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The production of a plant-based chimeric vaccine against HPV and Gonorrhoea

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Background

Neisseria gonorrhoeae (Ng) is a bacteria which causes approximately 87 million gonorrhea infections globally per year. Cervical cancer is the fourth most prevalent cancer in women globally, with an estimated 604 000 reported cases in 2020. Approximately 95% of cervical cancer cases are a result of human papillomavirus (HPV) infections.. The HPV major capsid protein: L1 can self-assemble into highly immunogenic virus-like particles (VLPs) that structurally mimic native virions and has already proven to be an effective vaccine. By making use of HPV VLPs, a peptide mimic of the Ng lipooligosaccharide (LOS) epitope recognized by mAb 2C7 (called the 2C7 epitope) was displayed in the DE loop of L1 which still permitted VLP formation, thereby potentially creating a dual vaccine candidate (HPV-Ng) against both HPV-16 and gonorrhea.

Aim/Methods

Neisseria gonorrhoeae (Ng) is a bacteria which causes approximately 87 million gonorrhea infections globally per year. Cervical cancer is the fourth most prevalent cancer in women globally, with an estimated 604 000 reported cases in 2020. Approximately 95% of cervical cancer cases are a result of human papillomavirus (HPV) infections.. The HPV major capsid protein: L1 can self-assemble into highly immunogenic virus-like particles (VLPs) that structurally mimic native virions and has already proven to be an effective vaccine. By making use of HPV VLPs, a peptide mimic of the Ng lipooligosaccharide (LOS) epitope recognized by mAb 2C7 (called the 2C7 epitope) was displayed in the DE loop of L1 which still permitted VLP formation, thereby potentially creating a dual vaccine candidate (HPV-Ng) against both HPV-16 and gonorrhea.

Results

Transmission electron microscopy (TEM) confirmed that the transiently expressed HPV-Ng chimaera successfully assembled into VLPs that resembled native HPV virions. Immune sera from mice vaccinated with chimeric VLPs showed that the vaccine candidate elicited an immune response against both HPV and Ng by western blot and ELISA analysis. Vaccinated mice were protected against challenge with mammalian cell-produced HPV pseudovirions.

Conclusions

This study has shown that plant-based expression could provide a viable platform for the production of a dual vaccine candidate against HPV and gonorrhea.

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