

# The central role of diagnostics in personalized phage therapy and our rapid automated phagogram

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The personalized phage therapy model has the potential to sustainably serve a large and growing population of patients suffering from currently untreatable bacterial disease in military medicine. However, for this approach to be implemented, it will be necessary to construct a toolset for routine clinical microbiologists to accessibly and rapidly identify the phages that a patient's clinical isolate is sensitive to. Traditional phage methods cannot meet the needs of patients who require rapid, on-site, and reliable diagnosis to be credibly served at scale. Indeed, neither traditional methods nor other available tools can be implemented at lead times that are credible for patient needs, at costs that are credible to payors, or outside of distant core facilities.

To disrupt this challenge, we have constructed a semi-automated low-footprint multiplexed device, which can be accessibly implemented in Role 3 facilities that have the capacity to direct antibiotic treatment using an antibiogram. By providing a diagnostic answer within 3.5 hours personalized phage therapy will be made available at lead times comparable to directed antibiotic therapy. We do this with a simple kit that allows for a semi-quantitative direct detection of the phage-mediated lysis of the target bacteria in a liquid culture using an optical measurement of the ATP released from the cells. By returning scores reflecting the percentage of the culture that a low-MOI of each phage can lyse, the Inteliphage Phagogram both faithfully predicts the precise relationship between a clinical isolate and each member of a library of phages while identifying for the most effective phage(s) to be chosen for an individual patient.