
Supplementary information

Establishment and function of chromatin organization at replication origins

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Establishment and Function of Chromatin Organization at Replication Origins

Erika Chacin¹, Karl-Uwe Reuswig^{2,6}, Jessica Furtmeier¹, Priyanka Bansal¹, Leonhard Karl², Boris Pfander^{2,3,4}, Tobias Straub⁵, Philipp Korber¹ and Christoph F. Kurat^{1*}

Affiliations

¹ Biomedical Center Munich (BMC), Division of Molecular Biology, Faculty of Medicine, Ludwig-Maximilians-Universität in Munich, Martinsried, Germany

² Max Planck Institute of Biochemistry, DNA Replication and Genome Integrity, Martinsried, Germany

³ Genome Maintenance Mechanisms in Health and Disease, Institute of Aerospace Medicine, German Aerospace Center (DLR), Cologne, Germany

⁴ Institute of Genome Stability in Aging and Disease, CECAD, University of Cologne, Medical Faculty, Cologne, Germany

⁵ Core Facility Bioinformatics, BMC, Faculty of Medicine, Ludwig-Maximilians-Universität in Munich, Martinsried, Germany

⁶ Current address: Department of Pediatric Oncology, Dana-Farber Cancer Institute, Boston, MA, 02215, USA

* Correspondence

Christoph.kurat@bmc.med.lmu.de

Supplementary Figure 1 | Source gel data from main figures. Fig. 1c Gel electrophoresis of SGD chromatin digested with MNase. **Fig. 1e** SDS-PAGE with Coomassie Blue Staining showing purified ORC. **Fig. 1g** SDS PAGE with Coomassie Blue Staining showing purified INO80, ISW1a, ISW2, and Chd1. **Fig. 3d** SDS PAGE with Coomassie Blue Staining showing purified Orc1 WT ORC, Orc1-BAH mutant-ORC, Orc1-IDR mutant-ORC, Orc1-BAH-IDR mutant-ORC, and Orc1-Walker B mutant-ORC. **Fig. 3f** SDS PAGE with Silver Staining of the ORC binding and MCM loading experiments with WT ORC and Orc1 mutant-ORCs. **Fig. 4d** Alkaline gel electrophoresis of the genome scale *in vitro* chromatin replication assay to compare the effects of WT ORC and Orc1 mutant-ORCs.

Supplementary Figure 2 | Source gel data from Extended Data Fig. 1. ED Fig. 1a, SDS PAGE with Coomassie Blue Staining showing the purified histone chaperones FACT, HIR, Asf1, CAF1, Nap1, Nhp6, Spt6, Rtt106, and Vps75. **ED Fig. 1b** SDS PAGE with Coomassie Blue Staining showing the purified chromatin remodelers Fun30, RSC, SWI/SNF and SWR1.

Supplementary Figure 3 | Source gel data from Extended Data Figs. 8 and 9. ED Fig. 8 Immunoblots from the Co-immunoprecipitation assays with different purified chromatin remodelers and ORC WT and mutants. **ED Fig. 9b** Alkaline gel electrophoresis of the *in vitro* replication assay on naked DNA. **ED Fig. 9d** Alkaline gel electrophoresis of the *in vitro* replication assay on SGD chromatin with single locus ARS1 origin templates. **ED Fig. 9f** Alkaline gel electrophoresis of the *in vitro* replication assay as indicated in **ED Fig. 9d** but with different chromatin remodelers.

Supplementary Figure 1

Fig. 1c

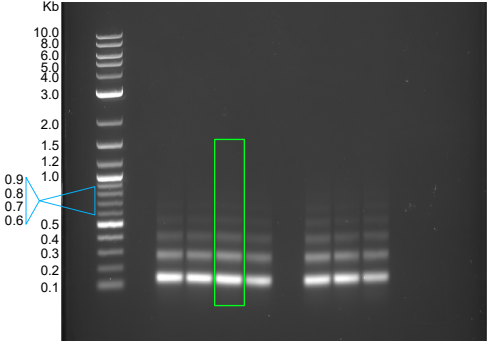


Fig. 1e

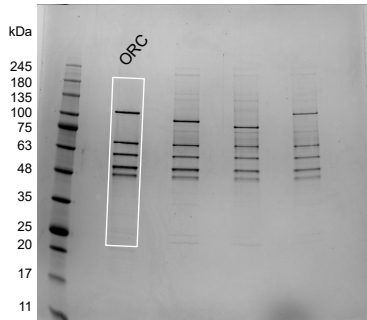


Fig. 1g

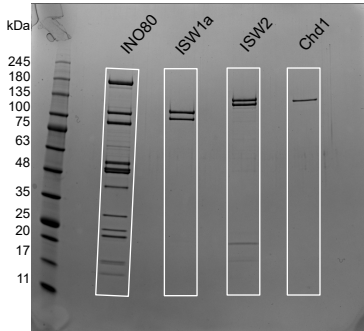


Fig. 3d

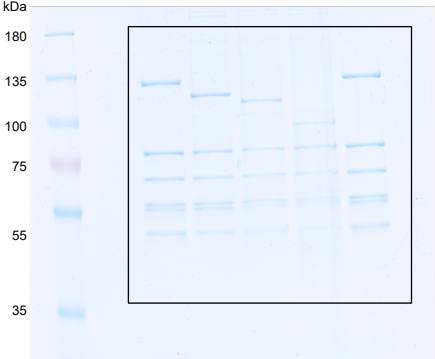


Fig. 3f

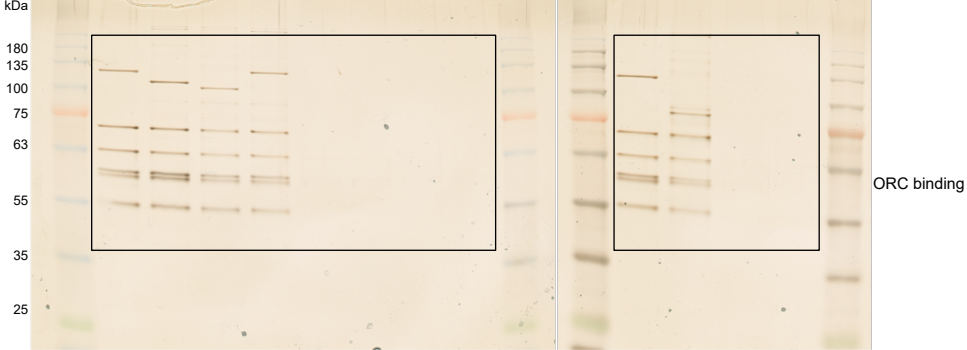
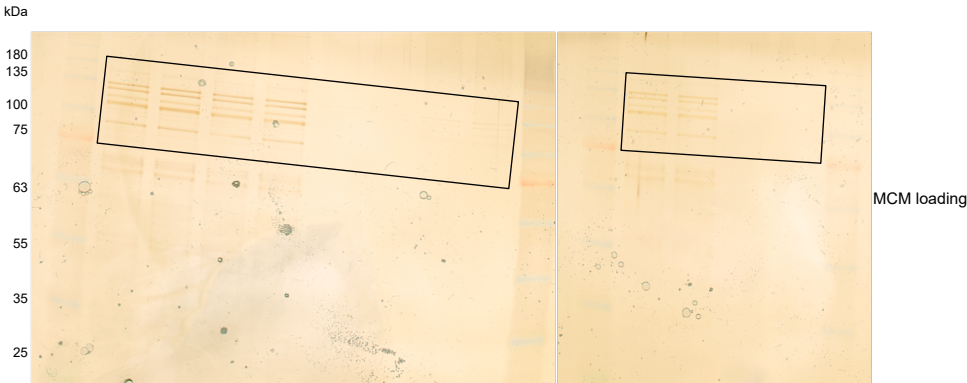
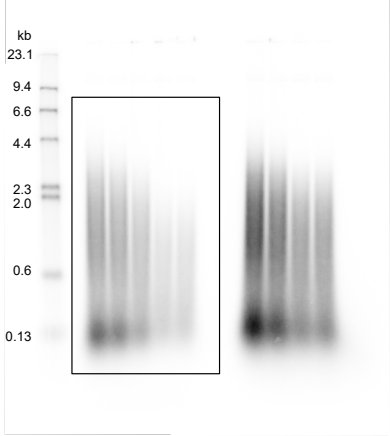
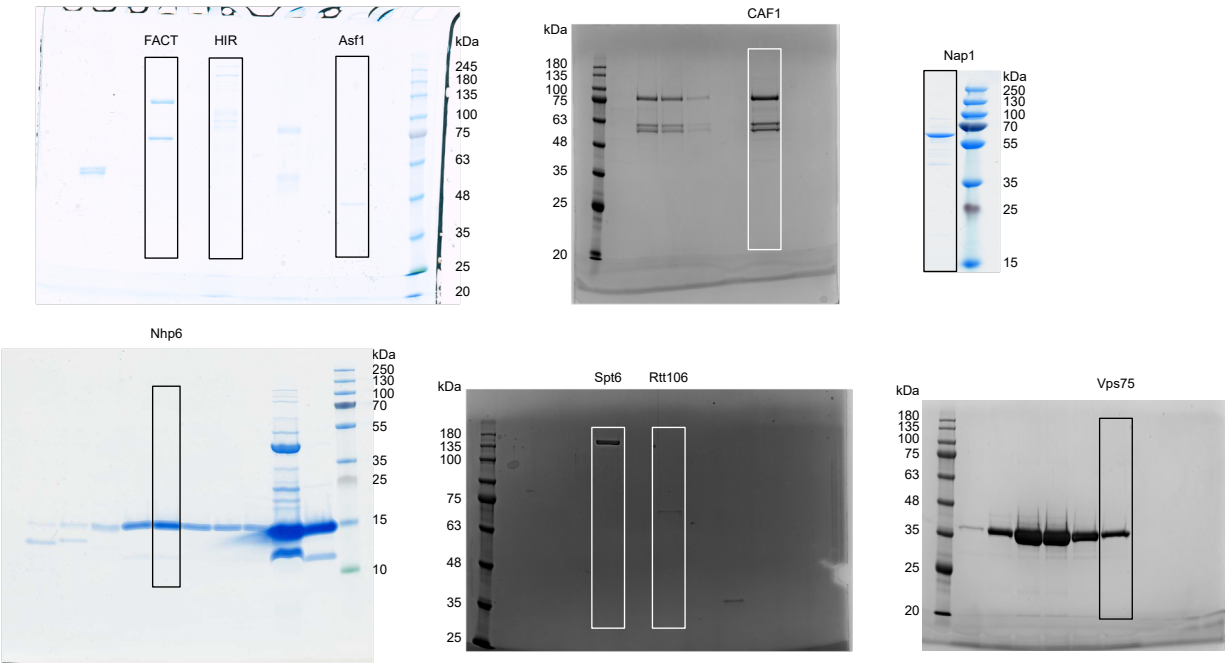


Fig. 4d

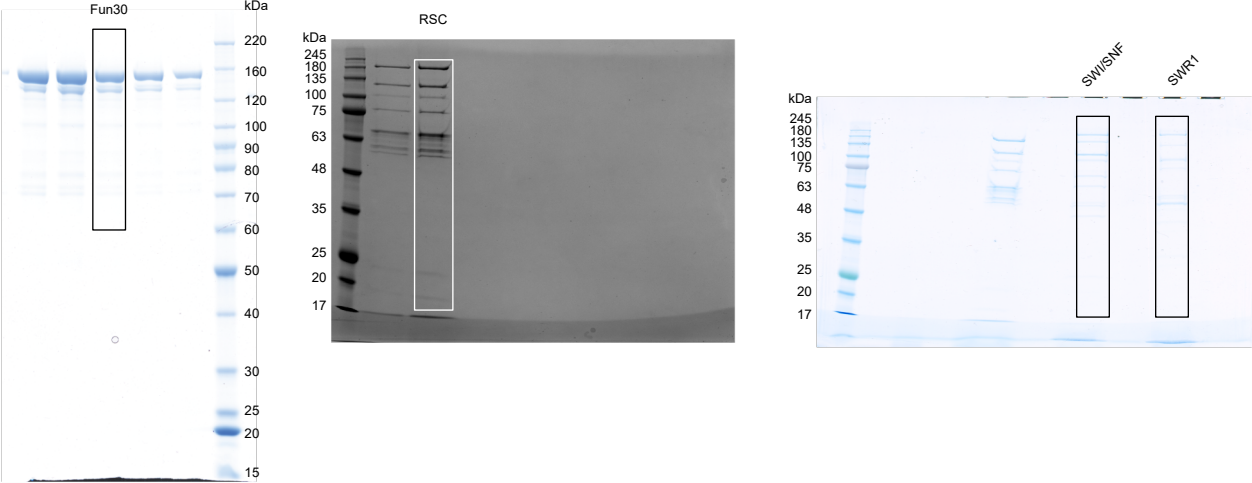


Supplementary Figure 2

ED Fig. 1a

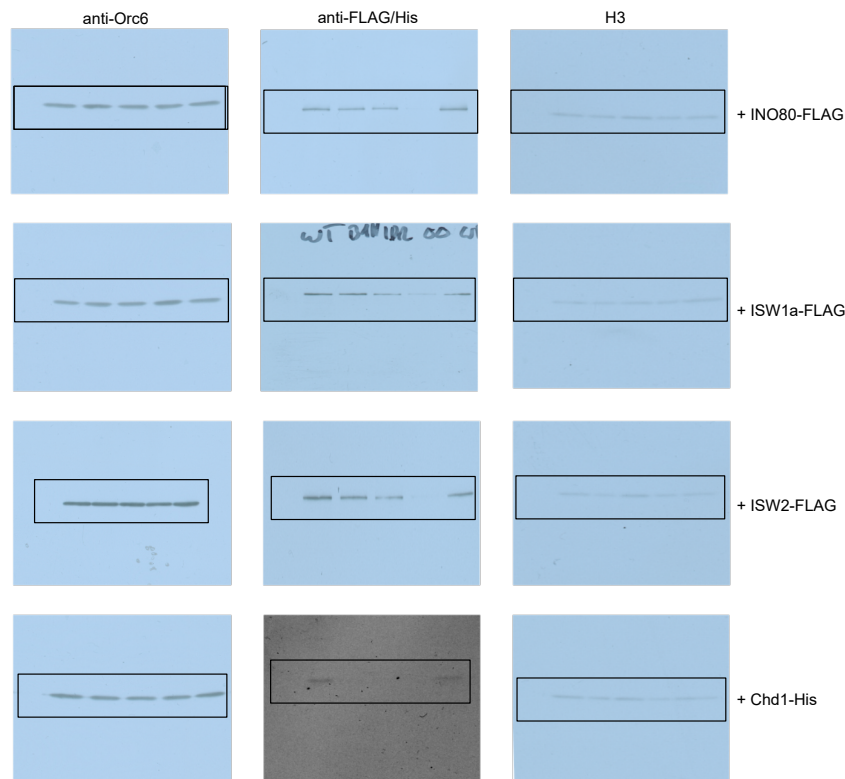


ED Fig. 1b

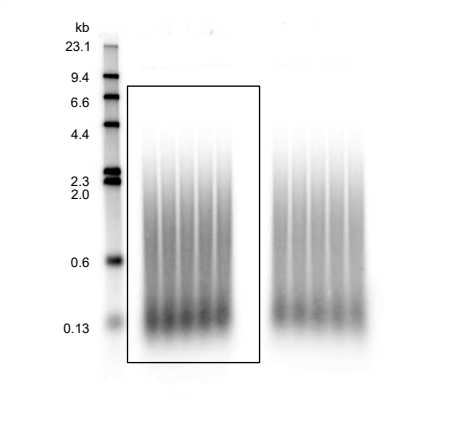


Supplementary Figure 3

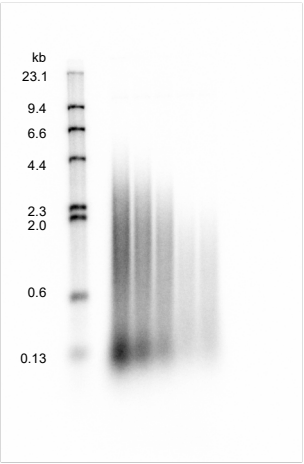
ED Fig. 8



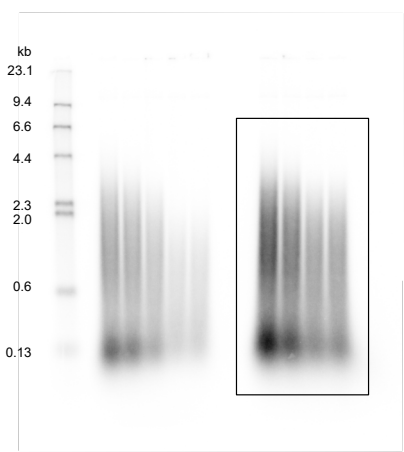
ED Fig. 9b



ED Fig. 9d



ED Fig. 9f



Supplementary Table 1. Yeast strains used in this study

Strain	Genotype	Source
yCFK3	W303-1a pep4::KanMx4 bar1::Hph-NT1 ade2-1 ura3-1 his3-11 trp1-1 leu2-3 ura3::URA3 pRS306/CBP-TEV-ORC1-GAL1-10-ORC2 his::HIS pRS303/ORC3-GAL1-10-ORC4 trp1::TRP1 pRS304/ORC5-GAL1-10-ORC6	Diffley lab ⁶⁷
yCFK31	ade2-1 ura3-1 his3-11,15 trp1-1 leu2-3,112 can1-100 bar1::Hyg pep4::KanMX his3::HIS3 pRS303/Ino80-TEV-3XFLAG, Nhp10 his3::HIS3 pRS303/Gal4,Taf14 ura3::URA3 pRS306/les1, les2 ura3::URA3 pRS306/Act1,Arp4 leu2::LEU2 pRS305/les5, les6 leu2::LEU2 pRS305/Arp5, Arp8 trp1::TRP1 pRS304/les3, les4 trp1::TRP1 pRS304/Rvb1, Rvb2	14
yCFK99	MATa ade2-1 ura3-1 his3-11,15 trp1-1 leu2-3,112 can1-100, bar1::Hyg, pep4::KanMX, IOC3-3xFLAG-NAT	14
yCFK86	MATa ura3Δ0 leu2Δ0 his3Δ1 lys2Δ0 ISW2-TAP::HIS3MX6	Pugh lab
ySB784	MATa ade2-1 ura3-1 his3-11,15 trp1-1 leu2-3,112 can1-100, bar1Δ::TRP1 pep4Δ::LEU2 GAL4 pGAI1-10 Fun30- 3xFLAG::HIS3	65
yCFK27	MATa pep4::HIS3 prbl::LEU2 prc::HISG RSC2-TAP::TRP1	64
yCFK84	MATa ade2-1 ura3-1 his3-11,15 trp1-1 leu2-3,112 can1-100, bar1::Hyg, pep4::KanMX, SWR1-3xFlag::NAT	This study
yCFK78	MATa ade2-1 ura3-1 his3-11,15 trp1-1 leu2-3,112 can1-100, bar1::Hyg, pep4::KanMX, SNF6-3xFLAG-NAT	This study
yCFK25	MATa ade2-1 ura3-1 his3-11,15 trp1-1 leu2-3,112 can1-100 bar1::Hyg pep4::KanMX his3::HIS3 pRS303/Asf1-CBP,Gal4	14
yCFK26	MATa ade2-1 ura3-1 his3-11,15 trp1-1 leu2-3,112 can1-100 bar1::Hyg pep4::KanMX his3::HIS3 pRS303/Cac1-CBP,Gal4	58
yCFK82	MATa ade2-1 ura3-1 his3-11,15 trp1-1 leu2-3,112 can1-100 bar1::Hyg pep4::KanMX HIR1-3xFLAG-NAT	This study
yCFK81	MATa ade2-1 ura3-1 his3-11,15 trp1-1 leu2-3,112 can1-100, bar1::Hyg, pep4::KanMX, SPT6-3xFLAG::NAT	This study
yCFK74	MATa ura3Δ0 leu2Δ0 his3Δ1 lys2Δ0 Rtt106-TAP::HIS3	This study
yAM4	MATa ade2-1 ura3-1 his3-11,15 trp1-1 leu2-3,112 can1-100, bar1::Hyg, pep4::KanMX, his::HIS pRS303/SDORC3,4, trp1::TRP1 pRS304/SDORC5,6	Diffley lab ⁶⁷
yJF5	MATa ade2-1 ura3-1 his3-11,15 trp1-1 leu2-3,112 can1-100, bar1::Hyg, pep4::KanMX, ORC1-3xFLAG-NAT his::HIS pRS303/SDORC3,4, trp1::TRP1 pRS304/SDORC5,6	This study
yJF16	MATa ade2-1 ura3-1 his3-11,15 trp1-1 leu2-3,112 can1-100, bar1::Hyg, pep4::KanMX, ORC1-3xFLAG-NAT his::HIS pRS303/SDORC3,4, trp1::TRP1 pRS304/SDORC5,6, ura3::URA3 pRS306/ΔBAH-SDORC1,ORC2	This study

yJF20	MATa <i>ade2-1 ura3-1 his3-11,15 trp1-1 leu2-3,112 can1-100, bar1::Hyg, pep4::KanMX</i> , ORC1-3xFLAG-NAT <i>his::HIS</i> pRS303/SDORC3,4, <i>trp1::TRP1</i> pRS304/SDORC5,6, <i>ura3::URA3</i> pRS306/ Δ IDR-SDORC1,ORC2	This study
yJF27	MATa <i>ade2-1 ura3-1 his3-11,15 trp1-1 leu2-3,112 can1-100, bar1::Hyg, pep4::KanMX</i> , ORC1-3xFLAG-NAT <i>his::HIS</i> pRS303/SDORC3,4, <i>trp1::TRP1</i> pRS304/SDORC5,6, <i>ura3::URA3</i> pRS306/D569Y-SDORC1,ORC2	This study
yJF52	MATa <i>ade2-1 ura3-1 his3-11,15 trp1-1 leu2-3,112 can1-100, bar1::Hyg, pep4::KanMX</i> , ORC1-3xFLAG-NAT <i>his::HIS</i> pRS303/SDORC3,4, <i>trp1::TRP1</i> pRS304/SDORC5,6, <i>ura3::URA3</i> pRS306/ Δ BAH- Δ IDR-SDORC1,ORC2	This study
W1588-4C	MATa <i>leu2-3, 112 trp1-1, can1-100, ura3-1, ade2-1, his3-11,15, RAD5+</i>	81
YTT186	MATa <i>leu2-3, 112 trp1-1, can1-100, ura3-1, ade2-1, his3-11,15, RAD5+, isw1::ADE2</i>	81
YTT196	MATa <i>leu2-3, 112 trp1-1, can1-100, ura3-1, ade2-1, his3-11,15, RAD5+, isw2::LEU2</i>	81
yFMP476	MATa <i>leu2-3, 112 trp1-1, can1-100, ura3-1, ade2-1, his3-11,15, RAD5+, arp8Δ::NATMX6</i>	29
yFMP382	MATa, <i>his3Δ1, leu2Δ0, met15Δ0, ura3Δ0, chd1::hphNT1</i>	Mueller-Planitz lab
yFMP480	MATa <i>leu2-3, 112 trp1-1, can1-100, ura3-1, ade2-1, his3-11,15, RAD5+, isw1Δ:ADE2 isw2Δ::LEU2 chd1Δ::TRP1 arp8Δ::NATMX6</i>	29
yEC26	MATa <i>ade2-1 ura3-1 his3-11,15 trp1-1 leu2-3,112 can1-100, orc1::URA3, leu2 ::pRS305/ORC1</i>	This study
yEC30	MATa <i>ade2-1 ura3-1 his3-11,15 trp1-1 leu2-3,112 can1-100, orc1::URA3, leu2 ::pRS305/ΔBAH-ORC1</i>	This study
yEC27	MATa <i>ade2-1 ura3-1 his3-11,15 trp1-1 leu2-3,112 can1-100, orc1::URA3, leu2 ::pRS305/ΔIDR-ORC1</i>	This study
yCFK100	MATa <i>ade2-1 ura3-1 his3-11,15 trp1-1 leu2-3,112 can1-100, bar1::Hyg, pep4::KanMX, ISW2-3xFLAG-NAT</i>	This study

Supplementary Table 2. DNA sequences of constructs for Orc1 mutations

All the codon-optimized sequences contain one 5' Ascl site, one 3' XhoI site, and encode an N-

Construct	DNA sequence
<i>orc1</i> -ΔBAH (Δ48-188)	ATGGCAAAACCGTTGAAGGATTTACAGGGTTGGGAGATAATAACAACCTGATGAGCAGGGAAATATAATCGATGGAGGTCAGAAGAGATTACGC CGAAGAGGTGCAAAAACCTGAACATTACTTAAAGAGAAGTTCTGATGGAATTGAGGATGTCAAAGCTTACATAAAGAAAGTGGAGCCAAAGGGA GCCCAGGAATGTTGAAAGATTTAACACTTCCATCAAGAAAGAGAGATGATCAAGAGGTCCTCAAAAGAAAGGATAAGCTTCAACCGGCA CAAATTTTCAGACGCAGAAACAAGAGCTACAGATATAACGGATAATGAGGACGGTAATGAAGATGAATCATCTGATTATGAAAGTCCGTCAGATAT CGACGTTAGCGAGGATATGGACAGCGGTGAAATATCCGCAGATGAGCTTGAGGAAGAAGAAGACGAAGAAGAACGAGCAAGAGAG AAAGAAGCTAGGCATACAAATTCACCAAGGAAAAGAGGCCGTAAAGATAAACTAGGTAAGATGATATTGACGCTTCTGTACAACCTCCCCCA AAAAAGAGGTCGTAACCTAAAGATCCTAGTAAACCGCGTCAGATGCTATTGATATCTTCATGCCGTGCAAAATAACTCCTGTGATTAGGAAA TTTACAAAAAGAAATGTTGCTAGGGCGAAAAAGAAATATACCCCGTTTTCGAAAAGATTTAAATCTATAGCTGCAATACCCAGATTTAACTTCATTA CCTGAATTTTACGGAAATTTCTTCGGAATTTGATGGCATCAAGGTTTGA AAAACAAATTA AAAACCAACCCAAAGCATTAGATTGTAGAAAACATTTT TCTAAAGTCAAAAACAGTTGAACCTCTCGTATGTCAAAGAAGAAATATTGAAGTCTGCAAAATTTCCAAATTTTACC GGATTTACGGGATAGGAGAATG AATTCGCCTCAATTTATTTAAGTGCATATAGTCCATTGAGTCCGACTCCGCTACTACTATATACGTGGCTGGTACGCCTGGTGTAGGGAAAAC TTAACCGTAAGGGAAGTCGTAAGGAAC TACTATCGTCTTCTGCACAACGAGAAATACCAGACTTTCTTTATGTGGAATAAATGGATTGAAAAAT GGTAAACCCACAGACTGTTACGAAACTTTATGGAACAAAGTGTCAAGGAAGAGGTTAAACATGGGCAGCTTCAATGGAGTCACTAGAGTTTTC CTTTAAAGAGATTCCAAAAATAAGAGAAAACCATTTGAGTCTTTGTGGACGAATCGATGCCATGGTAACGAAATCTCAAGATATATGTACA ATTTTTCAATTGGACTACTTACGAAATGCCAACTATTGTCATTGCAGTAGCCAATACAACTAGGACTTACCAGAACGTACGTACGGAGAATG ATTACTTCAAGAATTTGGGTTTACCAGAATTATGTTCACTGGGTATACGCACGAAGAGCTAAAAAATATCATTGATTTAAGACTGAAGGGGTTGAA CGACTCATTTTTCTATGTTGATACAAAACTGGCAATGCTATTTGATTGATGCGGCTGGAAACGACACTACAGTTAAGCAAAACGTTGCGCTGAA GACGTGAGGAAAGTTTCGCTTAAGAATGAGTGCATGATGCCATTGAAATGACTTCGAGAAAAGTACCAAGTGTAGTGGTGATGCAAGAGAGGAA TTGAAGGTTTGTAAAAGAGCAGCTGAAATTTGCTGAAAAACATATATGGCTAAGCATGGTTATGGATATGATGGAAGAGCGGTTATTGAAGATG AAAATAGGAGCAAAATATACGATGATGAAGACAAGGATCTTATTGAAGTAACAAAGCCAAAGCAGATAATGATGACGATGATGACATGACATG GGTACAAACAGTTCACATCACGCACGTTATGAAAGCCTTAAACGAAACTTTAAATTCTCATGTAATTACGTTTATGACGCGACTTTCATTACAG CAAAAGCTGTTTATTATGTCATTATTAACCTTGATGAAAAAGAACGGATCTCAAGAGCAAGAACTGGGCGATATTGTCGATGAAATCAAGTTACTTA TTGAAGTAAATTGGCAGTAATAAGTTTGTCTATGGAGATAGCCAAACATTGTTCCAAACAGGGAAGTGATAATATTTCTGAACAAATTGAGAATTATAT CATGGGATTTCTGTTCTCAATCAGTTACTTGACGCGGGAATATTGTTTAAACAAACTATGAAGAACGATAGAATATGTTGTGTCAAGCTAAATATAT CAGTAGAAGAAGCCAAAAGAGCCATGAATGAGGATGAGACATTGAGAAATTTATAG
<i>orc1</i> -ΔIDR (Δ236-345)	ATGGCAAAACCGTTGAAGGATTTACAGGGTTGGGAGATAATAACAACCTGATGAGCAGGGAAATATAATCGATGGAGGTCAGAAGAGATTACGC CGAAGAGGTGCAAAAACCTGAACATTACTTAAAGAGAAGTTCTGATGGAATTAACTAGGTCGTGGTGATAGTGTAGTCATGCACAACGAAGCC GCTGGGACTTACTCCGTTTATATGATCCAGGAGTTGAGACTTAATCAATTAATAATGTTGTGCAACTCTGGGCTCTACCTATTACGATGGTT TGAAGTCAATCCTTTAGCTCATTATAGGCAGTTTAACTCTGACGCTAACATTTTGAATCGTCTTTAAATTTATACAATAAATCTGTTTCTGAAACT GCAATAAAAAATGAACGTGATCTCACTGCAGAAATTAGCCGAATTGCAGCTATTAACTTTATCAGGGTTGCCAACGTAATGGATGGAAGCAAATG GGAAGTATTGAAAGGAAATGTCGATCCAGAAAGAGACTTTACAGTTCTGTTATATTGTTGAGCCGACTGGGAGAAATTTGTGGACATTAATATT GAGGATGTCAAAGCTTACATAAAGAAAGTGGAGCCAAGGGAAGCCCAGGAATATTTGAAAGATTTAAACACTTCCATCAAGAAGAAAGAGATC AAAAGAGGTCCTCAAAAGAAAGATAAGGCTACTCAAACGGCACAATATCTTCATGCCGTGCAAAATAACTCCTGTGATTAGGAAATTTACAAA AAAGATGTTTGGCTAGGGCGAAAAAGAAATATACCCCGTTTTCGAAAAGATTTAAATCTATAGCTGCAATACCAGATTTAACTTTCTTACCTGAAAT TTACGGAATCTTTCGGAATTTGATGGCATCAAGGTTTGA AAAACAAATTA AAAACCAACCCAAAGCATTAGATTGTAGAAAACATTTTCTCAAAG TCAAAAAACAGTTGAACCTCTTCGATGTCAAAGAAGAAATTTGAAGTCTGCAAAATTTCCAAGATTTATTACCGGCTAGGGAGAATGAATTCGCC TCAATTTATTTAAGTGCATATAGTCCATTGAGTCCGACTCCGCTACTACTATATACGTGGCTGGTACGCCTGGTGTAGGGAAAACCTTTAACCGT AAGGGAAGTCGTAAGGAAC TACTATCGTCTTCTGCACAACGAGAAATACCAGACTTTCTTTATGTGGAATAAATGGATTGAAAAATGGTAAAA CCACAGACTGTTTACGAAACTTTATGGAACAAAGTGTCAAGGAGAAGGTTAAACATGGGCAGCTTCAATGGAGTCACTAGAGTTTACTTTAAAA GAGTTCCAAAAATAAGAGAAAACCATTTGAGTCTTTGTTGACGAACCTCGATGCCATGGTAACGAAATCTCAAGATATATGTACAATTTTTC AATTGGACTATTACGAAATGCCAACTTATTGTCATTGCAGTAGCCAATAGGACTTACCAGAACGTACGTAGGCAATGATGACATGACATGACTTC AAGAATTTGGGTTTACCAGAATTATGTTCACTGGGTATACGCACGAAGAGCTAAAAAATATCATTGATTTAAGACTGAAGGGGTTGACGACTCAT TTTTCTATGTTGATACAAAACTGGCAATGCTATTTGATTGATGCGGCTGGAAACGACACTACAGTTAAGCAAACTGTGCCTGAAGACGCTGAG GAAAGTTCGTTTGAAGTGAAGTGCATGCTGATGCCATTGAAATAGCTTCGAGAAAAGTACGAAGTGTAGTGGTGATGCAAGAAGAGCATTGAAGGT TTGTAAAGAGCAGCTGAAATTTGCTGAAAAACACTATATGGCTAAGCATGGTTATGGATATGATGGAAGAGCGGTTATTGAAGATGAAATGAG TAGCAAAATATACGATGATGAAGACAAGGATCTTATTGAAGTAACAAAGCCAAAGACGATAATGATGACGATGATGACATGATGGGTACAAAG CAGTTCACATCACGCACGTTATGAAAGCCTTAAACGAAACTTTAAATTCTCATGTAATTACGTTTATGACGCGACTTTCATTACAGCAAACTGT TTATTATGCAATTATTAACCTTGATGAAAAAGAACGGATCTCAAGAGCAAGAACTGGGCGATATTGTCGATGAAATCAAGTTACTTTATTGAAGTAA ATTGGCAGTAAGATTTTGTCTATGGAGATAGCCAAACATTGTTCCAAACAGGGAAGTGATAATATTTCTGAACAAATTGAAATTTATCATGGGAT TCGTTCTCAATCAGTTACTTGACGCGGGAATATTGTTTAAACAAACTATGAAGAACGATAGAATATGTTGTGTCAAGCTAAATATATCAGTAGAAG AAGCCAAAAGAGCCATGAATGAGGATGAGACATTGAGAAATTTATAG
<i>orc1</i> -Walker B (D569Y)	ATGGCAAAACCGTTGAAGGATTTACAGGGTTGGGAGATAATAACAACCTGATGAGCAGGGAAATATAATCGATGGAGGTCAGAAGAGATTACGC CGAAGAGGTGCAAAAACCTGAACATTACTTAAAGAGAAGTTCTGATGGAATTAACTAGGTCGTGGTGATAGTGTAGTCATGCACAACGAAGCC GCTGGGACTTACTCCGTTTATATGATCCAGGAGTTGAGACTTAATCAATTAATAATGTTGTGCAACTCTGGGCTCTACCTATTACGATGGTT TGAAGTCAATCCTTTAGCTCATTATAGGCAGTTTAACTCTGACGCTAACATTTTGAATCGTCTTTAAATTTATACAATAAATCTGTTTCTGAAACT GCAATAAAAAATGAACGTGATCTCACTGCAGAAATTAGCCGAATTGCAGCTATTAACTTTATCAGGGTTGCCAACGTAATGGATGGAAGCAAATG GGAAGTATTGAAAGGAAATGTCGATCCAGAAAGAGACTTTACAGTTCTGTTATATTGTTGAGCCGACTGGGAGAAATTTGTGGACATTAATATT GAGGATGTCAAAGCTTACATAAAGAAAGTGGAGCCAAGGGAAGCCCAGGAATATTTGAAAGATTTAAACACTTCCATCAAGAAGAAAGAGATC AAAAGAGGTCCTCAAAAGAAAGATAAGGCTACTCAAACGGCACAATTTTCAGACGCAGAAACAAGAGCTACAGATATAACGGATAATGAGGAC GGTAATGAAGATGAATCATCTGATTATGAAAGTCCGTGAGATATGACGAGGATATGGACAGCGGTGAAATATCCGAGATGAGCTTG AGGAAGAAGAGACGAGAAGAGACGGAAGACGAGAAGAGAGAAAGAGCTAGGCATACAAATTCACCAAGGAAAAAGAGGCCGTAAAGATAAA ACTAGGTAAGATGATATTGACGCTTCTGTACAACCTCCCCCAAAAAAAGAGGTCGTAACCTAAAGATCCTAGTAAACCCGCTCAGATGCTA TTGATATCTTCATGCCGTGCAAAATAACTCCTGTGATTAGGAAATTTACAAAAAAGAAATGTTGCTAGGGCGAAAAAGAAATATACCCCGTTTTCT GAAAAGATTTAAATCTATAGCTGCAATACCAGATTAACTTCACTTGAATTTACGGAAATCTTCGGAATTCGATGGCATCAAGGTTTGAAAA CAAATTA AAAACCAACCCAAAGCATCAGATTGTAGAAAACATTTTTC TAAAGTCAAAAAACAGTTGAACTTCTCGTATGTCAAAGAAAGAAATATT GAAGTCTGCAAAATTTCCAAGATTTATTACCGGCTAGGGAGAATGAATTCGCCTCAATTTATTTAAGTGCATATAGTCCATTGAGTCCGACTCCG CTACTACTATATACGTGGCTGGTACGCCTGGTGTAGGGAAAACTTTAACCGTAAAGGGAAGTCGTAAGGAACACTACTATCGTCTTCTGCACAACG AGAATACCAGACTTTCTTTATGTGGAATAAATGGATTGAAAATGGTAAACCCACAGACTGTTACGAAACTTTATGGAACAAAGTGTCAAGGA GAAAGGTTAACATGGGCAGCTTCAATGGAGTCACTAGAGTTTTACTTTAAAGAGTTCAAAAAATAAGAGAAAACCATTTGAGTCTTGTGG ACGAACTCTATGCCATGGTAAACGAAATCTCAAGATATTATGTACAAATTTTTC TAAAGTGGACTTACGAAAAATGCCAACTTTATGTCAATTGCAG TAGCCAATACATGGACTTACCAGAACGTCACTAGGCCAATAAGATTACTTCAAGAATTTGGGTTTACCAGAATTATGTTCACTGGGTATACGCAC GAAAGACTAAAAAATATCATTGATTTAAGACTGAAGGGGTTTACAGCACTCATTTTCTATGTTGATACAAAACTGGCAATGCTATTTTGATTGAT GCGGCTGGAACGACACTACAGTTAAGCAACGTTGCTGGAAGACGTGAGGAAAGTTTCGCTTAAGAAATGAGTGTGCTGATGCCATTGAAATAGC TTTCAGAAAAGTAGCAAGTGTTAGTGGTGATGCAAGAAGAGCATTTGAAGGTTTGTAAAAGAGCAGCTGAAATTTGCTGAAAAACACTATATGGC TAAGCTGGTTGGATGATGGAAGAGCGGTTATTGAAGATGAAATGAGGAGCAAAATATACGATGATGAAGACAAGGATCTTATTGTAAGAGTA ACAAAGCCAAAGACGATAATGATGACGATGATGACAATGATGGGTGACCAACAGTTTCACATCAGCAGCTTATGAAAGCCCTTAAACGAAACTTT AAATTTCTCATGTAATTACGTTTATGACGCGACTTTTCAATTCAGCAAACTGTTTATTGATGCAATTAACTTTGATGAAAAAGAACCGGATCTCA GAGCAAGAACTGGGCGATATTGTGATGAAATCAAGTTACTTATTGAAGTAAATGGCAGTAATAAGTTTGTCTATGGAGATAGCCAAAACATTGTT CCAACAGGGAAGTGATAATATTTCTGAACAAATTGAGAATTATATCATGGGATTTCTGTTCTCAATCAGTTACTTGACGCGGGAATATTGTTTAAACA AACTATGAAGAACGATAGAATATGTTGTGTCAAGCTAAATATATCAGTAGAAGAAGCCAAAGAGCCATGAATGAGGATGAGACATTGAGAAAT TATAG

Construct	DNA sequence
orc1-ΔBAH-ΔIDR (Δ48-188, Δ236-345)	ATGGGCAAAACGTTGAAGGATTTACAGGGTTGGGAGATAATAACAACATGATGAGCAGGGAAATATAATCGATGGAGGTCAGAAGAGATTACGC CGAAGAGGTCGCAAAACATGAACATTACTTAAAGAGAAGTTCTGATGGAATTGAGGATGCAAAAGTTACATAAAGAAAGTGGAGCCAAAGGGAA GCCCAGGAATTTTGAAGATTTAAACACTTCCATCAAAAGAAAGAGATCAAAAGAGGTCCTCAAAAGAAAGATTAAGGCTACTCAAAACGGCA CAAATATCTTCATGCCGTGCAAAATACTCCTGTGATTAGGAAATTTACAAAAAGAAATGTTGCTAGGGCGCAAAAGAAATATACCCCGTTTTTC GAAAAGATTTAAATCTATAGCTGCAATACCAGATTTAACTTCATTACCTGAATTTTACGGAAATTCCTCGGAATTTGATGGCATCAAGGTTTGAAAA CAAATTAACCAACCCCAAAAGCATCAGATTTGTAGAAACAATTTTTCTTAAAGTCAAAAAACAGTTGAACTCTTCGTATGTCAAAGAAGAAATATT GAAGTCTGCAAAATTTCCAAGATTATTACCGGCTAGGGAGAATGAATTCGCCTCAATTTATTTAAGTGCATATAGTGCCATTGAGTCCGACTCCG CTACTACTATATACGTGGCTGGTACGCCTGGTGTAGGGAAAACTTTAAACCGTAAGGGGAAGTCGTAAAGGAACACTATCGTCTTCTGCACAAACG AGAAATACCAGACTTTCTTTATGTGGAATAAATGGATTGAAAAATGGTAAACCCACAGACTGTTACGAAACTTTATGGAACAAAGTGTACAGGA GAAAGGTTAACATGGGCAGCTTCAATGGAGTCACTAGAGTTTTACTTTAAAAAGAGTTCCAAAAAATAAGAAGAAAACCATTTAGTCTTGTTGG ACGAACTCGATGCCATGGTAACGAAATCTCAAGATATTATGTACAATTTTTCAATTTGGACTACTTACGAAAATGCCAAACTTATTGTCAATTGCAG TAGCCAATACAATGGACTTACCAGAACGTCAGCTAGGCAATAAGATTACTTCAAGAATTTGGGTTTACCAGAATTATGTTCACTGGGTATACGCAC GAAGAGCTAAAAAATATCATTGATTAAAGACTGAAGGGGTTGAACGACTCATTTTTCTATGTTGATACAAAAACGCGCAATGCTATTTTGATTGAT GCGGCTGGAACGACACTACAGTTAAGCAACGTTGCCTGAAGACGCTGAGGAAAGTTGCGTTAAGAATGAGTGCTGATGCCATTGAAATAGC TTGAGAAAAAGTAGCAAGTGTTAGTGGTGATGCAAGAAGACATTGAAGGTTTGTAAAGAGCAGCTGAAATTTGCTGAAAAACACTATATTGGC TAAGCATGGTTATGGATATGATGGAAGACGGTTATTGAAGATGAAATGAGGAGCAAAATACGATGATGAAGACAAGGATCTTATTGAAAGTA ACAAGGCCAAAGACGATAATGATGACGATGATGACAATGATGGGGTACAAACAGTTTCCATCACGCACGTTATGAAAGCCTTAAACGAAACTTT AAATCTCTCATGTTTACGTTTATGACCGGACTTTTCTTACAGCAAAAGCTGTTTTATTTATGCAATTTAAACTTATGATGAAAAAGAACCGGATCTCAA GAGCAAGAACTGGGCGATATTGTGATGAAATCAAGTTACTTATTGAAGTAAGTGGCAGTAATAAGTTTGTCTGATGGAGATAGCCAAAACATTTGTT CCAACAGGGGAAGTGATAATTTCTGAACAATTGAGAATTTATATCTGGAATTCGTTCTCAATCGATTACTTACGCTGAGCGGGAATTTGTAAAAACA AACTATGAAGAACGATAGAATATGTTGTGTCAAGCTAAATATATCAGTAGAAGAAGCCAAAAGAGCCATGAATGAGGATGAGACATTGAGAAAT TATAG
Codon-optimized Orc1-BAH (Δ48-188)	GGCGCGCCTATAAAACAATGAAGAGAAGATGGAAGAAGAACCTTCATTGCTGTTTCTGCTGCTAACAGATTCAAGAAGATTTCTTCTTCTGGTG CTTTGAAAACTTGACTTCCAAGGTGAAATGGCTAAGACTTTGAAGGACTTGCAAGGTTGGGAAATTTACTACTGACGAACAAGGTAACAT TATTGACGGTGGTCAAAAGAGATTGAGAAGAAGAGGTCCTAAGACTGAACACTACTTTGAAGAGATCTTCTGACGGTATTGAAGACGTTAAGGC TTACATTGAAGAAGGTTGAACCAAGAGAAGCTCAAGAATACTTGAAGGACTTGACTTTGCCATCTAAGAAGAAGGAAATTAAGAGAGGTCACACA AAAGAAGGCAAGGCTACTCAAACCTGCTCAAATTTCTGACGCTGAAACTAGAGCTACTGACATTACTGACAACGAAGACGGTAACGAAGACGA ATCTTCTGACTGAACCTCCATCTGACATTGACGTTTCTGAAGACTGGAACCTGCTGGTGAATTTCTGCTGACGAATTTGAAGAAGAAAGA CGAAGAAGAAGACGAAGACGAAGAAGAAAAGGAAGCTAGACACACTAACTCTCCAAGAAGAGAGGTTAGAAGATTAAAGTTGGGTAAGGAC GACATTGACGCTTCTGTTCAACCACCACCAAAAGAGAGAGGTAGAAGGCCAAAGGACCCATCTAAGCCAAAGACAATGTTGTTGATTCTTCT TGTAGAGCTAACAACACTCCAGTTATTAGAAGTTCTACTAAGAAGACGTTGCTAGAGCTAAGAAGAAGTACACTCCATTCTCTAAGAGATTCA AGTCTATTGCTGCTATTCCAGACTTGACTTCTTTCGACAGATTTCTACGTAACCTTCTGAAATTTGCTGAAATGCTGATGCTTCAAGAAACAGTTGAAG ACTACTCAAGGACCAAAATTTTGAACATTTTCTCTAAGGTTTCAAGGTAAGCAATTTGAACTCTTCTTACGTTAAGGAAGAAATTTGAAGTCTGC TAACTTCCAAGACTACTTGCCAGCTAGAGAAAACGAATTCGCTTCTATTACTTGTCTGCTTACTCTGCTATTGAATCTGACTCTGCTACTACTAT TTACGTTGCTGGTACTCCAGGTGTTGGTAAGACTTTGACTGTTAGAGAAGTTGTTAAGGAAATGTTGTCTTCTTCTGCTCAAGAGAGAAATCCA GACTTCTTGTACGTTGAAATTAACGGTTTGAAGATGTTTAAGCCAACTGACTGTTACGAAACTTTGTGGAACAAGGTTTCTGGTGAAGAGATTGA CTTGGGCTGCTTCTATGGAATCTTGGAAATCTACTTCAAGAGAGTTCCAAAGAACAAGAAAGAAAGTATGTTGTTTGTGGACAGAAATTTGGA CGCTATTGGTTACTAAGTCTCAAGACTTTGATACACTTCTTCAACTGACTACTTACGAAACCGTAAGTTGATTGTATTGCTGTTGCTAACA CTATGGACTTGCCAGAAAGACAATTTGGGTAACAAGATTACTTCTAGAATTGGTTTCACTAGAATTATGTTCACTGGTTACACTCACGAAGAATTG AAGAACATTATTGACTTGAGATTGAAGGGTTGAACGACTCTTCTCTACGTTGACACTAAGACTGGTAACGCTATTGTTGATGACGCTGCTG GTAACGACACTACTGTTAAGCAAACTTTGCCAGAAGACGTTAGAAGAGTTGAGATTTGAGAAATGCTGCTGACGCTATTGAAATTTCTAGAAA GGTGTGCTTCTGTTTCTGGTGACGCTAGAAGAGCTTTGAAGGTTTGAAGAGAGCTGCTGAAATTTGCTGAAAAGCACTACATGGCTAAGACAG GTTACGGTTACGACGCTAAGACTGTTATTGAAGACGAAGAACAAGCAATTTACGACGACGAAGACAAGGACTTGAATGATTAACAAAGG CTAAGGACGACAACGACGACGACGACGACAACGACGGTGTCAAACCTGTTCACTTACTCACGTTATGAAGGCTTTGAACGAAACTTTGAAC TCTCACGTTATTACTTTCATGACTAGATTGCTTTCCTGCTAAGTTGTTTCAATTTACGCTTTGTTGAACCTTGATGAAGAAGAACGGTTCTCAAGA ACAAGAATTTGGGTGACATTGTTGACGAATTAAGTTGTTGATTGAAGTTAAGCGTTCTAACAAGTTGCTGTTAGGAAATTTCTAAGACTTTGTTCC AACAAAGGTTCTGACAACATTTCTGAACAATTGAGAATTTTCTTGGGACTTCGTTTGAACCAATTTGTTGACGCTGGTATTGTTTCAAGCAAA ACTATGAAGAACGACAGAATTTGTTGTGTTAAGTTGAACATTTCTGTTGAAGAAGCTAAGAGAGCTATGAACGAAGCAAACTTTGAGAAGACT TGTAAATTTGAATTTGAATTTGAATTCGATAGATCAATTTTTTCTTCTTCTTCCCATCCTTTACGCTAAAATAATAGTTTATTTTATTTTGAATAT TTTTATTTATATACGTATATATAGACTATTATTATCTTTAATGATTATTAAGATTTTATTAATAAAAAAATTCGCTCCTCTTTAATGCCTTTATGCC CCGGCTGCAGGAATTCGATATCAAGCTTATCGATACCGTCGACCTCGAG
Codon-optimized Orc1-IDR (Δ236-345)	GGCGCGCCTATAAAACAATGAAGAGAAGATGGAAGAAGAACCTTCATTGCTGTTTCTGCTGCTAACAGATTCAAGAAGATTTCTTCTTCTGGTG CTTTGAAAACTTGACTTCCAAGGTGAAATGGCTAAGACTTTGAAGGACTTGCAAGGTTGGGAAATTTACTACTGACGAACAAGGTAACAT TATTGACGGTGGTCAAAAGAGATTGAGAAGAAGAGGTCCTAAGACTGAACACTACTTTGAAGAGATCTTCTGACGGTATTAAAGTTGGGTAGAGG TGACTCTGTTGTTTATGCACAACGAAGCTGCTGGTACTTACTCTGTTTACATGATTCAAGAATTGAGATTGAACACTTTGAACACGCTGTTGTAAT GTGGGCTTTGACTTACTTGAGATGGTTGGAAGTTAACCATTGGCTCACTACAGACAATTC AACCCAGACGCTAACATTTTGAACAGACCATT GAACTACTACAACAAGTTGTTCTGTAAGCTGCTAACAAGAAGCAAGTTGACTTTGACTGCTGAATTTGGCTGAATTTGCAACTTCAATTA GAGTTGCTAACGTTATGGACGGTTCTAAGTGGGAAGTTTTGAAGGGTAACGTTGACCCAGAAAGAGACTTCACTGTTAGATACATTTGTGAAC CAACTGGTGAAAAGTTGCTTGACATTAAACATTGAAGACGTTAAGGCTTACATTAAAGAAGGTTGAACCAAGAGAAGCTCAAGAATATCTGAAGG ACTTGACTTTGCCATCTAAGAAGAAGGAAATTAAGAGAGGTCACAAAAGAGGACAAAGGCTCAAACTGCTCAAAATTTCTTCTGTAGAG CTAACAACACTCCAGTTATTAGAAAGTTCACTAAGAAGAAGCGTTGCTAGAGCTAAGAAGAAGTACACTCCATTCTCTAAGAGATTCAAGTCTATT GCTGCTATTCCAGACTTGACTTCTTTGCCAGAATTCTACCGTAACTCTTCTGAATTTGATGGCTTCTAGATTGCAAAACAAGTTGAAGACTACTCA AAAGCACCAGAAATTTGTTGAACATTTTCTCTAAGGTTAAGAAGCAATTTGAACTCTTCTTACGTTAAGGAAGAAATTTTGAAGTCTGCTAACTTCC AAGACTACTTGCCAGCTAGAGAAAACGAATTCGCTTCTATTGCTTGTCTTACTCTGCTATTGAATCTGACTCTGCTACTACTATTACGTTG CTGGTACTCCAGGTGTTGGTAAGACTTTGACTGTTAGAGAAGTTGTTAAGGAATTTGTTGCTTCTTCTGCTCAAGAGAAATTCAGACTTCTT GTACGTTGAAATTAACGGTTTGAAGATGGTTAAGCCAACTGACTGTTACGAAACTTTGTGGAACAAGGTTTCTGGTGAAGAGATTGACTTGGGC TGCTTCTATGGAATCTTGAATTTCACTTCAAGAGAGTTCCAAAGAACAAGAAAGAGACTATTGTTGTTTGTGGACGAATTTGGACGCTATG GTTACTAAGTCTCAAGACATTATGTACAACCTTCTCAACTGGACTACTTACGAAAACGCTAAGTTGATTGTTATGCTGTTGCTAACACTATGGA CTTGCCAGAAAGACAATTTGGGTAACAAGATTACTTCTAGAATTTGGTTTCACTAGAATTATGTTCACTGGTTACACTCACGAAGAATTGAAGAACA TTATTGACTTGAGATTGAAGGGTTTGAACGACTCTTCTTCTACGTTGACACTAAGACTGGTAACGCTATTGTTGATTGACGCTGCTGGTAACGA CACTACTGTTAAGCAAACTTTGCCAGAAGACGTTAGAAGGTTAGATTGAGAATGCTGCTGACGCTATTGAAATTTGCTTAGAAGAGGTTGCT TCTGTTTCTGGTGACGCTAGAAGAGCTTTGAAGGTTTGAAGAGAGCTGCTGAAATTTGCTGAAAAGCACTACATGGCTAAGCAGCGTTACGGT TACGACGGTAAGACTGTTATTGAAGACGAAAACGAAGAACAATTTACGACGACGAAGACAAGGACTTGATTGAATCTAACAAGGCTAAGGAC GACAACGACGACGACGACGACAACGACGGTGTCAAACCTGTTCACTTACTTACGTTATGAAGGCTTTGAACGAACTTTGAACCTCTCACGTT ATTACTTTCATGACTAGATTGCTTCTCACTGCTAAGTTGTTCAATTTACGCTTTGTTGAACTTGATGAAGAAGAACGGTTCTCAAGAACGAAT GGGTGACATTGTTGACGAAATTAAGTTGTTGATTGAAGTTAAGCGTTTCAACAAGTTGCTTATGGAATTTGCTAAGCAATTTGTTTCAACAAGGTT CTGACAACAATTTCTGAACAATTTGAGAATTTTCTTGGGACTCTGTTTTGAACCAATTTGTTGAGCACTGGTATTGTTTCAAGCAAACTATGAAG AACGACAGAATTTGTTGTGTTAAGTTGAACATTTCTGTTGAAGAAGCTAAGAGAGCTATGAACGAAGACGAAACTTTGAGAACTTTGTAATTTGA AATTGATTTGAATTCGATAGATCAATTTTTTCTTCTTCTTCCCATCCTTTACGCTAAAATAATAGTTTATTTTATTTTGAATTTTATTTA TATACGTATATAGACTATTATTATCTTTAATGATTATTAAGATTTTATTAATAAAAAAATTCGCTCCTCTTTAATGCCTTTATGCCCTGGGCTG CAGGAATTCGATATCAAGCTTATCGATACCGTCGACCTCGAG

