

FUNDING PROGRAM FOR NEXT GENERATION WORLD-LEADING RESEARCHERS

Project Title: Development of a new therapeutic strategy against pathogenic bacterial infection by using genome information and regulation of autophagy

Name: Ichiro NAKAGAWA

Institution: Tokyo Medical and Dental University

1. Background of research

The evolution of pathogenic bacteria is constantly occurring to spread their habitat and adapt to new environments. In response to such environmental changes, bacterial genes have been evolving to acquire the new phenotypes such as pathogenicity. At the same time, many exogenous genes have been incorporated into their genome from the outside. These “non-self” genes are also thought to provide new phenotypes for survival in their niche. Such genetic changes are important for spreading the gene repertoire. In recent years, the threat of new infectious diseases, such as the emergence of new bacterial infections and antibiotic-resistant infections, are reported from all over the world, and these emerging infections are thought to be due to the excessive changes of the natural environment and lifestyle. Conventional methods are insufficient for prevention and treatment of such emerging infections.

2. Research objectives

Therefore, we try to clarify the evolution of pathogenic bacteria and to determine the strain-specific pathogenic gene clusters by using the comparative genome analysis and bioinformatics techniques. In addition, we also try to analyze the anti-bacterial effect and regulation of autophagic degradation mechanism. We set our goal to elucidate new therapeutic methods for efficient elimination of specific bacteria.

3. Research characteristics (incl. originality and creativity)

Bacterial virulence has not demonstrated every time or everywhere in in vivo. In this study, we try to analyze the spatial-temporal expression of genes, which related to the ‘real’ pathogenicity, rather than focusing only on functions of individual genes, using genomic information. Genome is the blueprint of life, but there is no information when and how they induce the pathogenicity. Our research features are comprehensive analysis of the pathogenicity of bacterial and the control of the recognition and elimination system of bacteria.

4. Anticipated effects and future applications of research

Our final goal is to develop new therapeutic strategies for bacterial infections not relied on antibiotics treatment. Comprehensive analysis of bacterial strains- or species-specific virulence factors may clarify the adaptation mechanism. In addition, we expect that the control of the host defense system based on the bacterial lifestyle leads the new treatment methods without the emergence of resistant bacteria.

Development of a new therapeutic strategy against pathogenic bacterial infection by using genome information and regulation of autophagy.

