

Supplementary Table S1

Bacteria host strains and plasmids used and constructed in this study.

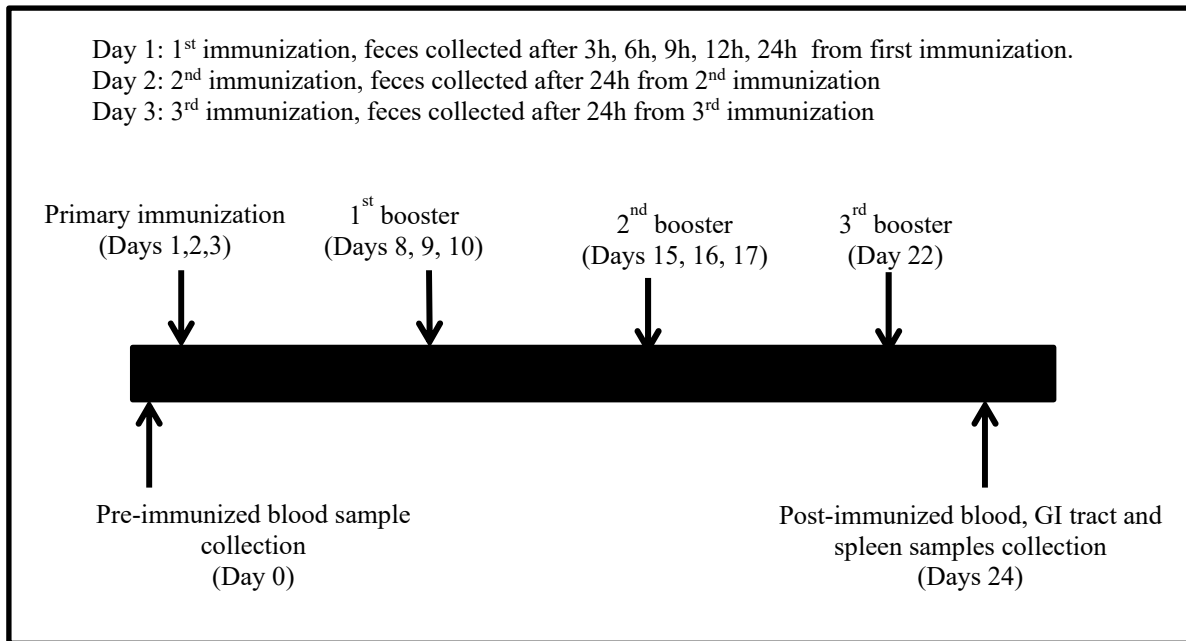
Host strains	Plasmids	Characteristics	Source
<i>L. lactis</i> NZ9000	-	<i>L. lactis</i> subsp. <i>cremoris</i> (derivative strain of MG1363, carrying <i>nisRK</i> genes on the chromosome).	University Putra Malaysia
<i>L. lactis</i> NZ9000	pNZ8048	<i>L. lactis</i> subsp. <i>cremoris</i> (derivative strain of MG1363, carrying <i>nisRK</i> genes on the chromosome).	University Putra Malaysia
<i>L. lactis</i> NZ9000	pNZ-Usp45-NucA	P _{nisA} /Cm ^r pNZ8048 derivative containing Usp45-NucA	University Putra Malaysia
XL-10 GOLD <i>E. coli</i>	pIDT-SMART-139A mimotopes	Amp ^R , pIDT-SMART derivative containing synthesized tK- <i>Ras</i> mimotopes	Present study
XL-10 GOLD <i>E. coli</i>	pIDT-SMART-TTD	Amp ^R , pIDT-SMART derivative containing synthesized toxoid	Present study
<i>L. lactis</i> NZ9000	pNZ-wtKRAS	P _{nisA} /Cm ^r , pNZ8048 derivative containing wtKRAS	³⁷
<i>L. lactis</i> NZ9000	pNZ-G12A	P _{nisA} /Cm ^r , pNZ8048 derivative containing fusion of Usp45 and natural mutant G12A-KRAS in exon 2	Present study
<i>L. lactis</i> NZ9000	pNZ-Usp45	P _{nisA} /Cm ^r pNZ8048 derivative containing Restriction site-modified Usp45	³⁷
<i>L. lactis</i> NZ9000	pNZ-Usp45-G12A	P _{nisA} /Cm ^r , pNZ8048 derivative containing fusion of Usp45 and natural mutant G12A-KRAS in exon 2	Present study
<i>L. lactis</i> NZ9000	pNZ-Usp45-139A	P _{nisA} /Cm ^r , pNZ8048 derivative containing fusion of Usp45 and 139A mimotopes	Present study
<i>L. lactis</i> NZ9000	pNZ-Usp45-139A-TTD	P _{nisA} /Cm ^r , pNZ8048 derivative containing fusion of Usp45 and 139A mimotopes-tetanus toxoid	Present study

Supplementary Table S2

List of PCR oligonucleotide primers used in this study.

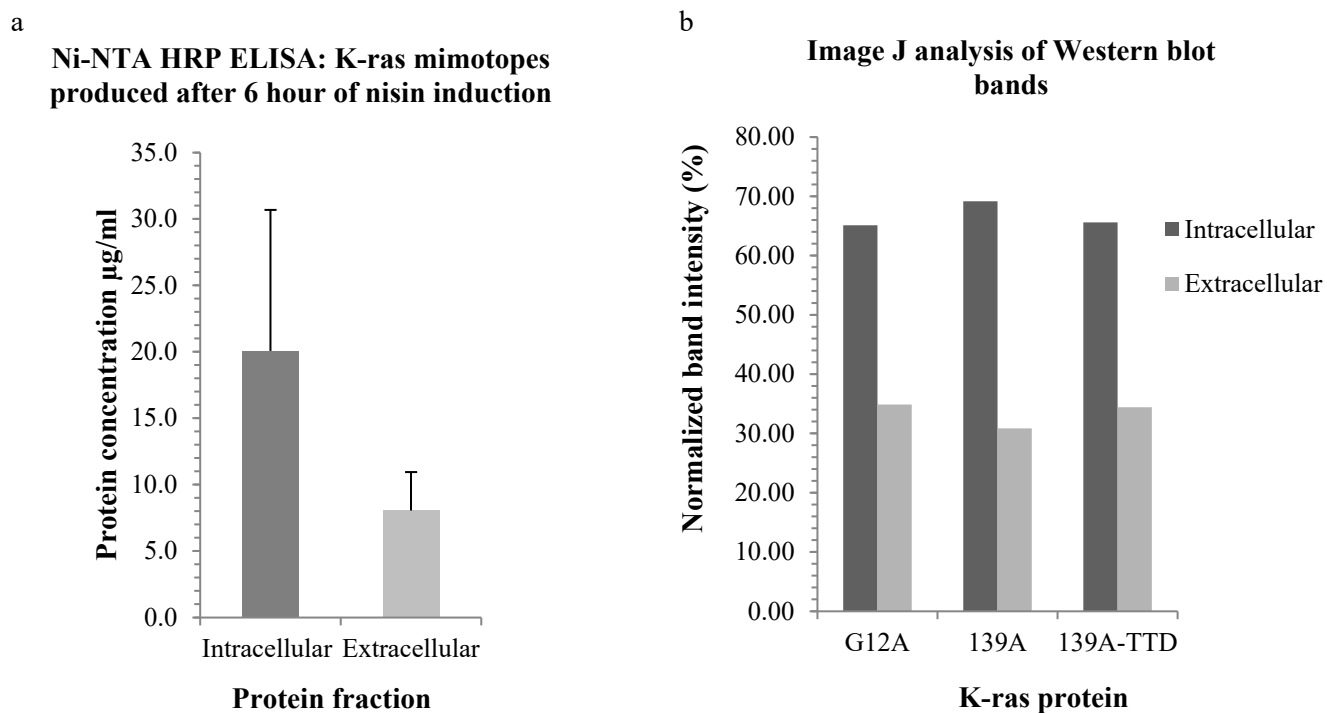
Name	Forward (5'-3')	Reverse(5'-3')	T _m (°C)	Amplicon Size (bp)	Template
pNZ8048	TATTGTCGATAACGCGAGCAT	CGTTTCAAGCCTTGGTTTTC	59	Vary with insert size	Recombinant pNZ8048 plasmid
SDM	TGGGTACTGCAGAAATGACTGAAT ATAAACTTGTGGTAGTTGGAGCTG CTGCCGTAG	CTATATACTAGTCTAATGATG ATGATGATGATGGGTTTCTCC ATCAATTACTAC	57	180	wt <i>KRAS</i> cDNA
For construction pNZ-Usp45- therapeutic <i>KRAS</i> (139A)					
Usp45[a]	CACTCACCATGGGCATGAAAAAA AG	TTATATTCGGCATGCAGCGTAA ACAC	56	110	pNZ8048-Usp45- Xgene
Therapeutic <i>KRAS</i> mimotopes	GCCTCTGGGTAGCATGCGAA TATAAATTAG	TAGAACTAGTCTAATGATGATG ATGATGATGA	59	193	pIDTSMART-139- A
For construction pNZ-Usp45-mt<i>KRAS</i> (control)					
Usp45[b]	GCACTCACCATGGGCATGAAAAAA AAGATTATCTC	GTTTATATTCAGTCATGCATGC AGCGTAAACACC	56	118	pNZ8048-Usp45- Xgene
mt <i>KRAS</i> mimotopes	TTACGCTGCATGCATGACTAATATA AACTTGTGG	AGCTTGAGCTCTCTAGAACTA GTCTAATGATGATG	61	207	pNZ8048-G12A
SOE-Usp45- mt <i>KRAS</i>	GCACTCACCATGGGCATGAAAAAA AAGATTATCTC	AGCTTGAGCTCTCTAGAACTA GTCTAATGATGATG	59	299	Two overlapping PCR products
For construction of pNZ-Usp45- therapeutic <i>KRAS</i>-TTD					
Mimotopes- TTD-B	GCCTCTGGGTAGCATGCGAATATA AATTAG	AAAATTATTACTAGTATGATG ATGATGATGATGAGC	67	98	pIDTSMART -139A
TTD	CATCATCATCATCATACTAGT AATAATTTTACAGTTTCATTTTGG	AAGCTTCTAATGATGATGATG ATGATGTGTTTCTAAATGTGA AGCTGA	62	144	pIDTSMART-TTD
SOE- mimotopes-TTD	GCCTCTGGGTAGCATGCGAATATA AATTAG	AAGCTTCTAATGATGATGATG ATGATGTGTTTCTAAATGTGA AGCTGA	66	179	Two overlapping PCR products

Supplementary Figure S1



Schedule of immunization and sample collection including blood, feces, GI tract and spleen. To evaluate immune response raised by 139A-tK-ras mimotopes and its counterparts, 5 groups (n=4) of BALB/c mice were tested. Each group were separately fed with: NaHCO₃, recombinant *L. lactis* expressing control G12A-K-ras, 139A-tK-ras, 139A-tK-ras-TTD and empty vector pNZ8048. Each group was orally administered on day 1/2/3, and boosted on days 8/9/10, 15/16/17 and 22.

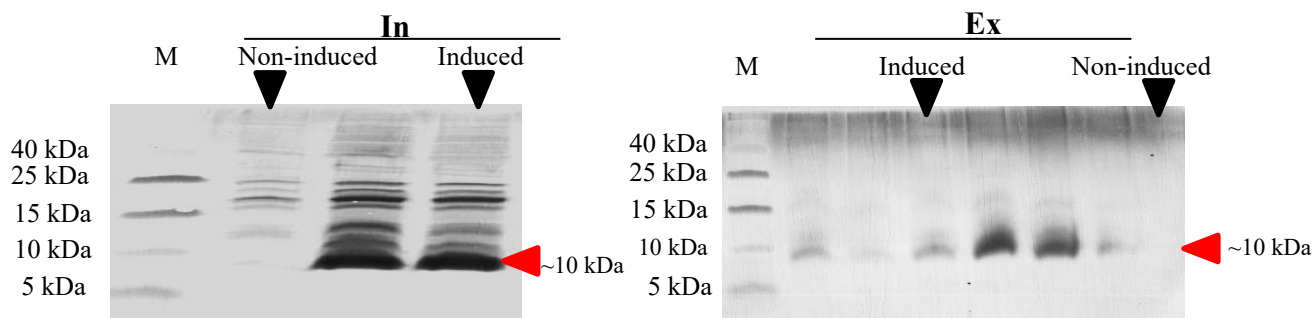
Supplementary Figure S2



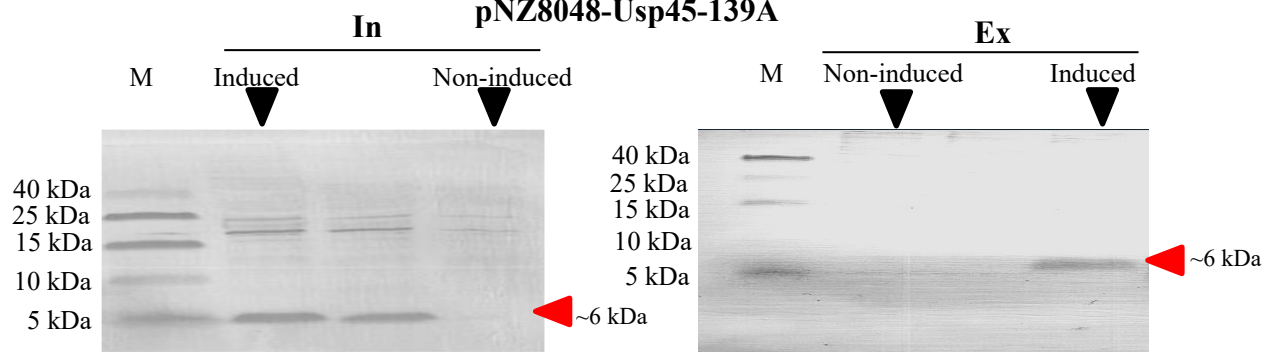
K-ras mimotopes produced after 6 hour of nisin induction. a) Concentration of K-ras mimotopes b) Image J analysis of Western blot bands representing intra- and extra-cellular K-ras mimotopes produced after 6 hour of nisin induction.

Supplementary Figure S3

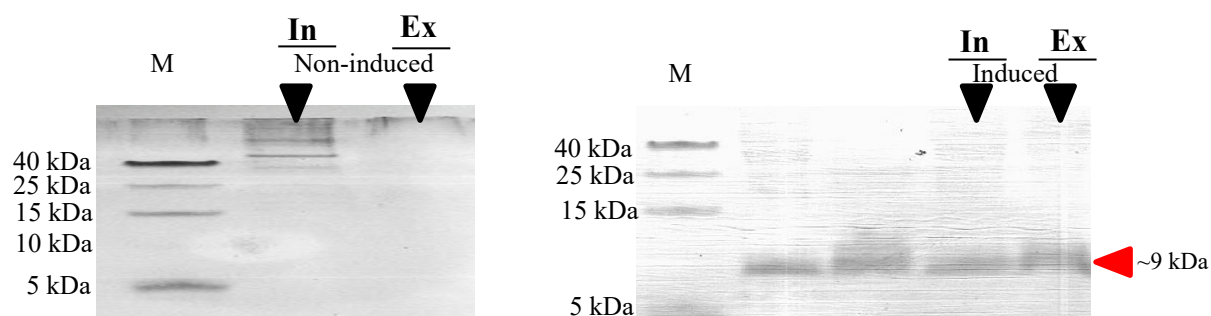
pNZ8048-Usp45-G12A



pNZ8048-Usp45-139A

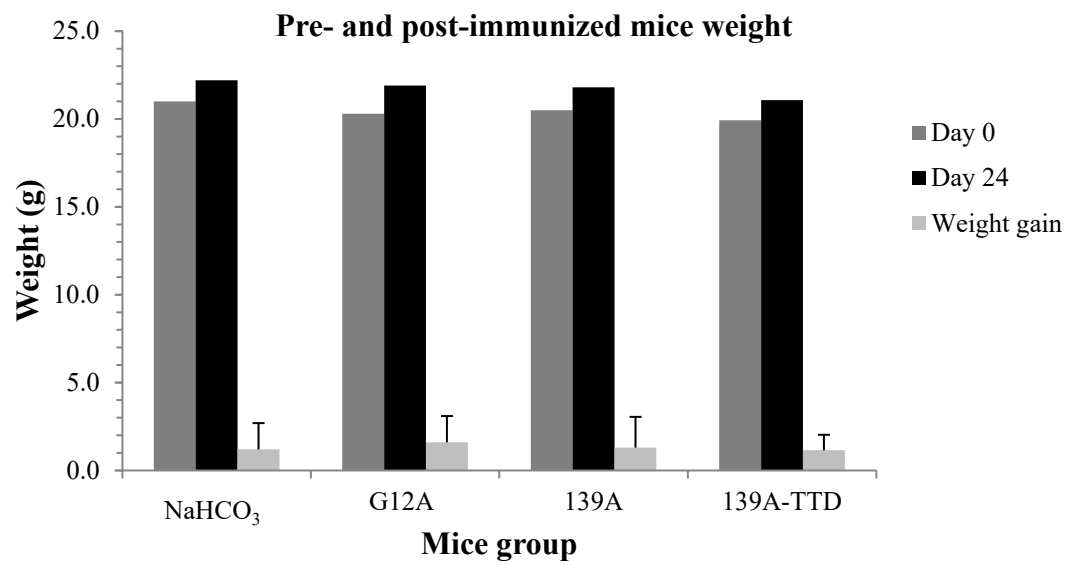


pNZ8048-Usp45-139A-TTD



Recombinant *L. lactis* clones harbouring pNZ-Usp45-G12A, pNZ-Usp45-139A and pNZ-Usp45-139A-TTD. Western blot of expressed Usp45-G12A, Usp45-139A and Usp45-139A-TTD in both intracellular and extracellular protein fractions were detected via His-tag markers. M: Protein ladder; In: intracellular protein fraction; Ex: extracellular protein fraction; Usp45: lactococcal extracellular secretion signal peptide; TTD: tetanus toxoid.

Supplementary Figure S4



Average weight of 4 mice during pre- and post-immunized. No significance weight different between control and experimental groups.