# Laser speckle imaging system for antibacterial resistance assessment

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Due to widespread use of antibiotics during the last century many common bacterial species have acquired resistance factors and become insensitive to traditional antibiotics. For appropriate treatment in case of infection it is necessary to quickly determine susceptibility to antibiotics of a specific isolated pathogen. Recently, it has also been a significant factor in treatment of COVID-19 patients as severity of disease is strongly related to presence of bacterial coinfection. Finding the effective antibiotic treatment quickly is crucial to reduce mortality of patients and to avoid the formation of new antibiotic-resistant bacteria due to preventative antibiotic use.

Laser speckle imaging has been demonstrated as an improved method for measuring bacterial growth[1] compared to traditionally used laboratory methods. Laser diodes create a specific reflection pattern depending on the surface the laser light illuminates. If the pattern is tracked with a camera over time it is possible to detect sub-micron motions due to variation of speckle intensity which is a suitable scale for study of bacteria. The system will be compatible with the use of Petri dishes where bacterial activity will be tracked to find zones where antibiotics have been successful in sterilizing the dish. Additionally, AI recognition techniques will be trained on the data to advance detection of changes in the complex laser speckle pattern. The system will be tested in Pauls Stradins Clinical University Hospital laboratory.

**References**

[1] [1] Ilya Balmages, Janis Liepins, Stivens Zolins, Dmitrijs Bliznuks, Ilze Lihacova, and Alexey Lihachev, "Laser speckle imaging for early detection of microbial colony forming units," Biomed. Opt. Express 12, 1609-1620 (2021)