CREATING A WWWW COLLECTION OF THERAPEUTIC BACTERIOPHAGES ACTIVE AGAINST GLOBAL BACTERIAL INFECTIONS

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Bacteriophages are natural predators of bacteria also those pathogenic to humans. Phages outnumber bacteria at least tenfold and are the most abundant life form on the Earth. Typically phages are highly specific and demonstrate narrow host ranges oftheir lytic activity restricted to single bacterial clones. Phages together with the sensitive bacteria form predator-prey pairsinevolutionary arms racethat tends to keep the populations of both species in unbalanced equilibrium. Thus phages and bacteria must have a history of previous contacts and interactions and physically close to each other. Accordinglyphages isolated in certainplaces may not be active against bacterial strains isolated from the other locations simply due to the fact that they do nothave such a history of previous interactions. On the other hand, if bacteria from one part of the globe are successfully attacked by the phages isolated from the other part, this meanseither a global dissemination of the bacterial-phage pair or an extremely wide phage host range due to commonly used receptors.

We have tested the sensitivity of 65 clinical bacterial pathogens including MRSA, multiple resistant Pseudomonas aeruginosa, Acinetobacter baumanii and Klebsiella pneumoniae, carbapenem resistant Escherichia coli and Enterobacter cloacae, as well as vancomycin resistant Enterococcus faecium isolated in Singapore hospitals against a collection of the corresponding resident bacteriophages isolated from the waste waters of Munich. Although some specieslike MRSA and Pseudomonas demonstrated 80% and 90% sensitivity to the locally isolated phage preparations, respectively; 80% Kl. pneumonia and 80% E. coli were resistant to the corresponding phages. Moreover all tested Acinetobacter and E. cloacae strains were resistant to the phages previously isolated in Germany.

We have used different water samples from Munich waste water collectors to isolate phages active against the phage-resistant bacteria isolated in Singapore. We have successfully isolated lytic phages to the representatives of each group of the pathogenic bacteria. The phages demonstrated different host ranges and activities. The DNAs of the collected lytic bacteriophages were NG sequenced, their genomes assembled and compared to the phage DNAs presented in the available public databases. Such detailed characterization of the therapeutic bacteriophages allow us covering both potential threats present in the phage genomes and epidemiological and evolutionary linkages of these abundant life forms.

Thus, Munich waste waters already contain phages active against bacterial cultures isolated in Singapore hospitals that make it possible to establish a representative well characterized “world-wide” collection of therapeutic bacteriophages active against both locally and globally disseminated pathogenic microorganisms.