

Editorial

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The Forever War Against Evil Germs

Jin-Hong Yoo *

Division of Infectious Diseases, Department of Internal Medicine, College of Medicine, The Catholic University of Korea, Seoul, Korea

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Address for Correspondence:

Jin-Hong Yoo, MD, PhD

Division of Infectious Diseases, Department of Internal Medicine, Bucheon St. Mary's Hospital, College of Medicine, The Catholic University of Korea, 327 Sosa-ro, Wonmi-gu, Bucheon 14647, Republic of Korea.
Email: jhyoo@catholic.ac.kr

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ORCID iD

Jin-Hong Yoo

<https://orcid.org/0000-0003-2611-3399>

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Those Were the Days, My Friend

It was from the penicillin-resistance of *Staphylococcus aureus* in the 1950s that the problem of antibiotic resistance began to draw attention, but in fact, admittedly, Korean clinicians before the new millennium, including myself, did not properly realize its seriousness.

After graduating from medical school in the mid-late 1980s, I began my medical career as a resident in internal medicine. To be honest, I don't remember having much difficulty in treating infectious diseases at the time. Whether it was pneumonia or meningitis, even infected patients with unexplained high fevers were almost all cured with penicillin alone. Typhoid fever was successfully treated with ampicillin, chloramphenicol, or trimethoprim/sulfamethoxazole. Third-generation cephalosporin or fluoroquinolones were rarely used, and carbapenem had not yet been introduced at that time.

Dear Korean young doctors of the new generation, can you believe this Belle Époque?

As you go through your life, you realize that a change does not happen in a linear way, but in most cases, it happens in a non-linear way, more specifically, in an exponential progression. In other words, a change happens suddenly and drastically one day. Such is the case with antibiotic resistance. Just as a war broke out suddenly after the Belle Époque, the troubles of antibiotic resistance lay quietly dormant during that beautiful period and suddenly burst out all at once.

No matter how hard we try to contain it, the entropy of human vs. microbial ecosystem has been increasing and will continue to get worse.

What Is Going on Here?

As emphasized by the World Health Organization, antibiotic resistance is a global problem, and of course Korea is no exception.¹ On the aspect of this problem, the paper by Bae MH *et al*, published in this issue,² provides important guidelines on how to cope with antibiotic

resistance in the coming decade. There is an old saying in Korea that rivers and mountains change their shape in 10 years. As expected, during the 20 years of this new millennium, the pattern of antibiotic resistance in Korea has changed markedly.

The first noticeable point is that the isolation frequency of Gram-positive bacteria represented by *S. aureus* decreased, whereas that of Gram-negative bacteria represented by *Escherichia coli* increased. In proportion to this, the rate of antibiotic resistance expressed by Gram-negative bacteria also increased.

In particular, the increase in carbapenem resistance, especially on the epidemiology of *Klebsiella pneumoniae*, *Acinetobacter baumannii*, and *Pseudomonas aeruginosa*, is giving us the greatest concern.

Nevertheless, as methicillin-resistant *S. aureus* (MRSA) has always harassed us for a long time, it still remains a difficult task for us to solve.

Vancomycin-resistant Enterococci are still giving us trouble.

The emergence of *Streptococcus agalactiae* as a dark horse that has not received much attention before is also a future concern that should be noted.

But of all these problems, the one that we urgently need to solve right now is the prevalence of carbapenem-resistant Enterobacteriaceae (CRE) and carbapenemase-producing Enterobacteriaceae (CPE).

Now It's a Battle Against CRE & CPE as Well as MRSA

CRE and CPE are currently at the top of the most prominent antibiotic resistance problems worldwide, and Korea is also keeping pace with this global trend.^{3,4}

We are still fighting MRSA in the hospital, but we have not yet achieved a clear victory, and in the meantime, the situation of the war is never getting better as we face new enemies called CRE & CPE.

Strengthening infection control and thorough antimicrobial stewardship are the keys to turning this war into an advantageous situation.

Along with this, new weapons are also needed. The diversity of antibiotic resistance appears to outnumber the currently available antibiotics, and yet we must arm ourselves with the introduction of new weapons. Currently, new antibiotics that can overcome various multidrug-resistant organisms are being introduced one after another,⁵ but unfortunately, they are not quickly imported into Korea. Cooperation from not only medical institutions but also from government officials is desperately needed.

In fact, this war will never end and will continue forever. That's a fact since entropy within the system is bound to increase anyway. But we must continue the war against these evil germs.

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