

Arthropod-Borne Infections

- Arthropods play an important role in the transmission (vector) of many infectious diseases.
- Arthropod vectors includes many species of:
 - Flies (snadfly)
 - Mosquitoes
 - Fleas
 - Ticks
 - Mites

The infective agents of arthropod-borne Infections:

1. Arbovirus infections (arthropod-borne viral diseases) 4 main clinical syndromes

2. Rickettsial infections

- a) Epidemic typhus
- b) Endemic typhus (murine)
- c) Scrub typhus
- d) African tick typhus (spotting fever)
- e) Q – fever

3. Bacterial infections

- a) Plague
- b) Relapsing fevers (tick-borne and louse-borne)
- c) Bartonellosis

4. Protozoal infections

- a) Malaria
- b) Trypanosomiasis
- c) Leishmaniasis

5. Helminthic infections

- a) Filariases
- b) Loiasis (Loa loa)
- c) Onchocerciasis
- d) Other filarial infections

Bacterial infections

- Plague
- Relapsing fevers (louse-borne and tick-borne)

Plague

(Pestis, Black death)

1. Identification:

Plague is primarily and basically a zoonoses involving rodents and their fleas, which transfer the bacterial infection to various animals and to people.

Types /

1. Bubonic : infection of L.N draining site of bite mainly: inguinal (90%), less commonly axillary and cervical L.N. The L.N are swollen, tender and may suppurate.

Bubonic plague may progress to (via blood) secondary septicemic plague or secondary pneumonic plague source of person to person transmission primary pneumonic plague epidemics.

CFR of un Rx 50 – 60 %

1. Bubonic :

The occurrence of bubonic plague in human population is always preceded by plague in the rat population and hence unusual mortality among rats should be looked into promptly.

2. Primary Septicemic rare, fatal if un Rx

3. Primary Pneumonic:

The bacilli are present in the sputum,
fatal if un Rx

Dx: clinical + bacteriological:

smear and/or culture from blood, pus, CSF, sputum

Giema's stain microscope **bipolar-staining “safety pin”**

culture **definite diagnosis**

2. Infectious agent:

Yersinia pestis

Easily destroyed by disinfectants, heat and sunlight but survive for W's-M's in cold or freezing conditions.

3. Occurrence:

Epidemics of plague are mentioned in the Bible. Since the Christian era, there have been 3 great pandemics

1st (542 y.) 100 millions deaths

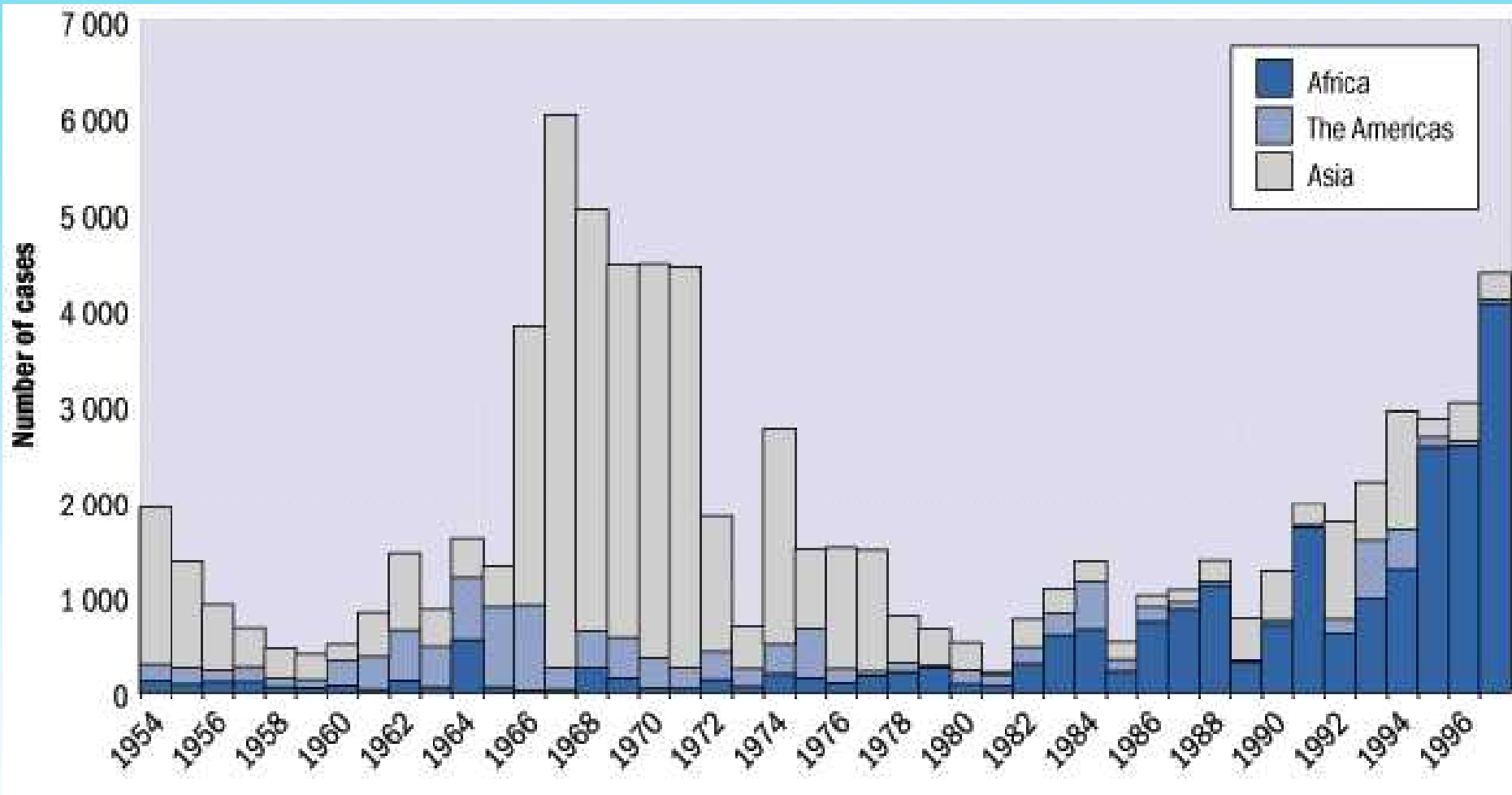
2nd (1350-1650s y.) 25 millions deaths

3rd (1894 -1930s y.) < 1 million deaths

Wild rodents plague persist in Central Asia, Vietnam, Indonesia, Middle east, South America, Africa (Natural foci).

While urban plague has been controlled in most of world except few outbreaks as in India in 1994 (167 cases and 53 death). Pneumonic plague in Ecuador in 1998.

2002 – 2003: 4 000 human cases and 350 deaths in 6 African countries.



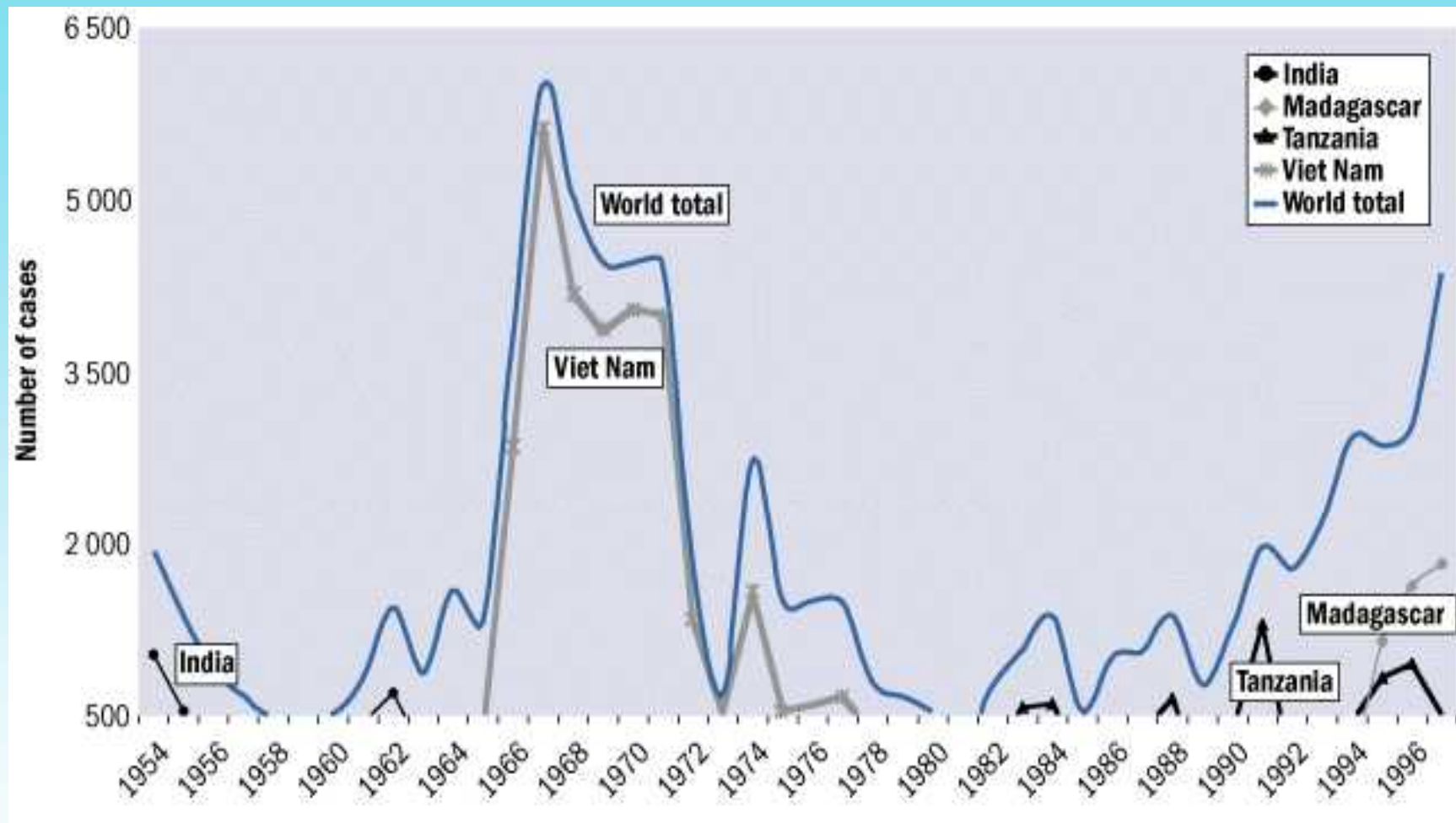


Figure 2 - Plague notification in Madagascar, 2000-2005

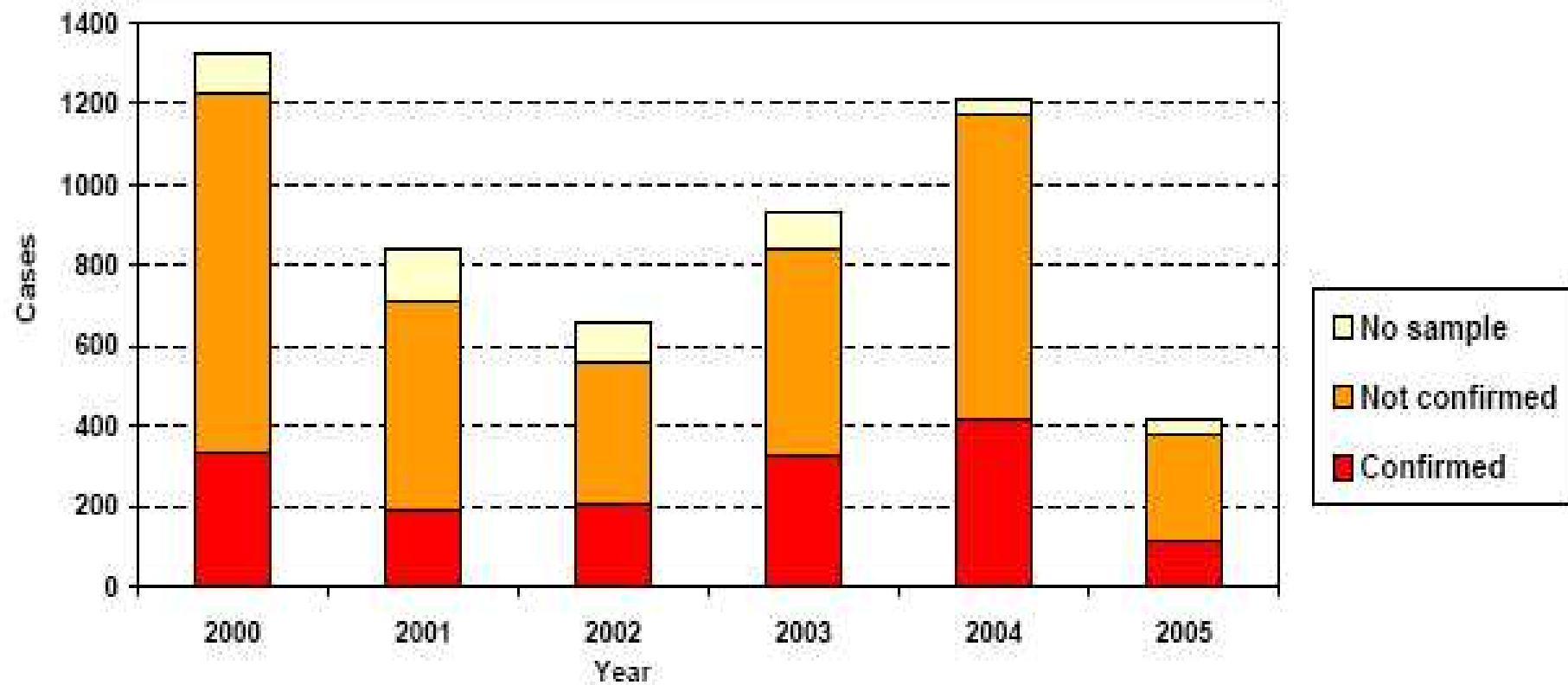
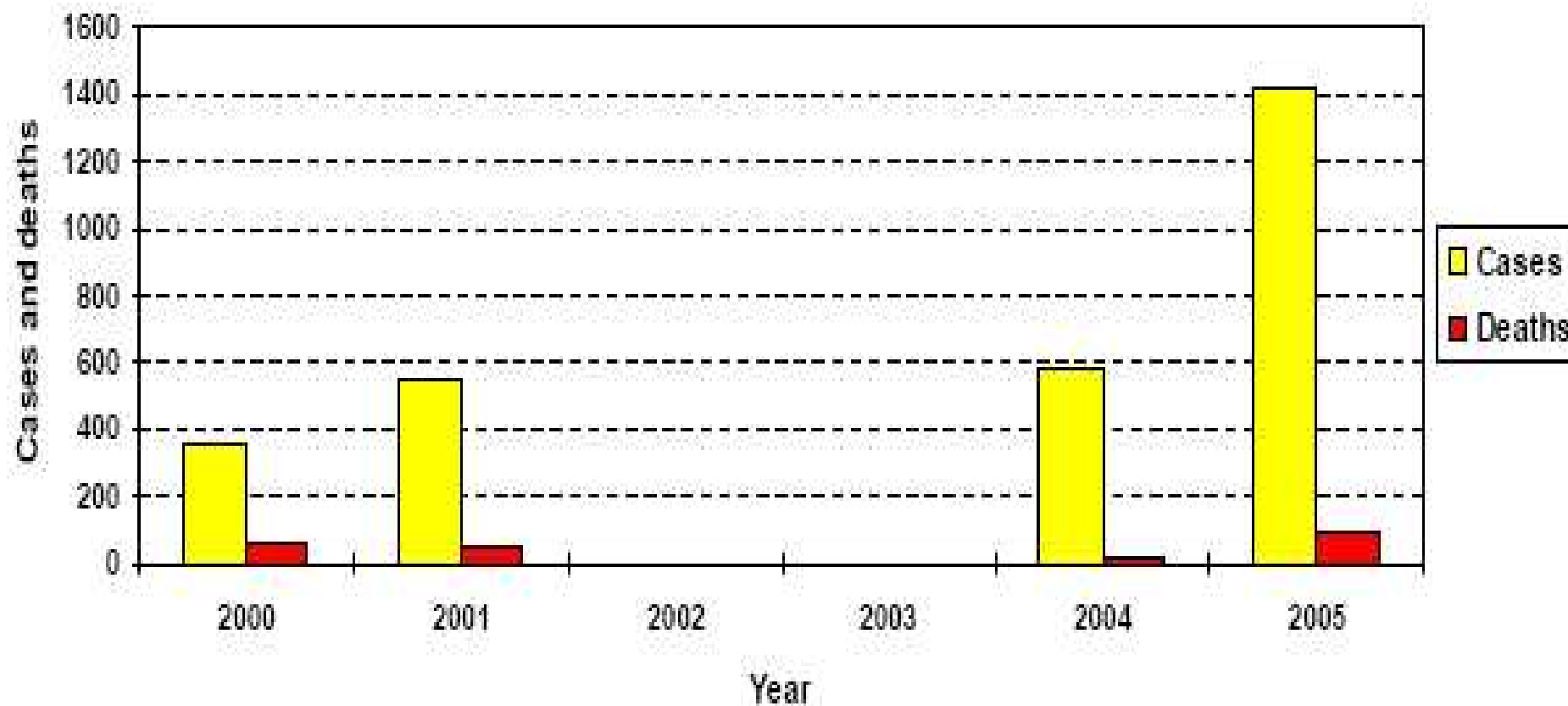


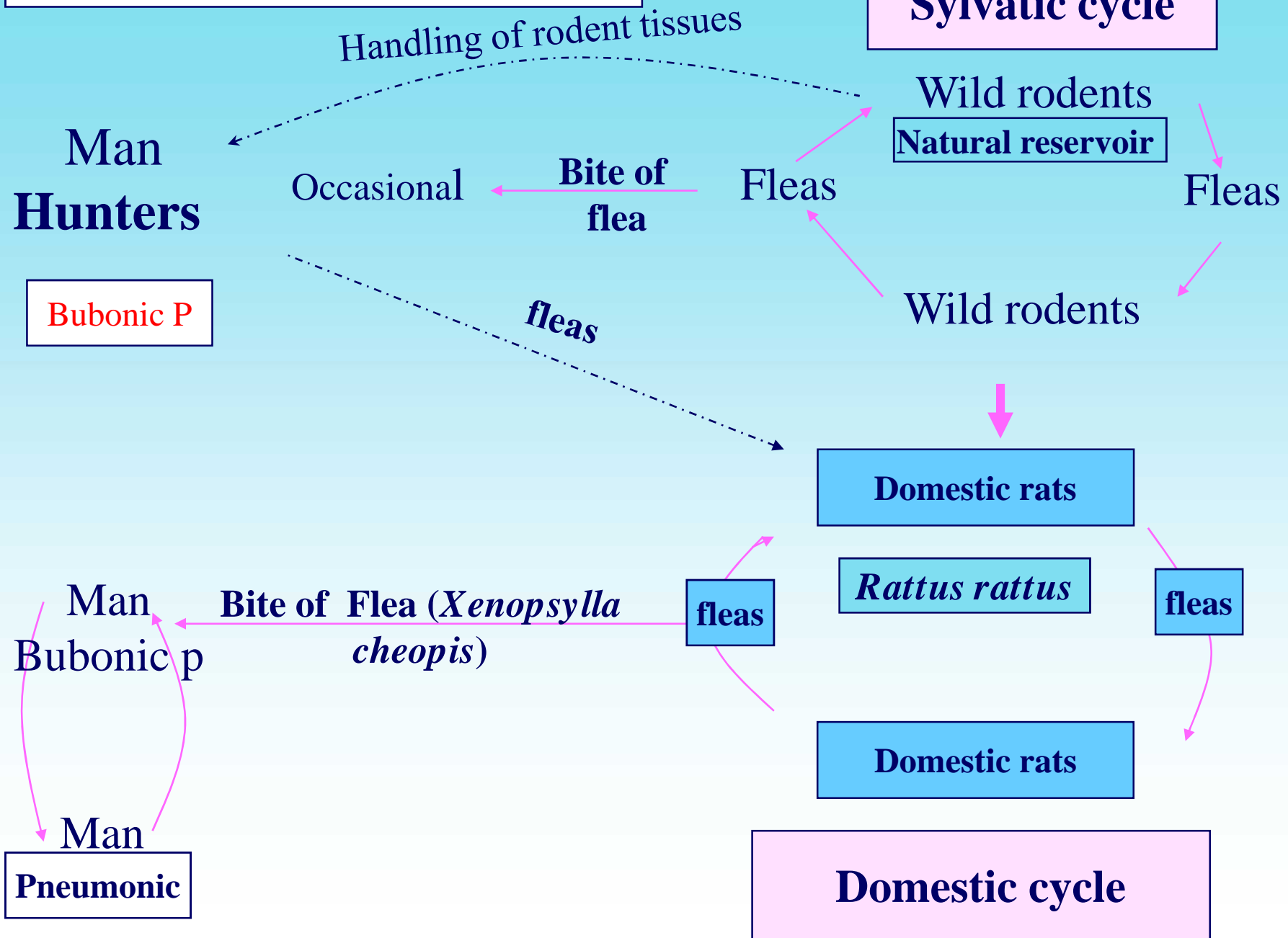
Figure 3 - Plague reporting in DRC, 2000-2005 (no data available for 2002-2003).



4. Reservoir:

wild rodents; > 200 species (rats, field mice, gerbils, skunks, squirrel and other rodents). Some time domestic cats.

Mode of transmission



5. Mode of transmission:

- The most frequent source of human infection by bite of infected rat fleas (*Xenopsylla cheopis*).
- Handling of tissues of infected animals (through an open wound).
- Airborne droplets from human patients or domestic cats with plague pharyngitis or pneumonia (primary pneumonic P)

Fleas

Flea ingests infected Blood bacilli multiply in the gut
block proventriculus (can not feed) hungry more
bites +regurgitate plague bacilli into the puncture. These
called "**blocked fleas**" are important factor in dissemination
of human disease.

6. I.P 2-6 days

7. Period of communicability:

Fleas may remain infective for months under suitable conditions. Bubonic is not transmitted directly unless contact with pus.

Pneumonic plague may be highly communicable (overcrowding).

8. Susceptibility:

General, immunity partial, 2nd infection may occur.

9. Method of control:

A- Preventive measures:

1. Educate the public in zoonotic areas.
 2. Elimination of fleas must precede rat destruction (DDT 10% + benzene hexachloride 3%)
 3. Rat destruction on ships, houses by rat-proofing.
Dead rats should be sprinkled with DDT and disposed carefully.
 4. Personal protection from flea.
 5. Immunization killed 2 doses 1 Week interval
 live attenuated 1 dose
- [protection commences 1 week after inoculation and last for 10 months, protect against bubonic plague only]. Given to high risk persons.

B. Control of patient, contacts and environment:

1. Reporting: Informing health authority (class I).
2. Isolation: Strict isolation particularly in pneumonic (quarantinable disease for 6 days).
3. Disinfection: of sputum and purulent discharges and terminal cleaning.
4. Quarantine: quarantinable disease for 6 days.
5. Immunization of contacts: Chemoprophylaxis by Tetracycline for 1 week for all close contacts and health personnel.
6. Investigation of contacts and source of infection: search for dead rodents and their fleas.
7. Specific treatment: Streptomycin is drug of choice(10 days). Garamycine , tetracycline and chloramphenicol can be used. All are highly effective if used early (within 8-18 hours after onset of pneumonic plague).

Arbovirus infections (arthropod-borne viral diseases)

Large number of arboviruses can cause spectrum of diseases include 4 main clinical syndromes:

- ❑ acute CNS illness mild meningitis
encephalitis
- ❑ Fever \pm exanthema \pm CNS \pm hemorrhages
(rare)
- ❑ Hemorrhagic fever: fever + hemorrhages
serious illness Hg either external or
internal.
- ❑ Polyarthrititis and rash \pm fever

(arthropod-borne viral diseases)

Most viruses are maintained in Zoonotic cycles.

Human not important in cycle.

Usually human infected during blood feeding by an infected arthropod vector.

Rarely human principle source e.g dengue & Yellow fever.

The vector: Majority by mosquitoes, the rest by ticks, sand flies, and others.

The virus: >100 viruses (ARBO) produce disease in humans.

Infective dose for all viruses 1 – 10 virus

Names: places Rift Valley F, West Nile F.
 cl. charact. Yellow Fever.

Arbo V.	Disease in humans	Reservoir	Vector	Geography
Dengue 1,2,3,4 v.	DF, DHF (fever, Hg, rash)	Human + Monkeys	Mosq.	Throughout tropics. Epidemic in SE Asia
Rift-valley	RVF (fever, Hg, enceph.)	Live-stocks + Mosq.	Mosq.	Africa, Arabia
Yellow F v.	Y.F. (fever, Hg)	Human + Monkeys	Mosq.	Africa, C. America
Crimean-Congo HFv.	CCHF (fever, Hg)	Small mammals	Ticks	Africa, Asia Middle East
Lassa v.	L.F	Rodents	Rodent excreta	Africa
Ebola v.	E.v. diseases	Unknown (monkeys)	Nosocomial (infected bl.)	Africa

Rift valley fever (RVF)

Disease affect live-stock as cattle, sheep, goats and camels.
Non-fatal disease in humans.

Infectious agent: RV virus.

Clinically in human: fever, headache, myalgia and epistaxis.

If severe form meningoencephalitis + bleeding with DIC.

CFR < 1%,

In severely ill > 50% (hepatic failure).

It cause severe disease in sheep and cattle (economic losses).

I.P: 2 – 6 days.

Occurrence: 1st identified in Rift Valley in Kenya 1912
hepatitis in sheep. In Egypt 1977: 200 000 cases 600
deaths in humans, outbreak in Saudi Arabia and Yemen in
year 2000.

Reservoir: Live-stocks + Mosquitoes (transovarial transmission).

Vector: Mosquitoes (Aedes or culexes)

Mode of transmission:

Bite of mosquitoes

Communicability: no direct man to man transmission.

No specific treatment.

Rickettsial diseases

1. Intracellular organisms living and multiplying in arthropod tissues
2. Closely related to G –ve bacteria
3. Dx by serological tests:
 - Weil-Felix test (reaction with protus O Ag: Ox_2 , Ox_{19} and Ox_k .)
 - ELISA or IFA
1. Dramatic response to tetracycline or chloramphenicol.

Disease	Causative agent	Reservoir	Vector	Geograph.
Epidemic typhus	<i>R. prowazekii</i>	Man	Louse (<i>Pediculus humanus</i>)	Worldwide
Endemic typhus (murine)	<i>R. typhi</i> (<i>R. mooseri</i>)	Rat	Flea (<i>Xenopsylla cheopis</i>)	Worldwide
Scrub typhus	<i>R. orientia</i> <i>tsutsugamushi</i>	Mouse	mite	SE Asia
Spotted F: 1) Rocky mountain SF 2) African tick typhus	<i>R. rickettsi</i>	Rodents, dogs	ticks	N and S America
	<i>R. africae</i>	Rodents, dogs	ticks	Africa, India
Q – fever	<i>Coxiella burnetti</i>	Mammals	ticks	Worldwide
Trench fever	<i>Bartonella quintana</i>	Man	Louse (<i>P. humanus</i>)	Africa, S America

Epidemic typhus:

Recent epidemics in Burundi and Rwanda (100 000 cases and 10 000 deaths).

Transmission:

- once louse suck blood defecate person itching so inoculate R. in feces inside skin (not by bite).
- no man to man transmission.

Prevention delousing + personal hygiene.

Endemic (murine Or shop) typhus:

Transmission:

- infected rat flea defecate person itching so inoculate R. in feces inside skin (not by bite).
- no man to man transmission.

Prevention Kill flea then rat destruction + personal hygiene.

Rx of epidemic and endemic typhus:

tetracycline for 5 days or single dose doxycycline 200mg.