

Biosafety Clearing-House (BCH)

LIVING MODIFIED ORGANISM (LMO)


BCH-LMO-SCBD-115699-1

[? Decisions on the LMO ? Risk Assessments](#)

LAST UPDATED: 01 SEP 2020

Living Modified Organism identity


The image below identifies the LMO through its unique identifier, trade name and a link to this page of the BCH. Click on it to download a larger image on your computer. For help on how to use it go to the LMO quick-links page.



Barley modified for the production of LL-37 peptide

Read barcode or type above URL into internet browser to access information on this LMO in the Biosafety Clearing-House © SCBD 2012

<https://bch.cbd.int/database/record?documentID=115699>



Name

Barley modified for the production of LL-37 peptide

EN

Transformation event

UBI:LL-37

Developer(s)

- [PERSON](#): PALACKY UNIVERSITY OLOMOUC | [BCH-CON-CZ-113440-2](#)

PERSON

Palacky University Olomouc
Institute of Molecular and Translational Medicine
Olomouc
77900, Czech Republic
Phone: +420 585 632 111
Email: reception@imtm.upol.cz
Website: <https://veda.upol.cz/en/workplaces/science-centres/the-institute-of-molecular-and-translational-medicine/>

RELATED ORGANIZATION

Description

The barley (*Hordeum vulgare*) was modified for the production of human LL-37 peptide, which has known broad spectrum antimicrobial activity and acts as component of the basal immune response to infection. Barley production platforms have little phenolic compound content and have low amount of proteolytic enzymatic activity.

EN

The line is one of three lines (see "Related LMOs") being tested for bioproduction and protein purification. This line contains a non-specific promoter and no protein purification tag sequences. Expression of the LL-37 peptide was demonstrated to be found in all tissues of the modified plant. All lines demonstrated normal phenotypes and the LL-37 peptide was shown to be bioactive.

The modified barley additionally contains an antibiotic selection marker, *Escherichia coli* hygromycin phosphotransferase B, for hygromycin selection during transformation.

Recipient Organism or Parental Organisms

The term “Recipient organism” refers to an organism (either already modified or non-modified) that was subjected to genetic modification, whereas “Parental organisms” refers to those that were involved in cross breeding or cell fusion.

BCH-ORGA-SCBD-12110-5 ORGANISM | HORDEUM VULGARE (BARLEY, HORVU) |
Crops

Point of collection or acquisition of the recipient organism or parental organisms

Hordeum vulgare cultivar Golden promise EN

Related LMO(s)

BCH-LMO-SCBD-115700-1 | Barley modified for the production of LL-37 peptide | Palacky University Olomouc Production of medical or pharmaceutical compounds (human or animal) Protein purification Resistance to antibiotics - Hygromycin Selectable marker genes and reporter genes [Show detection method\(s\)](#)
BCH-LMO-SCBD-115698-1 | Barley modified for the production of LL-37 peptide | Palacky University Olomouc Production of medical or pharmaceutical compounds (human or animal) Resistance to antibiotics - Hygromycin Selectable marker genes and reporter genes

Characteristics of the modification process

Vector

pBRACT214 EN

Techniques used for the modification

Agrobacterium-mediated DNA transfer

Genetic elements construct

P-35S-CaMV 0.000 kb	CS-hpt-ECOLX 0.000 kb	T-nos-RHIRD 0.000 kb		
P-ubi1-MAIZE 0.000 kb	ZmCKX1sp 0.000 kb	LL-37 0.000 kb	TP-KDEL 0.000 kb	T-nos-RHIRD 0.000 kb

Introduced or modified genetic element(s)

Some of these genetic elements may be present as fragments or truncated forms. Please see notes below, where applicable.

BCH-GENE-SCBD-100287-7 CAMV 35S PROMOTER

Promoter

BCH-GENE-SCBD-14991-8 HYGROMYCIN B PHOSPHOTRANSFERASE GENE | (BACTERIA)

Protein coding sequence | Resistance to antibiotics (Hygromycin), Selectable marker genes and reporter genes

BCH-GENE-SCBD-100269-8 NOPALINE SYNTHASE GENE TERMINATOR

Terminator

BCH-GENE-SCBD-100362-7 UBIQUITIN GENE PROMOTER | (MAIZE, CORN)

Promoter

BCH-GENE-SCBD-115696-1 LL-37 PEPTIDE - HOMO SAPIENS - HUMAN

Production of medical or pharmaceutical compounds (human or animal)

BCH-GENE-SCBD-103023-2 KDEL ER RETENTION SIGNAL

Transit signal

BCH-GENE-SCBD-115697-1 CYTOKININ DEHYDROGENASE 1 SIGNAL PEPTIDE - ZEA MAYS - MAIZE, CORN, MAIZE

Notes regarding the genetic elements present in this LMO

Gene cassettes

The DNA insertion contain the following two gene cassettes:

- 1) *Escherichia coli* hygromycin B phosphotransferase (*hph*); and
- 2) *Homo sapiens* LL-37 peptide.

Gene expression

Transcription of *hph* is under control of the *Cauliflower mosaic virus* 35S promoter and the *Agrobacterium tumefaciens* nopaline synthase (*nos*) terminator. Due to the nature of the viral promoter, transcription is expected to occur at high levels.

Transcription of the human LL-37 peptide occurs from the *Zea mays* ubiquitin promoter and terminates at the *nos* terminator. The transcript contains the following (from 5' to 3'): *Z. mays* cytokinin dehydrogenase 1 (ZmCKX1sp) signal peptide, LL-37 peptide and a synthetic KDEL ER retention signal. The ubiquitin promoter is non-specific and thus expression is expected in all tissues of the plant. The synthetic eukaryotic KDEL sequence facilitates the transport of LL-37 peptide to the endoplasmic reticulum (ER). Prior to export from the ER, the KDEL sequence is cleaved from the peptide. ZmCKX1sp facilitates the transit of LL-37 through the ER and excretion from the plasma membrane.

Note

- *Agrobacterium tumefaciens* strain AG1 was used in the transformation of barley immature zygotic embryos.
- The final LL-37 peptide is not expected to retain the signal peptides.

EN

LMO characteristics

Modified traits

Resistance to antibiotics

Hygromycin

Production of medical or pharmaceutical compounds (human or animal)

Selectable marker genes and reporter genes

Common use(s) of the LMO

Pharmaceutical
Research

Detection method(s)

Additional Information

The LL-37 peptide can be detected in all tissues of the plant (see "Molecular Farming in Barley: Development of a Novel Production Platform to Produce Human Antimicrobial Peptide LL-37").

EN

Additional Information

Additional Information

Cathelicidin antimicrobial peptide is the only cathelicidin protein found in humans and is located on chromosome 3p21. The sequence contains 4 exons and is translated to hCAP18, a pre-pro-protein, containing signal peptide, a conserved pro-sequence (cathelin-like domain) and a C-terminal antimicrobial peptide, LL-37. The active LL-37 peptide is produced from proteolytic cleavage from hCAP18 and its primary structure is based on 37 amino acid residues (~ 18kDa), which form an amphipathic alpha-helix (secondary) structure.

Other relevant website addresses and/or attached documents

? [Joint Research Centre - Deliberate Release and Placing on the Market of GMOs - GMO Register](#) (*English*)

? [John Innes Centre - Crop Transformation \(BRACt vectors\)](#) (*English*)

? [Molecular Farming in Barley Development of a Novel Production Platform to Produce Human Antimicrobial Peptide LL-37.pdf](#) (*English*)

? [pBract214-ss.doc](#) (*English*)

[BCH-LMO-SCBD-115699-1](#)

Further Information

Questions about the Cartagena Protocol on Biosafety or the operation of the Biosafety Clearing-House may be directed to the Secretariat of the Convention on Biological Diversity.

**Secretariat of the Convention
on Biological Diversity**

413 rue Saint-Jacques, suite 800
Montreal, Québec, H2Y 1N9
Canada

Fax: +1 514 288-6588

Email: secretariat@cbd.int