseases can be substantially reduced or eventually eliminated.