

Microarray patches for drug delivery

HEALTH NEED

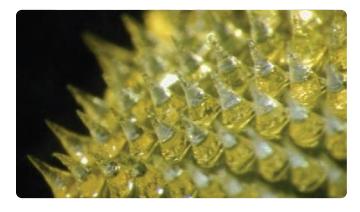
Many issues complicate the delivery of drugs that prevent and treat diseases and infections in low-resource settings. For example, HIV infection can be averted with antiretroviral medications, but adherence to daily regimens can be challenging. Patient compliance is also an issue for some malaria medications that can cause a range of side effects. Other delivery scenarios, such as the intramuscular or intravenous injection of antibiotics for the treatment of neonatal sepsis, can be out of reach for those in remote areas. In fact, the majority of the world's population, especially in low- and middle-income countries, lacks access to appropriate medical devices required for the safe delivery of pharmaceuticals. New drug presentations and safe delivery methods are therefore needed to ensure access and use of lifesaving medicines by all patients that need them.

TECHNOLOGY SOLUTION

One solution is transdermal drug delivery by microarray patch (also known as a microneedle patch), which consists of microscopic projections that painlessly penetrate the skin's upper layers or mucosal tissues to administer medicines into the body. Some microarray patches are designed to dissolve upon contact with the skin (when applied like a small adhesive bandage) or vaginal mucosa (when applied with an applicator). In other designs, the patch projections serve as a conduit, transferring the drug from a solid drug reservoir embedded within the patch to deliver it to the patient.

As an easy-to-use and discreet delivery method, microarray patches hold promise for self-administration, which could expand access to drug treatment and prevention strategies in a range of outpatient settings. Moreover, some patches could be formulated for long-acting, sustained delivery to help reduce the frequency with which they need to be re-administered.

Microarray patches also eliminate the risks associated with needlestick injury and improper needle reuse, helping improve safety and reducing the burdens of medical waste management and sharps disposal for patients, communities, and health systems.



Magnified image of a microarray patch. Photo: Queen's University Belfast

CURRENT STATUS AND RESULTS

PATH is collaborating with product developers and other global stakeholders to evaluate and advance a range of microarray patch designs for diverse applications. We are also exploring the use of patches in different drug delivery scenarios. Recent activities include:

- Working with Queen's University Belfast to develop microarray patches for the delivery of gentamicin for the treatment of neonatal sepsis and antiretroviral drugs for the treatment and prevention of HIV.
- Evaluating the benefits and challenges associated with self-administration of microarray patches.
- Identifying and facilitating product development pathways for microarray patches—including the relevant clinical, regulatory, manufacturing, and scale-up activities.
- Conducting end-user assessments in South Africa to evaluate perceptions of microarray patches for the delivery of HIV prevention drugs.
- Developing and testing applicators for microarray patches intended for vaginal delivery—incorporating end-users' preferences and functional requirements into prototype designs.