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# Zoonoses and poverty – a long road to the alleviation of suffering

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**Summary**

Populations living in poverty in the developing world suffer a heavy burden caused by infectious diseases, most of them zoonoses. The poorer populations also tend to be marginalised from the health sector and so are many of the diseases that affect them. The poor in every society, and particularly in developing countries, bear a disproportionately high share of the disease burden. There is a broad range of viral, bacterial, mycotic, chlamydial, rickettsial and parasitic diseases of global and regional importance given their major impact on the health and socio-economic development of many populations. Endemic infectious diseases, including zoonoses, together with emerging and re-emerging diseases, are mostly shouldered by poor and vulnerable populations. Livestock are important in supporting the livelihoods of poor farmers, consumers and traders throughout the developing world. The animals of poor people are particularly vulnerable to disease because of costs, absence or unsuitability of the animal health sector, etc. The impact of endemic animal diseases are mainly felt at the farm level, while a broader economic impact can occur with these diseases through the restriction of trade in livestock and their products. Addressing comprehensive and sustainable solutions to public health problems created by endemic infections cannot be achieved solely by the public health sector alone. Partnerships with other sectors, particularly agriculture, environment, education, local administration, will be necessary to contain and effectively control zoonotic and foodborne diseases that affect mainly the poor. International organisations could support developing countries by coordinating national intersectoral activities, promoting appropriate technology and public health education, community participation and encouraging decision-makers to commit themselves. This is the only perspective for improved quality of life of poor and marginalised populations.

**Keywords**

Animal health, Neglected zoonoses, Poverty, Public health, Zoonoses.

## Zoonosi e povertà – verso il sollievo della sofferenza

**Riassunto**

*Popolazioni che vivono in povertà nel mondo in via di sviluppo, sostengono un pesante fardello dovuto alle malattie infettive, molte delle quali sono zoonosi. Inoltre, tendono a rimanere ai margini del settore sanitario, così come le malattie che le colpiscono. Il povero in qualsiasi società, ma in particolare nei paesi in via di sviluppo, sostiene una parte sproporzionata del danno prodotto dalle malattie. Esiste una vasta gamma di malattie di origine virale, batterica, micotica, parassitaria, da clamidie, rickettsie d' importanza globale e regionale, per il loro impatto sulla salute e lo sviluppo socio-economico di molti popoli. Malattie infettive endemiche, zoonosi incluse, insieme a quelle emergenti e ri-emergenti, vengono per lo più sostenute da popolazioni povere e vulnerabili. Nei paesi in via di sviluppo l'allevamento del bestiame è*

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*molto importante per la sopravivenza degli allevatori, consumatori e commercianti. Gli animali, in queste aree, sono particolarmente vulnerabili alle malattie a causa del costo delle cure, assenza o inadeguatezza di un settore di sanità animale, ecc.. L'impatto delle malattie endemiche si riflette sui singoli allevamenti, mentre le malattie che limitano il commercio del bestiame e dei suoi prodotti hanno conseguenze sull'intera popolazione animale . Le soluzioni ai problemi di sanità pubblica, legati a malattie endemiche, non possono essere trovate e sostenute dal solo settore di sanità pubblica. Collaborazione e coordinamento con altri settori, in particolare con agricoltura, ambiente, educazione, amministrazione locale ecc., sarà necessaria per controllare effettivamente le zoonosi e le tossinfezioni alimentari, che affliggono soprattutto i poveri. Le organizzazioni internazionali potrebbero sostenere i paesi in via di sviluppo coordinando piani nazionali intersettoriali, atti a promuovere tecnologie adeguate ed educazione in sanità pubblica, la partecipazione delle comunità, informazione corretta ed impegno delle autorità responsabili, ecc. Questi prerequisiti costituiscono l'unica prospettiva per una vita migliore e lo sviluppo socio-economico delle popolazioni povere ed emarginate.*

**Parole chiave**
Povertà, Sanità animale, Sanità pubblica, Zoonosi, Zoonosi dimenticate.

## Introduction

Zoonotic and foodborne diseases of animal origin are expanding and the health and socioeconomic impact is increasingly being experienced by many countries, but most particularly by the developing nations. Poor and marginalised populations bear a disproportionately high share of the burden that such diseases are creating.

In these countries, the establishment and implementation of adequate measures, especially against emerging and re-emerging zoonotic and foodborne diseases, has proven to be very difficult. Thus, they remain a major cause of human morbidity and mortality while they undermine efforts to boost livestock production and trade, as well as socio-economic development.

The health of a population has long been acknowledged to have a deep and profound impact upon the economic and social conditions of a nation. There is a strong link between disease and poverty. Attempts to decrease poverty without addressing disease control often contribute to the spread of disease. Endemic, emerging and re-emerging infectious diseases, including zoonoses, frequently exacerbated by malnutrition and other health conditions, continue to threaten the ability of people in developing countries to improve their quality of life. These diseases reduce earning capacity as well as individual and family welfare. Recurring disease is a major cost to the individual, the community and to the health system (3, 7, 8, 9, 12, 18, 20, 21, 26, 30).

The importance of zoonotic, parasitic and foodborne diseases from animal products has multiplied because of the increasing invasion of the natural environment due to particularly large-scale development projects in agriculture, water resources and extensive population movements. Urbanisation rates have multiplied rather than lessened the incidence of the so-called 'rural' diseases. This trend has served to bring predominantly rural diseases into urban areas where concentrated human and vector populations increase the incidence of infection. Until recently however, only a few studies of the economic and social ramifications of zoonotic, parasitic and foodborne diseases and control strategies related to these diseases have been carried out. They are of global and regional importance because of their major impact on the health and socio-economic development of many people (3, 6, 9, 13, 20, 21, 24, 29, 33).

The group of the so-called 'neglected zoonotic diseases' including, among others, plague, yellow fever, leptospirosis, brucellosis, anthrax, bovine tuberculosis, equine encephalitides, leishmaniasis, Chaga's disease, schistosomiasis, taeniasis/cysticercosis (*Taenia solium*), trichinellosis, hydatidosis, fascioliasis, etc, possess this characteristic because, with the exception of plague which is subject to compulsory reporting in most countries, they usually affect the poor, are unknown or not well known and

 

are therefore not perceived as public health problems. Most of them do not lead to dramatic epidemiological emergencies and consequently attract little attention from the media and official and private sectors. Moreover, the financial sector and the multinational pharmaceutical companies do not consider this group of diseases as an advantageous investment, a phenomenon which severely hampers the development of corresponding diagnostic tools, drugs for treatment, and vaccines (1, 4, 8, 15, 18, 24, 25, 28, 29, 30).

## Rationale and socio-economic impact of the neglected zoonotic diseases

Determinants influencing the maintenance of development/hampering conditions include socio-political and socio-cultural behaviour, vector ecology and occupational activities, natural disasters, uncontrolled urbanisation, indiscriminate insecticide use, weak national infrastructures, lack of public health education and of community awareness, etc.

Such conditions create a framework inside which the poor is included. Clearly, poverty is one of the most critical determinants that has repercussions on the health of individuals and of the society as a whole. It also increases the vulnerability to diseases by limiting access to quality health care, safe and nutritious food and adequate housing.

The burden of neglected zoonotic diseases, as mentioned before, is mostly shouldered by poor and vulnerable populations. Every day, thousands of people living in poverty get sick and die of diseases that could be prevented. They account for the major difference in the magnitude of morbidity and mortality rates between developed and the developing countries. Among infectious diseases, the neglected zoonoses are indicators of the level of socio-economic development, and are pervasive in regions or countries where the gross national product (GNP) is low or where the income distribution is highly diversified. Some of these diseases would cease to exist with an increase in GNP and a more balanced income distribution (7, 9, 15, 18, 21, 25, 29, 31).

Neglected zoonotic diseases exert a high financial burden on the individual, the family, the community, the country and even a region by impeding social and economic development. For instance, in Latin America, an estimated 75 million people live in areas where *T. solium* cysticercosis is endemic, with approximately 400 000 affected by symptomatic disease and it is in these areas where neurocyticercosis is the leading cause of epilepsy. The highest concentrations of cases of human hydatidosis is in the southern cone of South America, in the southern Mediterranean, the Middle East, south-western Asia, North Africa, Uganda, Kenya, etc (3, 7, 8, 13, 18, 21, 25, 27, 28, 30, 31).

There are many reasons for the increased burden of disease on the poor. Firstly, the poor are much more susceptible to disease because they lack access to clean water and sanitation, safe housing, medical care, information on preventive action and adequate nutrition. Secondly, the poor are much less likely to seek medical care even when it is urgently needed, because of the distance they are from health providers, their lack of out-of-pocket resources needed to cover health outlays and their lack of knowledge of how best to respond to an episode of illness. Thirdly, for serious cases of illness, out-of-pocket outlays, if identified, can push them into a poverty trap from which they do not recover, by forcing them into debt or into the sale or mortgaging of productive assets, such as land and/or their livestock. A serious illness may plunge a household into prolonged impoverishment, extending even to the next generation as children are forced out of the school and into the workforce (3, 7, 9, 12, 18, 26, 27, 28, 31).

## Animal diseases and multiple impacts on the poor

Livestock are important in supporting the livelihoods of poor farmers, consumers, traders and labourers through the developing world. The greatest impact of livestock in sustainable development, designed to help the

poor, is enhancement of livestock production systems. Animal diseases are crucial constraints because the animals of poor people are particularly vulnerable to disease due to the expense, absence or unsuitability of animal health and production inputs. The distribution of foot and mouth disease (FMD) in the world follows poverty indicators. Poor farmers have few animals and few reserves on which to survive during lean times, so the loss of even individual animals has a proportionally significant impact (7, 9, 13, 18, 23, 24, 29).

The impact of animal endemic diseases is mainly felt at the farm level, while a broader economic impact can occur with epidemic diseases that restrict trade in livestock and livestock products. The occurrence of such diseases strikes both poor and richer livestock producers by marginalising them from higher-priced livestock markets which restrict their capacity to access value-added trade (9, 19, 21, 24, 26, 28).

Endemic, production-limiting diseases and the condition of animals, together with major infectious and zoonotic diseases, reinforce the vicious circle of poverty. Livestock assets do not grow and products for home consumption or sale are not harvested. Rural populations are at high risk of zoonotic infections because of their continual close contact with their livestock, e.g. brucellosis, hydatidosis and other intestinal parasitic diseases (7, 9, 18, 21, 26).

The benefits of livestock as a regular source of income, in terms of both cash and exchange, have been detailed in numerous studies which have shown that poor farmers (small land size or landless) are increasingly relying on livestock as their main source of income. In addition, livestock are often the main way in which poor farmers can acquire real assets, providing a safety factor when difficulties strike. The asset-acquisition pathway usually begins with poultry, followed by small ruminants and pigs, with larger stock such as equids, cattle and buffalo acquired at later stages. Animal diseases are a major constraint to the generation of income and the acquisition of assets for the poor, since poor people and poor farmers have limited cash to pay for animal health (3, 5, 6, 9, 16, 19, 29).

However, most of the low-income countries do not have the resources and adequate infrastructures to support certain essential pre-requisites in order to place strategic approaches to control endemic neglected zoonotic diseases and/or prevent/contain emerging/re-emerging zoonoses. National animal health services in these countries, like other departments, have to compete for scarce resources, often they are politically weak and unable to succeed in receiving the support they need. Therefore, progress of programmes designed to control major animal infectious diseases, among which zoonoses include an important part, often becomes problematic (2, 4, 5, 6, 7, 13, 16, 18, 23).

## Human and animal health: problems, impact and challenges

Most of the countries around the world, with the technical cooperation of international organisations, have recognised and addressed the problem of zoonoses as simultaneously social, economic and health issues since the 1950s. Programmes have been launched, some are still on-going, to prevent, control and eradicate rabies, bovine tuberculosis, brucellosis, echinococcosis, taeniasis/cisticercosis, equine encephalitides, FMD, etc. Moreover, considerable achievements have succeeded in certain developing countries over the last 30 years and have resulted in an increase in life expectancy, a global average decrease in the mortality rate of under five-year olds, etc. Such results confirm that well targeted investments in health, if they can possibly be identified, including sustained immunisation campaigns and public health education, are always important for success (25, 27, 28).

Besides achievements, there are also tragic conditions among 48 of the least developed countries where the life expectancy is just 51 years, as compared with 78 years in the high income countries. For low and middle income

 

countries combined, almost a third of deaths are due to preventable and/or mild communicable diseases, to maternal and perinatal conditions, nutritional deficiencies, etc (5, 9, 12, 20, 21, 26, 27, 30, 32).

Over the past 30 years, infectious and vector-borne animal diseases have become increasingly important worldwide and disease emergencies now occur with an increasing frequency. Those of major economic importance for the livestock of a country, such as FMD, bovine pleuropneumonia, sheep and goat pox, classical swine fever (hog cholera), tickborne diseases, trypanosomiases, Newcastle disease, etc, extend from Africa across to the Near and Middle East into Asia, encompassing many of the poorer countries of the world (3, 7, 9, 13, 18, 21, 27, 28).

There has been a resurgence of serious livestock infectious diseases throughout the world, including zoonoses, creating interconnected social and economic problems in addition to the challenge of new diseases such as the highly pathogenic avian influenza (HPAI) or severe acute respiratory syndrome (SARS). Worsening of epidemiological conditions in humans and animals are influencing developed and developing countries, while developing countries are much more vulnerable. The livelihoods and health of poor livestock farmers and farming communities in such countries are under severe threat (3, 7, 8, 9, 13, 16, 18, 24, 33).

The economic costs of avoidable diseases are extremely high. For example, disease reduces the annual income of society, the lifetime income of individuals and prospects for economic growth. Such a situation creates a particularly heavy burden and clearly hampers development in poor countries.

## Improving national public health and animal health policies and delivery systems

Zoonotic and other infectious disease prevention and control strategies for poor and marginalised populations demand immediate action, while solutions can be identified following the adoption of sustained strategies over long-term programmes. It has been largely understood that such a framework should be based on integrated, multi-disease, inter-programmatic intersectoral concept and management. Approaches should provide multiple health risks and protective factors for both the short and medium-terms. The mobilisation of public and private initiative and resources, particularly at local and community levels, are of paramount importance (4, 5, 9, 12, 15, 22, 25, 28, 29, 30, 32, 33, 34).

In this context, sustainable control and organisation programmes would need basic pre-requisites, such as (5, 12, 15, 16, 17, 19, 25, 28, 29):

- maintenance of an effective epidemiological surveillance system
- access to all livestock of animal health personnel
- access of the population to efficient health care
- human resource development and capacity-building at national level
- input of resources to supply vaccines and drugs
- socio-political stability and comprehensive information and commitment of decision-makers
- inter-country collaboration and regular information exchanges
- sustainable technical support and funds mobilisation from international organisations.

Such pre-requisites that require integrated actions and coordinated efforts are major challenges for poor countries and their targets are often difficult to meet.

In 2007, the World Health Organization (WHO) published the *Global plan to combat neglected tropical diseases, 2008-2015*. Among the key elements, were goals, targets and strategies placed for action, these are summarised in Table I (29).

The Statement of the 3rd International Conference on neglected zoonotic diseases held in Geneva in 2010 (32), refers to strategic aspects that should be addressed so as to prevent, control and possibly eliminate

diseases that affect mostly the poor and marginalised populations. From the list of recommendations, the following aspects can be highlighted:

- Providing resources to implement specialised training in all aspects of surveillance, prevention and control to serve national human health and national veterinary services in countries where neglected zoonotic diseases represent a significant threat to local communities. Training in surveillance and laboratory diagnosis of neglected zoonotic diseases is of paramount importance to improve reporting and assess their burden
- Providing affected countries with the skills to develop economically sustainable national control strategies, including economic evaluations integrating cross-sectoral costs and benefits
- Identifying priority neglected zoonotic diseases in each WHO region and country by considering their impact on both human and animal health and the level of commitment for prevention and control from interested sectors. This approach will require budget lines from the relevant implementing ministries as well as national research commitments, stable policy and essential long-term national and international financing
- Requesting pharmaceutical companies to broaden the scope of their collaboration and funding to include pharmaceutical products and development of vaccines to be used in the context of interventions against neglected zoonotic diseases
- Increasing awareness among the international funding community of the local, regional and global impact of neglected zoonotic diseases, and urging funding agencies to consider neglected zoonotic diseases as an integral part of their portfolios to assist governments in the support of affected communities.

Together with the above mentioned priorities, comprehensive and sustainable solutions must be a shared responsibility among all sectors involved in achieving a better quality of life for the population. The conceptual basis of the approach for the prevention and control of zoonotic and other infectious diseases for populations in poverty, should address the multiplicity of risks and protective factors, while the strategy should rely on convergence and synergies of public health and animal health sectors which should meet the local communities and individuals (3, 4, 5, 9, 12, 14, 17, 18, 25, 27, 31, 32, 33, 34).

Under the conditions described, the technical, educational, training coordination, as well as

Table I
Extract from key elements of the *Global Plan to combat neglected tropical diseases, 2008-2015* (29)

| Vision | Pre-requisites for achieving the objectives |
|---|---|
| Goals and targets | Eliminating or eradicating those diseases targeted in resolutions of the World Health Assembly and WHO Regional Committees |
| | Reducing significantly the burden of diseases not yet targeted for elimination or eradication |
| | Ensuring that interventions using novel approaches are available, promoted and accessible for diseases that have inadequate control methods |
| Strategies for action | Assessing the burden of neglected tropical diseases and zoonoses |
| | Taking an integrated approach and adopting multi-intervention packages for disease control |
| | Strengthening health-care systems and building capacity |
| | Ensuring free and timely access to high-quality medicine, diagnostic and preventive measures |
| | Providing access to innovation |
| | Strengthening integrated vector management and capacity building |
| | Establishing partnerships and mobilizing resources |
| | Developing strategy at country level and regional level |

 

the mobilisation of funds from international organisations are essential. These programmes and activities, guidance for harmonisation and adaptation of strategies and of drafting legislation where missing, in close collaboration with national sectors, can only create a positive outlook and the expectation of a better life at social and individual levels (18, 29, 32, 33, 34).

Major international organisations, such as the Food and Agriculture Organization (FAO), the World Organisation for Animal Health (*Office International des Épizooties*: OIE) and the WHO) operate across the globe, possess experience in the field of neglected zoonotic diseases in all countries. They recognise the cross-sectoral and interdisciplinary collaboration as a unique approach, while promoting inter-agency partnership in all relevant aspects. To this effect the 'One Health' concept, relayed from different academic and professional bodies, has been adopted, promoted and expended by the three organisations (2, 6, 10, 16).

The Tripartite Concept Note, issued in April 2010, stresses their determination for 'sharing responsibilities and coordinating global activities to address health risks at the animal-human-ecosystems interface'. They recognise that the coordination of strong partnerships is the only way to 'minimise the burden on member countries of multiple monitoring, reporting and delivery systems and to avoid duplicated efforts and fragmented outcomes' (11).

In this context it is evident that in strategies, approaches and activities, the major role and responsibilities reside in the human and animal health sectors. The 'One Health' approach, when adopted at national and international levels, would strongly support the coordinated contribution of the sectors involved, would promote the permanent horizontal inter-communication, the necessary information exchanges between countries, as well as community participation. Such a national structural reform in association with the international technical cooperation, could only become a positive step in opening the way to the alleviation of poverty, reducing human suffering and promoting socio-economic development.

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