**Short Report: Molecular Characterization of *Bacillus anthracis* Directly from Patients’ Eschar and Beef in an Anthrax Outbreak in Jiangsu Province, China, 2012**

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**Abstract.** An outbreak of anthrax was reported in Lianyungang, Jiangsu Province, China in 2012. Laboratory confirmation of cases was made by detection of *Bacillus anthracis* genes rpoB, pagA, and cap using real-time polymerase chain reaction (PCR); source tracking was conducted by multiple locus variable-number tandem-repeat analysis (MLVA) and pagA sequencing using DNA extracted from case specimens and meat from a suspected slaughtered cow. The genotypes were MLVA type 57 and pagA genotype I. Combined with the field epidemiological data, the four cutaneous anthrax cases most likely were caused by butchering of the sick cow. Backward tracing of animal cases identified the region of origin, and some public health measures, such as reactive or preventative animal vaccination for cattle, intersectoral cooperation, ensuring proper pre-slaughter inspection, and educating butchers and villagers about this disease, could be used to prevent *B. anthracis* infection.

*Bacillus anthracis*, the etiological agent of anthrax, is a Gram-positive, spore-forming bacterium that can cause serious and often fatal disease among livestock and humans. Animals are infected by contact with contaminated grass or soil. Human infections may result from contact with infected animals or products made from or derived from those animals, including hair, wool, leather, hide, hoof, and bone. Four types of human anthrax are currently recognized: cutaneous, gastrointestinal, pulmonary (inhalation), and injectional anthrax.

In China, the main form of infection is cutaneous anthrax, a relatively rare but severe disease. Infections may result from contact with infected animals or products made from or derived from those animals, including hair, wool, leather, hide, hoof, and bone. Four types of human anthrax are currently recognized: cutaneous, gastrointestinal, pulmonary (inhalation), and injectional anthrax.

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Protective antigen (PA) is encoded by the pagA gene and one of three toxins produced by isolates of B. anthracis; it is a critical component in the development of immunity against anthrax. Previous studies have documented six pagA genotypes. PagA (2,294 bp) was amplified from real-time PCR-positive samples and sequenced as described. All of them in this study were pagA genotype I, identical to B. anthracis strains Ames and Sterne.

Collectively, the genotyping results provided evidence that four human cases and the meat obtained from the slaughtered sick cow may be infected from a common source. Together with the epidemiological investigation, our evidence indicated the link between the four human cases and the slaughtered sick cow. In conclusion, our results provide evidence supporting the usefulness of genotyping for epidemiological investigation.

We recommend that some public health measures should be taken to prevent B. anthracis infection, including identification of the region of origin by backward tracing of animal cases, reactive or preventative animal vaccination for cattle, intersectoral cooperation between medical and veterinary authorities, ensuring proper pre-slaughter inspection to ensure that only healthy animals are used for meat sources, and providing education to butchers and villagers about this disease. This latter point addresses refraining from butchering and eating meat from sick livestock or carcasses and leaving the disposal of these animals to veterinary or other trained personnel.

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REFERENCES