Solid, heat-resistant vaccine to ease immunisation processes

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EU researchers have set out to substitute liquid and freeze-dried vaccines for new, solid state candidates. If successful, the research will enable the large scale production of new virosome-based vaccines with increased stability, longer shelf life and less invasive administration methods.

To this day, immunisation remains the most effective way to eradicate diseases. Their widespread use has helped reduce the incidence of diseases such as hepatitis A, polio, rubella, tetanus or varicella by over 90 % compared to pre-vaccine era.

A major problem for health professionals, however, has been the instability of these biological preparations. Transported in liquid or freeze-dried form, vaccines require strict respect of the cold-chain and extreme finesse to maintain their safety and efficacy and ultimately avoid unwanted immune responses or insufficient immune protection. Conscious that factors such as heat, light, radiations or changes in the environment can affect vaccines' components, researchers funded under the MACIVIVA project are now considering solid vaccines as a potential solution.

'With more than 90 % of the existing vaccines dependent on the cold-chain and the resulting detrimental impact on availability, efficacy and costs of these vaccines in developing countries, there is an undisputable need to innovate and manufacture vaccines that are stable and temperature independent,' explained Ronald Kempers, CEO of the Swiss-based project partner Mymetics.

The basis of this EUR 9 million project – supported by Horizon 2020 to the tune of EUR 5.3 million – is the idea that solid vaccine dosage formats such as powder may prevent molecular motion and shear-induced degradation while also slowing down degradation processes involving water and oxygen radicals.

To this end, MACIVIVA will explore new virosome-based vaccine formulations. Excipients, stabilization and drying methods will be carefully screened in order to generate new vaccine solid forms that can be easily self-administered, after which the team intends to produce scale-ups of the most promising thermo-stable and cold-chain independent nano-pharmaceutical vaccine candidates. Robust manufacturing processes for upscale production of virosome dried powder for the non-invasive intranasal, oral and sublingual routes should be achieved by month 42, the project hopes.

'We look forward to working with our consortium partners to start the efforts on our promising virosome-based HIV vaccine candidate, with the overall objective to make this scalable and applicable for all our virosome-based vaccines,' said MACIVIVA project coordinator Sylvain Fleury.

The interdisciplinary consortium includes well established and innovative SMEs, as well as market-leading industrial experts with unique expertise and know-how in virosome technology, spray and freeze drying, large scale manufacturing and packaging.

If successful, MACIVIVA will result in improved vaccine stability, longer shelf-life and increased patient well-being thanks to the use of non-invasive vaccine administration routes. The team also expects the research to pave the way to the large scale production of other thermostable nanopharmaceutical products for therapeutic and prophylactic vaccines as well as other potential applications.

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