Detection of Circular DNA Pathogens Using Rolling Circle Amplification by MEMS Devices
Host Professor Pr. H. FUJITA
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Context
Rolling Circle amplification (RCA) is important and powerful analytical method for the detection of circular DNA sequences. Isothermal capacity of RCA offers important advantage over existing DNA amplification strategies which eliminates the need for a thermal cycler and permits operation at near room temperatures reaching amplification rates of up to 10,000-fold in a few hours [1].

Results
We prepared a glass slit for DNA amplification. Introducing SNT tips into reaction solution in the slit, RCA was proceeded. After 2 hours incubation, SNT was completely retrieved and DNA bridge formed between the tips was visually confirmed (Fig. 1 and 2). The current of bridged DNA between tips was measured. According to our measurements, the current increased nearly 1,000,000 times after DNA amplification. This large increase could be partially due to a deposition of salts on the arms of the SNT during the incubation steps resulting in the increase of overall SNT conductivity. This problem was solved by coating hydrophobic surface between tips end and SNT main body. Further optimization is underway.

Objective & Methods
This project aims to develop a simple diagnostic microchip for infectious disease. With integration of electrodes, employing specific anchoring of primers, multiple bacterial and viral pathogens will be detected. To achieve this final goal, we are investigating RCA using silicon nanotweezers (SNT). Condition of DNA amplification and detection was optimized by an established SNT.

References