

Topic/Title (Norwegian)

Salat (*Lactuca sativa*) -produsert hepatitt B virus (HBV) vaksineantigen for utvikling av fremtidig spiselig vaksinealternativ

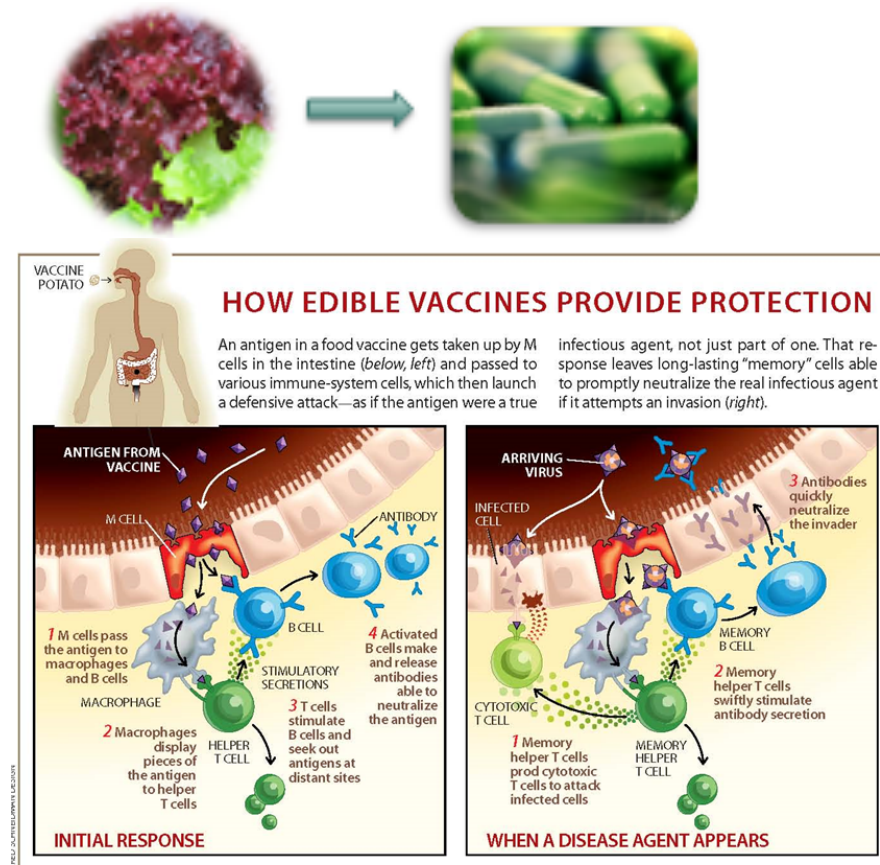
Kortnavn: Grønn anti-viral løsning G-AVL

Topic/Title (English)

Lettuce (*Lactuca sativa*) made hepatitis B Virus (HBV) vaccine antigen for future oral vaccine administration

Short name: Green anti-viral lettuce G-AVL

Picture



Summary (Describe the topic/thesis, type of thesis work: field work, laboratory work, literature study)

Plants are ideal bioreactors for the production of orally delivered vaccines, eliminating the need for expensive fermentation, purification, cold storage and sterile delivery (Pantazica et al. 2021). This MSc thesis work aims to exploit edible crop lettuce to generate recombinant hepatitis B Virus (HBV) vaccine antigen for future oral delivery. This is possible since HBV



infection can be prevented by vaccination (Dobrica et al. 2021; Joung et al. 2016). According to the WHO, chronic infection with Hepatitis B virus (HBV) is the primary cause of liver cancer worldwide and is responsible for the deaths of more than 750,000 people each year. Thus, effective vaccines against HBV are important but more research is needed to improve treatment solutions efficiency and delivery methods (Clarke et al. 2017).

The S/preS1¹⁶⁻⁴² chimera HBV antigen candidate produced in mammalian cells induces a significantly stronger immune response. Our approach is to introduce this into lettuce plants by *Agrobacterium*-mediated transient plant expression. The lettuce producing HBV antigens will be harvested and characterized using molecular methods (PCR, transcriptomics, western blot analysis and protein stability assay). Oral administration of adjuvant-free HBV antigen will be carried out in collaboration with the EEA project partners in Romania to evaluate the immune response in mice, at both humoral and cellular levels.

The MSc thesis work aims to train the MSc candidate in plant biotechnology and molecular biology covering vector construction, bacterial culture, plant transient expression, DNA and RNA isolation, PCR and protein analysis. The thesis involves mainly laboratory work with some greenhouse work on *Agrobacterium*-mediated agroinfiltrated plants and sample collection post agroinfiltration in addition to thesis writing.

Subject area (keywords)

Plant biotechnology, oral vaccine, HBV, human health

Language thesis (Norwegian and/or English)
English

Bachelor or Master thesis
MSc thesis

Credits
60

Project/company
NMBU and NIBIO

Please contact

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References:

Ana-Maria Madalina Pantazica, Lia-Maria Cucos, Crina Stavaru *, Jihong-Liu Clarke *, Norica Branza-Nichita (2021) Challenges and prospects of plant-derived oral vaccines against hepatitis B and C viruses. Plants 2021, 10, 2037 DOI: doi.org/10.3390/plants10102037

Clarke, J.L.; Paruch, L.; Dobrica, M.O.; Caras, I.; Tucureanu, C.; Onu, A.; Ciulean, S.; Stavaru, C.; Eerde, A.; Wang, Y.; et al. Lettuce-produced hepatitis C virus E1E2 heterodimer triggers immune responses in mice and antibody production after oral vaccination. *Plant Biotechnol. J.* **2017**, *15*, 1611–1621.



Bachelor or Master thesis BIOVIT 2021/22

Dobrica, M.O.; van Eerde, A.; Tucureanu, C.; Onu, A.; Paruch, L.; Caras, I.; Vlase, E.; Steen, H.; Haugslie, S.; Alonzi, D.; et al. Hepatitis C virus E2 envelope glycoprotein produced in *Nicotiana benthamiana* triggers humoral response with virus-neutralizing activity in vaccinated mice. *Plant Biotechnol. J.* **2021**, 1–13.

Joung, Y.H.; Park, S.H.; Moon, K.B.; Jeon, J.H.; Cho, H.S.; Kim, H.S. The Last Ten Years of Advancements in Plant-Derived Recombinant Vaccines against Hepatitis B. *Int. J. Mol. Sci.* **2016**, *17*, 1715.

Mihaela-Olivia Dobrica¹, Catalin Lazar¹, Lisa Paruch², André van Eerde², Jihong Liu Clarke², Catalin Tucureanu³, Iuliana Caras³, Sonya Ciulean³, Adrian Onu³, Vlad Tofan³, Alexandru Branza⁴, Stephan Urban⁵, Crina Stavaru³, Norica Branza-Nichita (2018) *Vaccine* 11;36(38):5789-5795

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