Electronic Supplementary Material (ESI) for Nanoscale.

Supporting Information:

Figure S1:

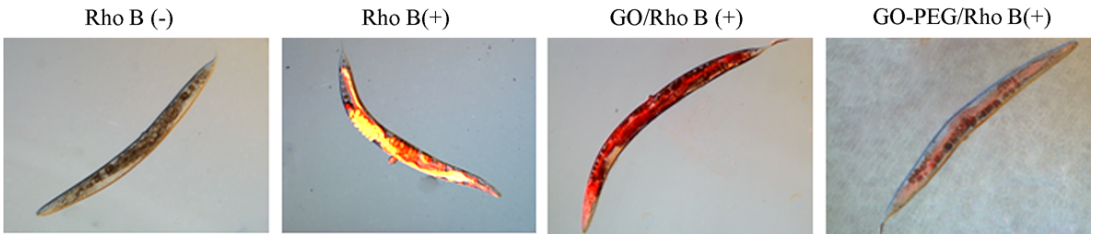

Fig. S1 Distribution and translocation of Rho B, GO/Rho B, and GO-PEG/Rho B in nematodes.

Figure S2:

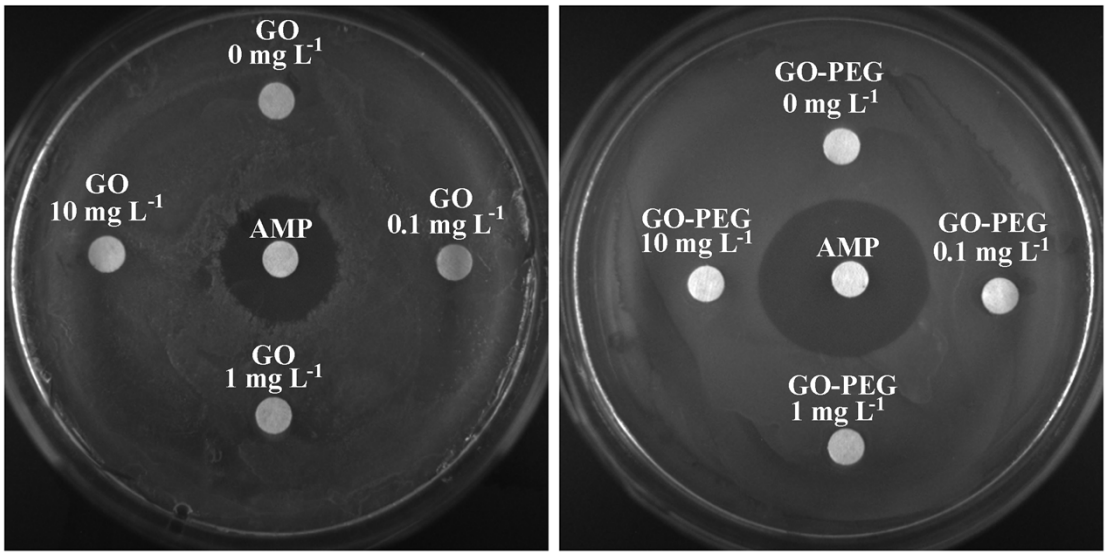

Fig. S2 *In vitro* antimicrobial assay for GO and GO-PEG. Ampicillin (AMP) was employed as a positive control.

Figure S3:

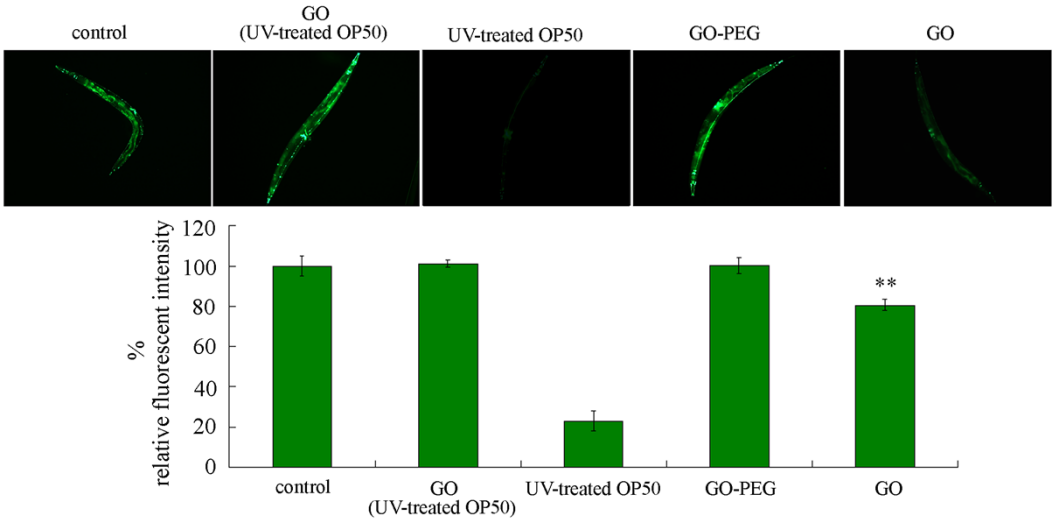

Fig. S3 Expression pattern of P*nlp-29*::GFP. Bars represent means ± S.E.M. $^{**}p < 0.01$.

Figure S4:

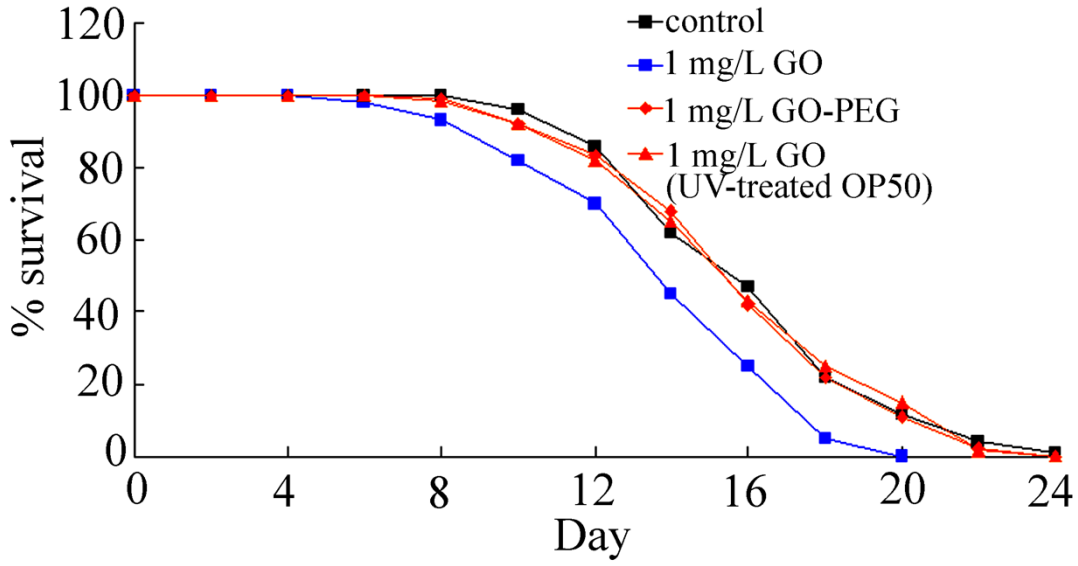

Fig. S4 Lifespan of control, GO, and GO-PEG treated nematodes. Exposure was performed from L1-larvae to adult day-8.

Figure S5:

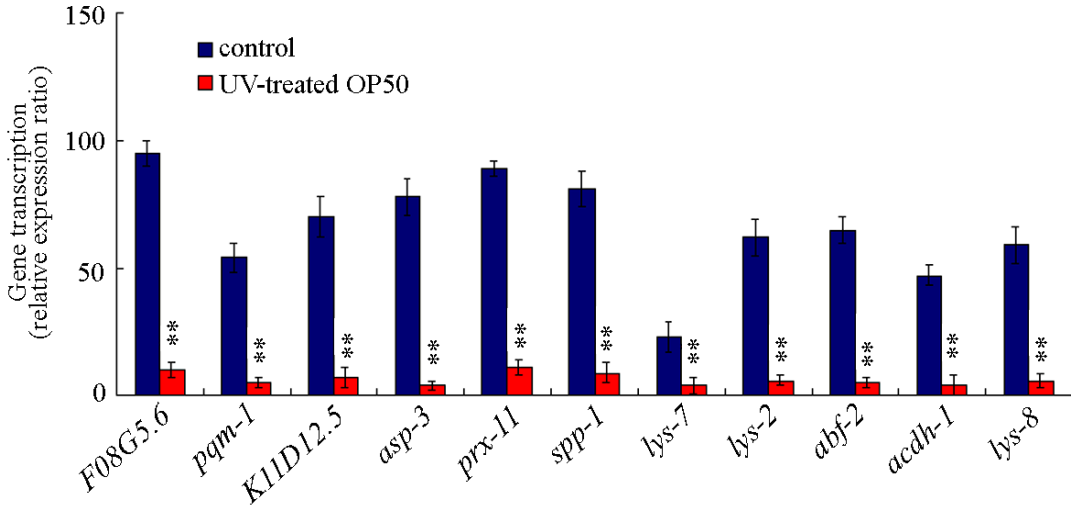

Fig. S5 Quantitative real-time polymerase chain reaction assay showing effects of UV-killed OP50 feeding on expression patterns of genes encoding anti-microbial peptides in control nematodes at adult day 8. Bars represent means ± S.E.M. $^{**}p < 0.01$.

Figure S6:

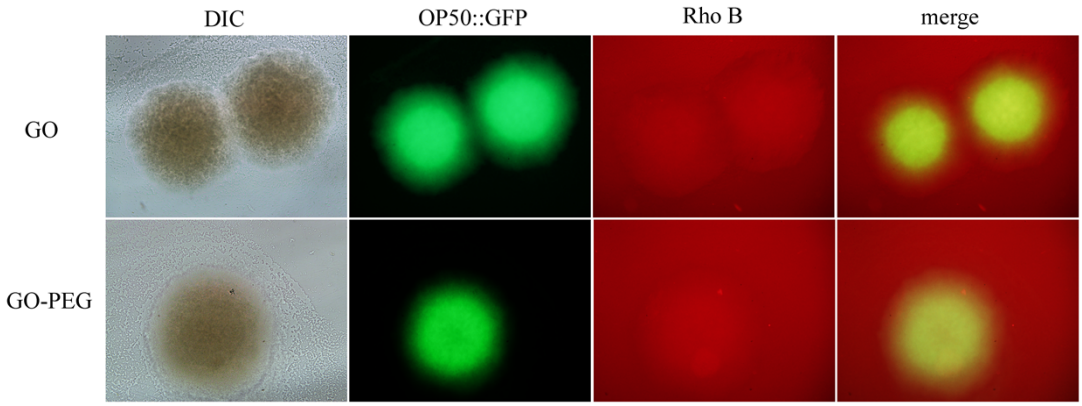

Fig. S6 Colocalization of GO or GO-PEG with OP50. The DIC pictures show the OP 50.

Figure S7:

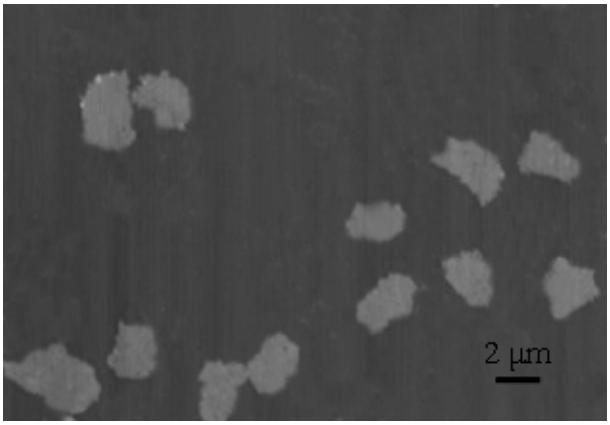

Fig. S7 AFM picture of prepared large size of GO.

Figure S8:

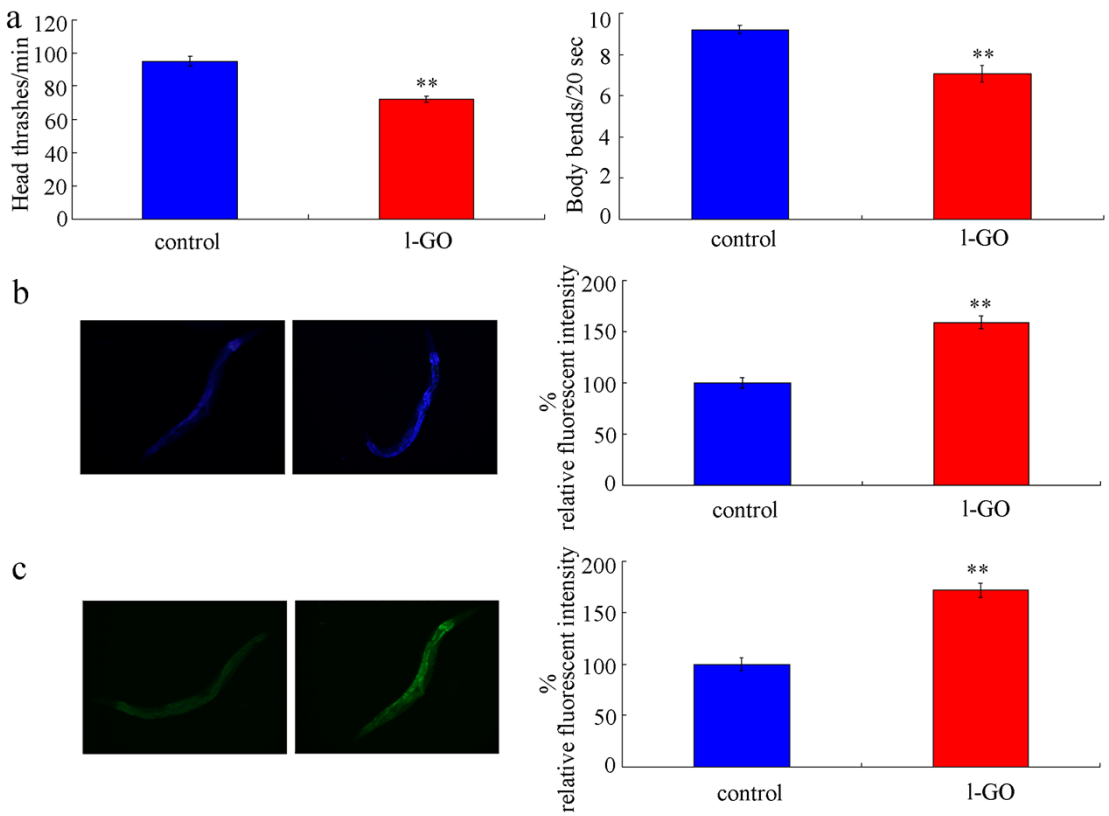

Fig. S8 Chronic toxicity assessment of large size of GO. (a) Effects of large size of GO on locomotion behavior. (b) Effects of large size of GO on intestinal autofluorescence. (c) Effects of large size of GO on intestinal ROS production. l-GO, large size of GO. l-GO exposure was performed from L1-larvae to adult day-8. Exposure concentration was 1 mg L^{-1}. Bars represent means ± S.E.M. $^{**}p < 0.01$.

Figure S9:

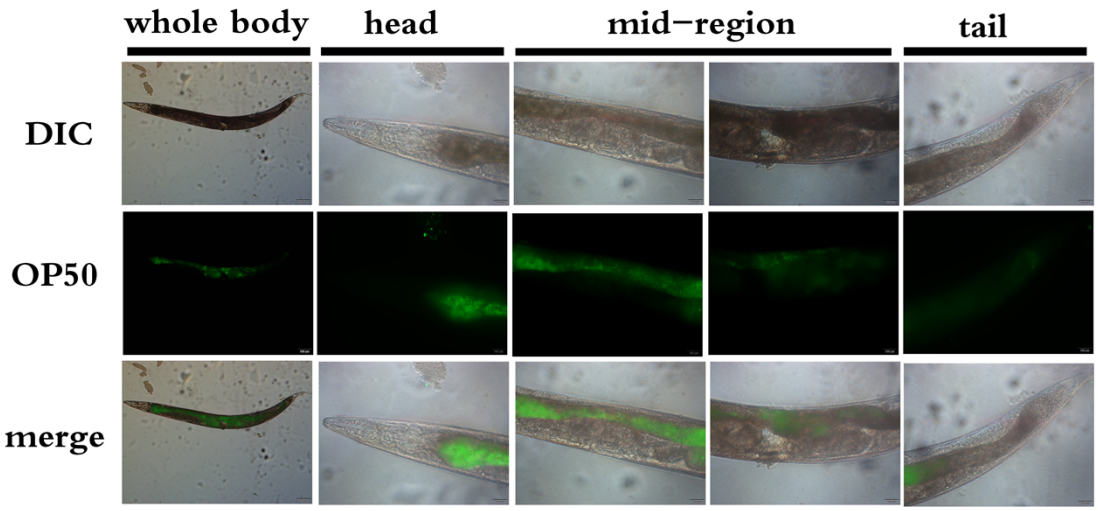

Fig. S9 Chronic exposure to 1 mg L^{-1} of l-GO induced the accumulation of OP50 in intestine. l-GO, large size of GO. l-GO exposure was performed from L1-larvae to adult day-8.

Table S1 Information on genes required for p38 MAPK signaling pathway in *C. elegans*

Gene	Products of the genes
pmk-1	mitogen-activated protein kinase
sek-1	SAPK/ERK kinase
mek-1	MAP kinase kinase
nsy-1	MAP kinase kinase kinase
vhp-1	MAP kinase phosphatase

Table S2 Information on genes required for defecation regulation in *C. elegans*

Gene	Products of the genes
unc-16	homolog of murine JNK-interacting protein 3
unc-33	homolog of murine JNK-interacting protein 3
unc-44	ankyrin-like protein
unc-101	adaptin orthologous to the mu1-I subunit of adaptor protein complex 1 (AP-1)
aex-1	C2 calcium-binding domain protein
aex-3	guanine nucleotide exchange factor
aex-5	ortholog of calcium-dependent serine endoproteinases
cab-1	protein with a C-terminal motif
egl-36	Shaw-type voltage-gated potassium channel
unc-2	calcium channel alpha subunit
unc-36	alpha2/delta subunit of a voltage-gated calcium channel
unc-13	protein that regulates neurotransmitter release
fat-3	delta-6 fatty acid desaturase
egl-30	ortholog of the heterotrimeric G protein alpha subunit Gq
exp-2	six-transmembrane voltage-activated potassium channels
unc-43	type II calcium/calmodulin-dependent protein kinase (CaMKII)
egl-2	voltage-gated potassium channel
sup-9	TWK (two-P domain K^+) potassium channel subunit
sup-10	potassium channel
unc-93	transmembrane protein
unc-25	GABA neurotransmitter biosynthetic enzyme
lim-6	LIM class homeodomain protein
unc-47	transmembrane vesicular GABA transporter
gat-1	electrogenic, Na^+/Cl^--coupled, high-affinity GABA transporter
hlh-8	helix-loop-helix protein
exp-1	excitatory, cation-selective GABA receptor

tax-6	ortholog of calcineurin A
dsc-1	transcription factor CHX10
flr-1	ion channel
flr-4	predicted Ser/Thr protein kinase
iri-1	tam3-transposase (Ac family)
smp-1	Semaphoring
itr-1	putative inositol (1,4,5) trisphosphate receptor
plc-3	phospholipase C gamma homolog
vav-1	Rho/Rac-family guanine nucleotide exchange factor
ced-10	GTPase orthologous to human RAC1
mig-2	member of the Rho family of GTP-binding proteins
rho-1	Rho GTPase
crt-1	ortholog of calreticulin
shn-1	scaffold protein Shank
elo-1	C-18 polyunsaturated fatty acid (PUFA) elongase
fat-2	delta-12 fatty acyl desaturase
dsc-4	subunit of the microsomal triglyceride transfer protein
tpk-1	Thiamin pyrophosphokinase
clk-1	ubiquinone biosynthesis protein COQ7
isp-1	“Rieske” iron-sulfur protein

Table S3 Primers used for quantitative real-time polymerase chain reaction (PCR)

Gene	Forward primer	Reverse primer
tba-1	TCAACACTGCCATCGCCGCC	TCCAAGCGAGACCAGGCTTCAG
F08G5.6	ACTGCACTCAAATTCCGGCTGGTGG	GTTTCCATTCAATCCGTTTTCCAGAAC
pqm-1	TCAAATGCAACGTTCCCAAC	CTCTGGAAGTGGAATTCCG
K11D12.5	CCCACGACTCTGCTTCAATC	ATGGAGATTGCGCGCTTA
asp-3	CGAGACCGATCCGAACCACT	TCAGTTGGTCCAGTGAGAAGG
prx-11	GGAGCAGCTGTTACAGGAATCTAC	AGAGCCTCGCTGAGTTGAATG
spp-1	GCATCACGGTGTTTTCTGTG	GCAACAGCATAGTCCAGCAA
lys-7	CTGCCATTCGGCATCAGTCA	GCACAATAACCCGCTTGTTT
lys-2	CCTTTCCAACAAATGTCCAAGTA	GGTATCCTTGCCAGCTTGAT
abf-2	CCATCGTGGCTGCCGACATCGACTTT	GAGCACCAAGTGGAATATCTCCTCCTC
acdh-1	GGTCTTACTGTAGATAAG	CTGCATTTAGGCATTCAA
lys-8	ATTCGTTGACTCATCTCTTC	TGGAACAGACAAATCAACAG
pmk-1	CGACTCCACGAGAAGGAT	ATATGTACGACGGGCATG
sek-1	TGCTCAACGAGCTAGACG	ATGTTCGACGGTTTCACG
mek-1	AAACCAAGCACCAAATCA	CCAGCTCGACCAAAGTAA
nsy-1	TGCGATGAACTACTACGG	CACCCAAATGACCAAATA
vhp-1	CGGGTTGGCTGCACTTAT	GCATTACACGACGCGATT
unc-16	CTCGGTGCTGATCTCACA	GCGTCTTAATCTCCTCCT
unc-33	CTCCCTGACAGACGATAA	CAGACTCCGCTAACCCTA
unc-44	TCCCAGACGGATCACTTA	ATTCCACGGTTGTTACTT
unc-101	CGGAAATTGTTGGAAGCG	CGGGCGGTATGAAGGAGA
aex-1	TGGAGCAAGAAGACCACT	GCGAATCTCCGATAACCT
aex-3	ATTACTGGGCGATGGGTG	TGGCGAACGAGTGGATTG
aex-5	AATGTGCTGGATTGGTAG	GCAATGCTCCATTCTTAA
cab-1	AATGCCGCTGTCAAGGAT	GTCTGCATCGCACTTTCG

egl-36	TGCCAGTTCCTGTTATCG	CTCCTAACCCTCCCTGTG
unc-2	CAACGCTCAGGAACTCAC	AATCAGAACTCGGAATGG
unc-36	CTCGCCACTTATGTCTCC	TCTTCAACTCGGCTCTTG
unc-13	AGTGAGCCGCTTTCTTAT	AATCCTCCACCACTTTCA
fat-3	ACTCATCACGCTGCCACA	TACCCAAGCCCAATGTCC
egl-30	AAGAGCTATGGGAGGATT	CACCAGGAACATGATTGA
exp-2	GCGGCATATTGGTGGTGT	TTGCTCGCTTTGCTGGTC
unc-43	ATTGGCAGGTGCTATTGA	TGCTGGCTGTAGATGAGT
egl-2	CCTATTTGGCTTCTGGTC	TGTAGATCCTTCGTTTCG
sup-9	GAAGATGAACGGAGGGAT	CTTTCTGTGACGGTGTCG
sup-10	TTACCGACAAGCAGTTTC	CAAGATGGCTGAGGACAC
unc-93	ACTACTTGTCGGTGTTGA	AAATACTTTGGGCTCCTC
unc-25	CGGCTCAACTGTCTACGG	TGGAGAAGTGCTCCCATG
lim-6	GTTCTGGTTGTGGGTGTC	ATAGCATTTGATGGTCGT
unc-47	TGGTCAAGGCTCTTCTAT	TTTCCAACTAATCCCATC
gat-1	AAAGTGTAGCCGAAGTAG	AACTCGTCAATGATAGCG
hlh-8	GTCAAAGGACCAAGGAAC	TGAAAGCCGACTGTAAAT
exp-1	CATCGACCAGAAATGACA	AACAACTCCAAAGCGTAA
tax-6	TGGAAAGATGGCAAGAGC	CGTTTGTCGTGACGGAAT
dsc-1	CGTATCACGGTATGGTTT	GATGCTCCTGTAGGCTTG
flr-1	TCACGGACTTGTGAGAAT	TGGTGTTCAGAGGGTTTA
flr-4	TCCACCAGTCATTCATCG	CAGAACCTCAGGAGCCAC
iri-1	AATAACGGCAGCACCTAA	GAAAGTCGTCGTGTCAAA
smp-1	CGGCAATGATGCTCTTAT	CTCCTCCTTTGTCGTTTT
itr-1	ATGGCAGGTCTTTATGTT	GAATCGGTATGCTTTGTT
plc-3	GTCATCTATCACGGGTAT	TCTATCGGCAACTTCTTA
vav-1	GTAATGGAGGATGTCTGC	TATAGCGTTGCTTAGGTT
ced-10	ATAAATCTCGGGCTCTGG	AGCACCGTACACTTGCTC
mig-2	ACAATGTGGCAAGCAAGT	TTTCGGATGAAGAATGGA

rho-1	ATTGAAGTTGACGGAAAG	TAATCGGAACATTTGGAC
crt-1	CTGTGGAGGTGGATACGT	GTCGGAGTTGAGGATGAG
shn-1	AGGAGGAAAGGTCAACGG	GTCGGAACGGCCTAGAAT
elo-1	CCGTTCTTGCTCATCTTG	TTTGGCACTGCCTTGTAC
fat-2	ACATTGCCTTTGTCCTCT	TGTCGATAGTTTGGGTTT
dsc-4	GGCTTCCCTCTACCATCA	GAATCGTCGAGTCATCCA
tpk-1	TAACGGTGAACCTACGGC	TCAGGCAGATGGACGACT
clk-1	GTGTCGGTTCAGCACTTC	GAGCCTTCATTCCATCGT
isp-1	GTACCAAGGCTGAGATTG	CAGAAGCGTCGTAGTGAG