Chapter  64

Polymerase Chain Reaction Assays for the
Presumptive Identification of Yersinia pestis Strains
in Georgia

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1. INTRODUCTION

Plague has been a danger for the human society since the pre–Christian era. Events of fall 2001 made it clear to the whole world that particularly dangerous infectious agents can be easily used as biological weapons. Plague was mentioned for the first time in the Georgian manuscripts from the XI century. Later, in the XV century another Georgian manuscript – “Ustsoro Karabadini” (“Matchless Book of Medical Treatment”) gave more detailed information on plague. Particularly, it described clinical manifestation of bubonic form of plague. In 1616, cases of plague were registered in western part of Georgia, and probably it was imported by catholic missionaries. In Georgian folklore plague is named “zhami” (in old Georgian it means “bad time”).

2. NATURAL FOCI OF PLAGUE IN GEORGIA

There are two natural foci of plague in Georgia. One of the foci, the ‘plain foothill region’, includes the territories of Dedoplistskaro, Signakhi, Sagarejo and Gardabani regions. Plague epizootics were identified in 1966 on Eldari Valley and in Karayazi Valley in 1968 – 1971. The main reservoir
of plague in these foci is *Meriones erythrourus* (*libicus*) and the main vectors, *Xenopsylla conformis* and *Ceratophyllus laeviceps*. Totally 83 *Y. pestis* strains were isolated: 30 strains from rodents and 53 strains from the vectors. Another focus, the ‘high mountainous region’, includes the territories of Ninotsminda and Akhalkalaki regions on Javakheti plateau. Only one part of the focus is on the territory of Georgia, the focus is conventionally divided by state border between Georgia and Armenia. The first epizooty of plague in this focus was identified in 1979 and lasted until 1983. Epizooties were also registered in 1992 and 1997. The main reservoir in this focus was *Microtus arvalis* and the main vectors, *Callopsylla caspia*, *Nosopsillus consimilis*. From 39 *Y. pestis* strains isolated in this focus 5 strains were from rodents and 34 from vectors. All strains isolated in Georgia belong to the biotype Mediaevalis.

About fifty isolates of *Y. pestis* are kept in the microbial culture collection of the National Center for Disease Control of Georgia. NCDC is responsible for carrying out surveillance on particularly dangerous infections. Field teams go out every season for reconnoitering and gathering materials for laboratory investigation. Materials are taken from live rodents and rodent remains from locations of epizooties: parts of organs, spleen, liver, lungs, lymph nodes, bone marrow, brain, etc. Fleas and ticks are combed out, and collected from burrows. Material is investigated by microscopy, cultivation on selective media, serology and by infecting laboratory animals. Isolates are investigated by bacteriological, biochemical and biological methods.

3. **IDENTIFICATION OF Y. pestis BY PCR ASSAYS**

![Figure 1. Identification of Y. pestis by PCR. Panel A. V antigen gene PCR; panel B. F1 antigen gene PCR. Lanes: 1-20 and 22 ~ Y. pestis, 21 and 23 ~ Y. pseudotuberculosis, 24 ~Y. enterocolitica.](image-url)