

## **Is it possible to prepare pharmaceutical preparations to be installed? : Studies using liquid crystal-forming lipids**

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Biopharmaceuticals have world-widely emerged as a priority in drug development in pharmaceutical industries. Further biopharmaceuticals and their formulations must be accomplished with an integration of artificial intelligence (AI) and internet of things (IoT) in an era of Industry 4.0 (4th Industrial Revolution). Biopharmaceuticals are presently administered by injections, so that most drugs are rapidly eliminated from the systemic circulation, thus requiring frequent injections. In order to reduce such frequent administration of biopharmaceuticals, sustained release micro-infusion formulation must be designed. In addition, it is much more suitable to have automatic/regulatable drug regimen including drug on/off time and its input mode/rate. We intended to develop installable DDS (iDDS), where drugs can be released from iDDS by external devices like PC or cellphone through Wi-Fi to internet and the dosage regimen as above is also controlled by the IoT. Then, we set several milestones to attain this goal, and focused on the fabrication of an installable depot or micro-infusion formulation for the first milestone. Installable depot or micro-infusion formulation can be set in and on the skin, respectively. Non-lamellar liquid crystal (NLLC) forming lipid was selected as a depot or infusion material for iDDS.