OBLIGATELY LYTIC PHAGE TREATMENT FOR METHICILLIN RESISTANT STAPHYLOCOCCUS AUREUS INFECTION
Yinghua Su (Catherine Loc Carrillo)
Department of Pathology

The overuse and misuse of antibiotics for treating bacterial infections has promoted the emergence of antibiotic-resistance bacteria such as Methicillin-resistant Staphylococcus aureus (MRSA). The proportion of MRSA identified from S. aureus infection has increased from 2% to 38% in the past 20 years becoming a big concern in the medical field, with the mortality rates of some MRSA infections reaching 86%. Alternative antimicrobials are therefore needed for treating MRSA infections such as phage therapy. However, there are two types of phages: temperate phages, which can integrate their DNA into the bacterial genome and potentially transfer genes to bacterial cells and make the bacteria more harmful; and obligately lytic phages, which can only lyse bacterial cells. The latter should only be used against susceptible bacterial strains for therapy.

Twenty-six Staph phages were isolated from either water treatment plants around the Salt Lake City area (12 WTP phages) or Eliava phage products (14 EP phages). Using a PCR assay, 21 of the phages did not contain seven integrase genes previously found in known temperate Staph phages. To test the virulence of those obligately lytic phages on MRSA strains, 42 clinical S. aureus strains obtained from a Wound Care Center were tested using a PCR assay to detect four genes associated with strain virulence. Twenty-seven of the strains were found to be MRSA containing the mecA gene. Of these determined MRSA strains, 41% also contained lukS gene which encodes for the toxin Panton-Valentine leucocidin. The lytic activity of each individual obligately lytic phage against the susceptible MRSA strains was determined. We found each phage had different lytic activity on the different strains. We further investigated the lytic activity of phage cocktails - mixing phages with high and low virulence activity. We found the cocktails to possess better lytic activities on some MRSA strains than using individual phages, which indicates a synergistic relationship between certain phage pairings. We plan to conduct more experiments with various phage combinations to determine if they have better lytic activities, as well as test them against additional MRSA strains.