

A Shelf-Stable Measles Vaccine for Global Immunization Access

Stanford researchers have engineered a recombinant measles fusion protein with enhanced stability that can serve as an effective vaccine candidate, offering a protein-based alternative to the current live-attenuated MMR vaccine. This technology enables the development of a safer, more shelf-stable measles vaccine suitable for immunocompromised populations and resource-limited settings worldwide.

Current MMR vaccines rely on live-attenuated viruses, which create significant practical and safety challenges: they require strict cold-chain storage, cannot be given to immunocompromised individuals or pregnant patients, and fuel vaccine hesitancy due to safety concerns. Manufacturing live-virus vaccines is also complex and inflexible, making it difficult to respond quickly to supply shortages or emerging variants. Existing protein-based vaccine approaches have struggled to generate sufficiently robust immune responses because the measles fusion protein is inherently unstable, collapsing into inactive conformations before the immune system can recognize it.

The inventors have solved this problem by identifying specific amino acid substitutions that stabilize the measles fusion protein in its prefusion state, the structural form that most effectively triggers immune recognition, while also improving thermal stability for shelf storage without refrigeration. This engineered protein can be manufactured as a recombinant subunit vaccine using standard biotechnology platforms, enabling rapid scale-up and flexibility in production. The thermostable formulation opens new possibilities for pediatric immunization, booster dosing, outbreak response, and safe vaccination of currently excluded populations in low-resource settings where cold-chain infrastructure is limited.

Stage of Development:

Proof of concept – *in vitro* data

Applications

- Next-generation pediatric MMR vaccine for routine immunization programs
- Booster vaccines for adolescents and adults with waning immunity
- Safe vaccination alternative for immunocompromised individuals and pregnant patients
- Outbreak control and rapid response in resource-limited settings
- Thermostable formulations for low-infrastructure and remote regions

Advantages

- Eliminates risks associated with live-attenuated vaccines while maintaining immunogenicity
- Addresses vaccine hesitancy by offering a safer, protein-based alternative to live-virus formulations
- Requires no cold-chain storage, enabling deployment in low-resource and remote settings
- Safe for immunocompromised populations and pregnant patients, expanding vaccine access
- Faster manufacturing scale-up and greater flexibility in responding to supply shortages or variants

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