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Supplementary information

Establishment and function of chromatin organization at replication origins

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Establishment and Function of Chromatin Organization at Replication Origins

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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

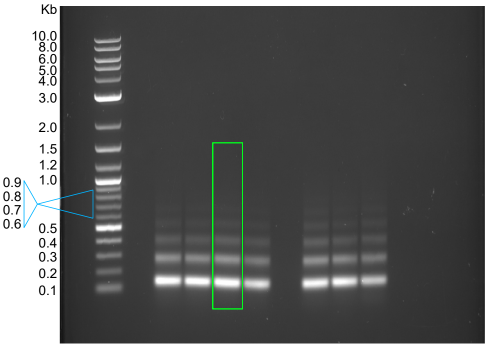


Fig. 1e

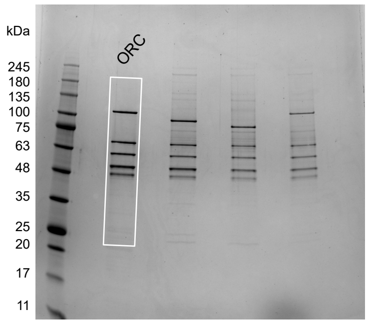


Fig. 1g

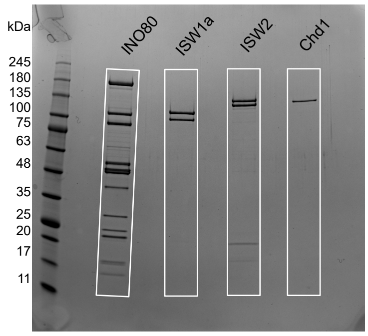


Fig. 3d

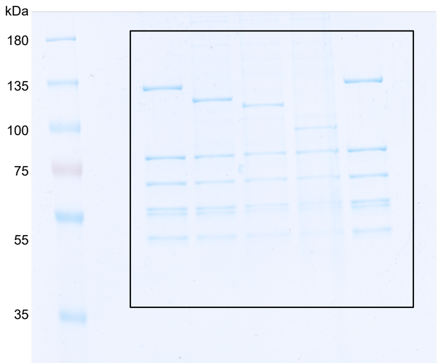


Fig. 3f

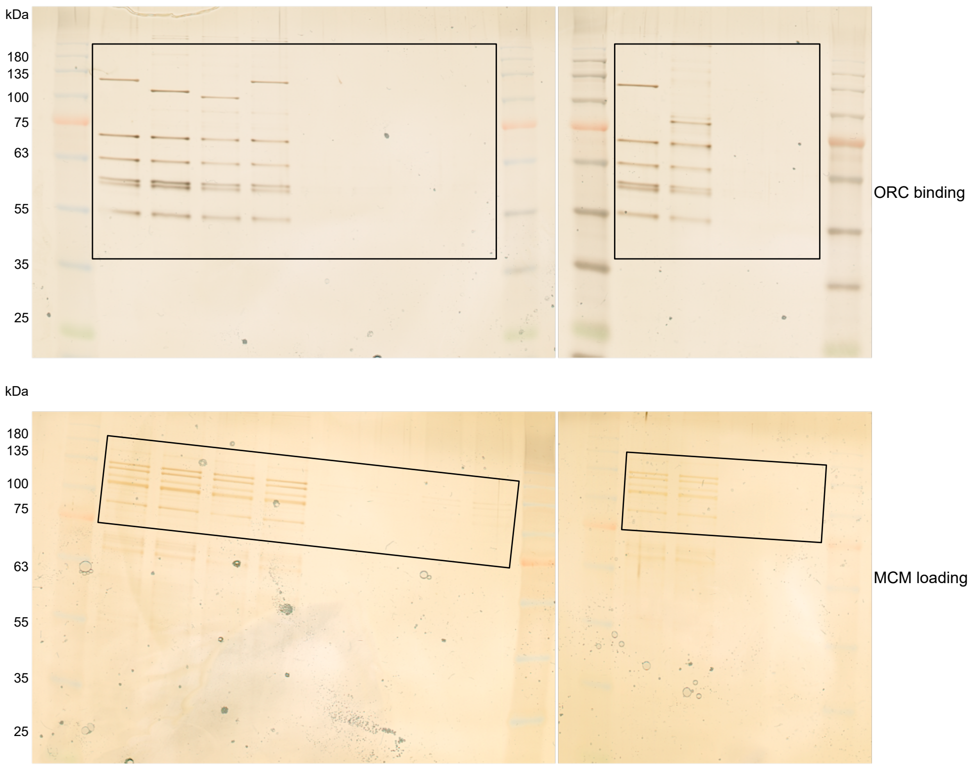
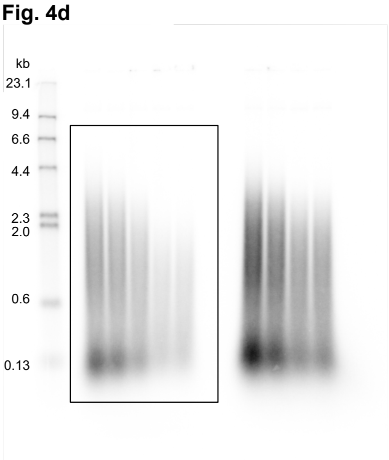
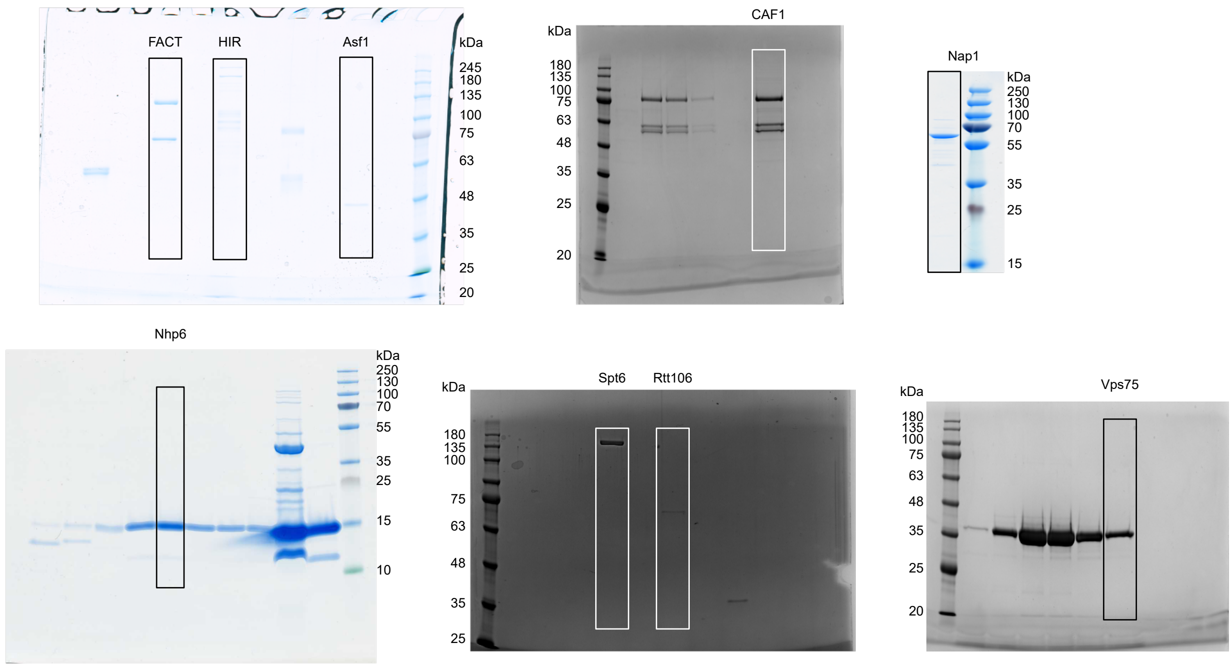


Fig. 4d

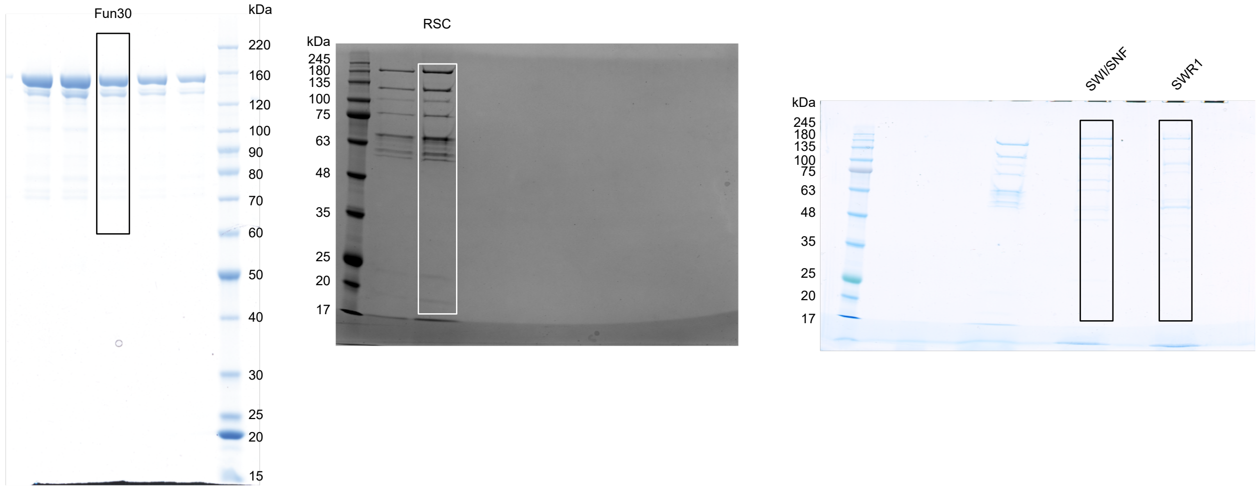


Supplementary Figure 2

ED Fig. 1a

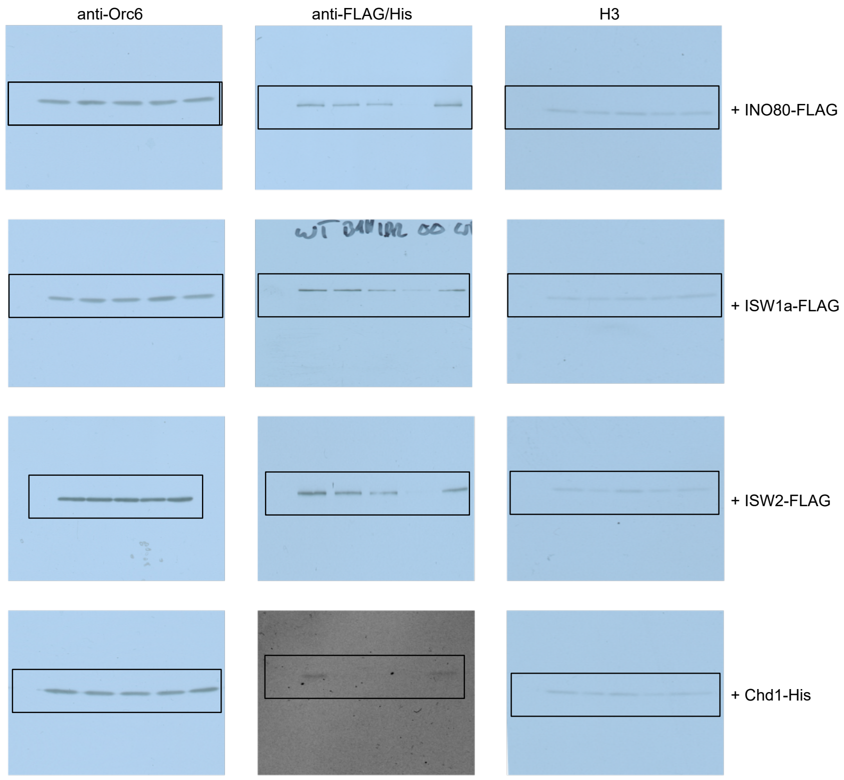


ED Fig. 1b

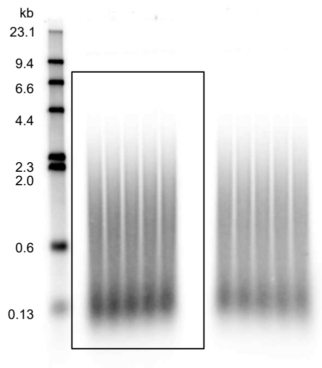


Supplementary Figure 3

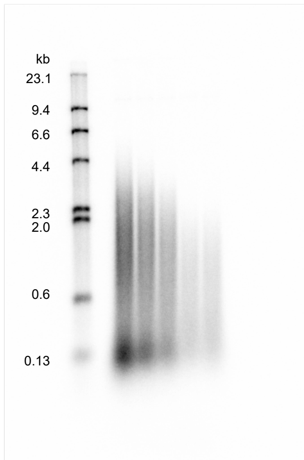
ED Fig. 8



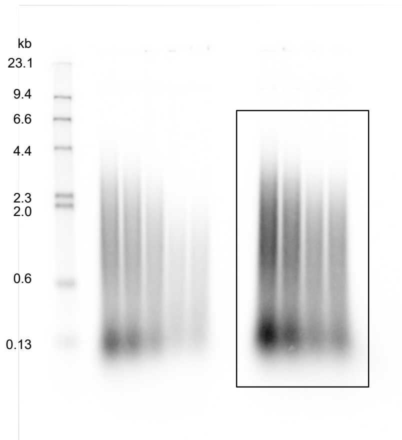
ED Fig. 9b



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/Ies1, Ies2 *ura3::URA3* pRS306/Act1,Arp4 *leu2::LEU2* pRS305/Ies5, Ies6 *leu2::LEU2* pRS305/Arp5, Arp8 *trp1::TRP1* pRS304/Ies3, Ies4 *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, bar1∆::TRP1 pep4∆::LEU2 GAL4* pGAl1-10 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::TRP1p* RS304/SDORC5,6, *ura3::URA3* pRS306/ΔBAH-SDORC1,ORC2	This study

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

Supplementary Table 2. DNA sequences of constructs for Orc1 mutations

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

Construct	**DNA sequence**
orc1-ΔBAH (Δ48-188)	ATGGCAAAAACGTTGAAGGATTTACAGGGTTGGGAGATAATAACAACTGATGAGCAGGGAAATATAATCGATGGAGGTCAGAAGAGATTACGC CGAAGAGGTGCAAAAACTGAACATTACTTAAAGAGAAGTTCTGATGGAATTGAGGATGTCAAAGCTTACATAAAGAAAGTGGAGCCAAGGGAA GCCCAGGAATATTTGAAAGATTTAACACTTCCATCAAAGAAGAAAGAGATCAAAAGAGGTCCTCAAAAGAAAGATAAGGCTACTCAAACGGCA CAAATTTCAGACGCAGAAACAAGAGCTACAGATATAACGGATAATGAGGACGGTAATGAAGATGAATCATCTGATTATGAAAGTCCGTCAGATAT CGACGTTAGCGAGGATATGGACAGCGGTGAAATATCCGCAGATGAGCTTGAGGAAGAAGAAGACGAAGAAGAAGACGAAGACGAAGAAGAG AAAGAAGCTAGGCATACAAATTCACCAAGGAAAAGAGGCCGTAAGATAAAACTAGGTAAAGATGATATTGACGCTTCTGTACAACCTCCCCCCA AAAAAAGAGGTCGTAAACCTAAAGATCCTAGTAAACCGCGTCAGATGCTATTGATATCTTCATGCCGTGCAAATAATACTCCTGTGATTAGGAAA TTTACAAAAAAGAATGTTGCTAGGGCGAAAAAGAAATATACCCCGTTTTCGAAAAGATTTAAATCTATAGCTGCAATACCAGATTTAACTTCATTA CCTGAATTTTACGGAAATTCTTCGGAATTGATGGCATCAAGGTTTGAAAACAAATTAAAAACAACCCAAAAGCATCAGATTGTAGAAACAATTTT TTCTAAAGTCAAAAAACAGTTGAACTCTTCGTATGTCAAAGAAGAAATATTGAAGTCTGCAAATTTCCAAGATTATTTACCGGCTAGGGAGAATG AATTCGCCTCAATTTATTTAAGTGCATATAGTGCCATTGAGTCCGACTCCGCTACTACTATATACGTGGCTGGTACGCCTGGTGTAGGGAAAACT TTAACCGTAAGGGAAGTCGTAAAGGAACTACTATCGTCTTCTGCACAACGAGAAATACCAGACTTTCTTTATGTGGAAATAAATGGATTGAAAAT GGTAAAACCCACAGACTGTTACGAAACTTTATGGAACAAAGTGTCAGGAGAAAGGTTAACATGGGCAGCTTCAATGGAGTCACTAGAGTTTTA CTTTAAAAGAGTTCCAAAAAATAAGAAGAAAACCATTGTAGTCTTGTTGGACGAACTCGATGCCATGGTAACGAAATCTCAAGATATTATGTACA ATTTTTTCAATTGGACTACTTACGAAAATGCCAAACTTATTGTCATTGCAGTAGCCAATACAATGGACTTACCAGAACGTCAGCTAGGCAATAAG ATTACTTCAAGAATTGGGTTTACCAGAATTATGTTCACTGGGTATACGCACGAAGAGCTAAAAAATATCATTGATTTAAGACTGAAGGGGTTGAA CGACTCATTTTTCTATGTTGATACAAAAACTGGCAATGCTATTTTGATTGATGCGGCTGGAAACGACACTACAGTTAAGCAAACGTTGCCTGAA GACGTGAGGAAAGTTCGCTTAAGAATGAGTGCTGATGCCATTGAAATAGCTTCGAGAAAAGTAGCAAGTGTTAGTGGTGATGCAAGAAGAGCA TTGAAGGTTTGTAAAAGAGCAGCTGAAATTGCTGAAAAACACTATATGGCTAAGCATGGTTATGGATATGATGGAAAGACGGTTATTGAAGATG AAAATGAGGAGCAAATATACGATGATGAAGACAAGGATCTTATTGAAAGTAACAAAGCCAAAGACGATAATGATGACGATGATGACAATGATGG GGTACAAACAGTTCACATCACGCACGTTATGAAAGCCTTAAACGAAACTTTAAATTCTCATGTAATTACGTTTATGACGCGACTTTCATTTACAG CAAAACTGTTTATTTATGCATTATTAAACTTGATGAAAAAGAACGGATCTCAAGAGCAAGAACTGGGCGATATTGTCGATGAAATCAAGTTACTTA TTGAAGTAAATGGCAGTAATAAGTTTGTCATGGAGATAGCCAAAACATTGTTCCAACAGGGAAGTGATAATATTTCTGAACAATTGAGAATTATAT CATGGGATTTCGTTCTCAATCAGTTACTTGACGCGGGAATATTGTTTAAACAAACTATGAAGAACGATAGAATATGTTGTGTCAAGCTAAATATAT CAGTAGAAGAAGCCAAAAGAGCCATGAATGAGGATGAGACATTGAGAAATTTATAG
orc1-ΔIDR (Δ236-345)	ATGGCAAAAACGTTGAAGGATTTACAGGGTTGGGAGATAATAACAACTGATGAGCAGGGAAATATAATCGATGGAGGTCAGAAGAGATTACGC CGAAGAGGTGCAAAAACTGAACATTACTTAAAGAGAAGTTCTGATGGAATTAAACTAGGTCGTGGTGATAGTGTAGTCATGCACAACGAAGCC GCTGGGACTTACTCCGTTTATATGATCCAGGAGTTGAGACTTAATACATTAAATAATGTTGTCGAACTCTGGGCTCTCACCTATTTACGATGGTT TGAAGTCAATCCTTTAGCTCATTATAGGCAGTTTAATCCTGACGCTAACATTTTGAATCGTCCTTTAAATTATTACAATAAACTGTTTTCTGAAACT GCAAATAAAAATGAACTGTATCTCACTGCAGAATTAGCCGAATTGCAGCTATTTAACTTTATCAGGGTTGCCAACGTAATGGATGGAAGCAAATG GGAAGTATTGAAAGGAAATGTCGATCCAGAAAGAGACTTTACAGTTCGTTATATTTGTGAGCCGACTGGGGAGAAATTTGTGGACATTAATATT GAGGATGTCAAAGCTTACATAAAGAAAGTGGAGCCAAGGGAAGCCCAGGAATATTTGAAAGATTTAACACTTCCATCAAAGAAGAAAGAGATC AAAAGAGGTCCTCAAAAGAAAGATAAGGCTACTCAAACGGCACAAATATCTTCATGCCGTGCAAATAATACTCCTGTGATTAGGAAATTTACAAA AAAGAATGTTGCTAGGGCGAAAAAGAAATATACCCCGTTTTCGAAAAGATTTAAATCTATAGCTGCAATACCAGATTTAACTTCATTACCTGAATT TTACGGAAATTCTTCGGAATTGATGGCATCAAGGTTTGAAAACAAATTAAAAACAACCCAAAAGCATCAGATTGTAGAAACAATTTTTTCTAAAG TCAAAAAACAGTTGAACTCTTCGTATGTCAAAGAAGAAATATTGAAGTCTGCAAATTTCCAAGATTATTTACCGGCTAGGGAGAATGAATTCGCC TCAATTTATTTAAGTGCATATAGTGCCATTGAGTCCGACTCCGCTACTACTATATACGTGGCTGGTACGCCTGGTGTAGGGAAAACTTTAACCGT AAGGGAAGTCGTAAAGGAACTACTATCGTCTTCTGCACAACGAGAAATACCAGACTTTCTTTATGTGGAAATAAATGGATTGAAAATGGTAAAA CCCACAGACTGTTACGAAACTTTATGGAACAAAGTGTCAGGAGAAAGGTTAACATGGGCAGCTTCAATGGAGTCACTAGAGTTTTACTTTAAAA GAGTTCCAAAAAATAAGAAGAAAACCATTGTAGTCTTGTTGGACGAACTCGATGCCATGGTAACGAAATCTCAAGATATTATGTACAATTTTTTC AATTGGACTACTTACGAAAATGCCAAACTTATTGTCATTGCAGTAGCCAATACAATGGACTTACCAGAACGTCAGCTAGGCAATAAGATTACTTC AAGAATTGGGTTTACCAGAATTATGTTCACTGGGTATACGCACGAAGAGCTAAAAAATATCATTGATTTAAGACTGAAGGGGTTGAACGACTCAT TTTTCTATGTTGATACAAAAACTGGCAATGCTATTTTGATTGATGCGGCTGGAAACGACACTACAGTTAAGCAAACGTTGCCTGAAGACGTGAG GAAAGTTCGCTTAAGAATGAGTGCTGATGCCATTGAAATAGCTTCGAGAAAAGTAGCAAGTGTTAGTGGTGATGCAAGAAGAGCATTGAAGGT TTGTAAAAGAGCAGCTGAAATTGCTGAAAAACACTATATGGCTAAGCATGGTTATGGATATGATGGAAAGACGGTTATTGAAGATGAAAATGAG GAGCAAATATACGATGATGAAGACAAGGATCTTATTGAAAGTAACAAAGCCAAAGACGATAATGATGACGATGATGACAATGATGGGGTACAAA CAGTTCACATCACGCACGTTATGAAAGCCTTAAACGAAACTTTAAATTCTCATGTAATTACGTTTATGACGCGACTTTCATTTACAGCAAAACTGT TTATTTATGCATTATTAAACTTGATGAAAAAGAACGGATCTCAAGAGCAAGAACTGGGCGATATTGTCGATGAAATCAAGTTACTTATTGAAGTAA ATGGCAGTAATAAGTTTGTCATGGAGATAGCCAAAACATTGTTCCAACAGGGAAGTGATAATATTTCTGAACAATTGAGAATTATATCATGGGATT TCGTTCTCAATCAGTTACTTGACGCGGGAATATTGTTTAAACAAACTATGAAGAACGATAGAATATGTTGTGTCAAGCTAAATATATCAGTAGAAG AAGCCAAAAGAGCCATGAATGAGGATGAGACATTGAGAAATTTATAG
orc1-Walker B (D569Y)	ATGGCAAAAACGTTGAAGGATTTACAGGGTTGGGAGATAATAACAACTGATGAGCAGGGAAATATAATCGATGGAGGTCAGAAGAGATTACGC CGAAGAGGTGCAAAAACTGAACATTACTTAAAGAGAAGTTCTGATGGAATTAAACTAGGTCGTGGTGATAGTGTAGTCATGCACAACGAAGCC GCTGGGACTTACTCCGTTTATATGATCCAGGAGTTGAGACTTAATACATTAAATAATGTTGTCGAACTCTGGGCTCTCACCTATTTACGATGGTT TGAAGTCAATCCTTTAGCTCATTATAGGCAGTTTAATCCTGACGCTAACATTTTGAATCGTCCTTTAAATTATTACAATAAACTGTTTTCTGAAACT GCAAATAAAAATGAACTGTATCTCACTGCAGAATTAGCCGAATTGCAGCTATTTAACTTTATCAGGGTTGCCAACGTAATGGATGGAAGCAAATG GGAAGTATTGAAAGGAAATGTCGATCCAGAAAGAGACTTTACAGTTCGTTATATTTGTGAGCCGACTGGGGAGAAATTTGTGGACATTAATATT GAGGATGTCAAAGCTTACATAAAGAAAGTGGAGCCAAGGGAAGCCCAGGAATATTTGAAAGATTTAACACTTCCATCAAAGAAGAAAGAGATC AAAAGAGGTCCTCAAAAGAAAGATAAGGCTACTCAAACGGCACAAATTTCAGACGCAGAAACAAGAGCTACAGATATAACGGATAATGAGGAC GGTAATGAAGATGAATCATCTGATTATGAAAGTCCGTCAGATATCGACGTTAGCGAGGATATGGACAGCGGTGAAATATCCGCAGATGAGCTTG AGGAAGAAGAAGACGAAGAAGAAGACGAAGACGAAGAAGAGAAAGAAGCTAGGCATACAAATTCACCAAGGAAAAGAGGCCGTAAGATAAA ACTAGGTAAAGATGATATTGACGCTTCTGTACAACCTCCCCCCAAAAAAAGAGGTCGTAAACCTAAAGATCCTAGTAAACCGCGTCAGATGCTA TTGATATCTTCATGCCGTGCAAATAATACTCCTGTGATTAGGAAATTTACAAAAAAGAATGTTGCTAGGGCGAAAAAGAAATATACCCCGTTTTC GAAAAGATTTAAATCTATAGCTGCAATACCAGATTTAACTTCATTACCTGAATTTTACGGAAATTCTTCGGAATTGATGGCATCAAGGTTTGAAAA CAAATTAAAAACAACCCAAAAGCATCAGATTGTAGAAACAATTTTTTCTAAAGTCAAAAAACAGTTGAACTCTTCGTATGTCAAAGAAGAAATATT GAAGTCTGCAAATTTCCAAGATTATTTACCGGCTAGGGAGAATGAATTCGCCTCAATTTATTTAAGTGCATATAGTGCCATTGAGTCCGACTCCG CTACTACTATATACGTGGCTGGTACGCCTGGTGTAGGGAAAACTTTAACCGTAAGGGAAGTCGTAAAGGAACTACTATCGTCTTCTGCACAACG AGAAATACCAGACTTTCTTTATGTGGAAATAAATGGATTGAAAATGGTAAAACCCACAGACTGTTACGAAACTTTATGGAACAAAGTGTCAGGA GAAAGGTTAACATGGGCAGCTTCAATGGAGTCACTAGAGTTTTACTTTAAAAGAGTTCCAAAAAATAAGAAGAAAACCATTGTAGTCTTGTTGG ACGAACTCTATGCCATGGTAACGAAATCTCAAGATATTATGTACAATTTTTTCAATTGGACTACTTACGAAAATGCCAAACTTATTGTCATTGCAG TAGCCAATACAATGGACTTACCAGAACGTCAGCTAGGCAATAAGATTACTTCAAGAATTGGGTTTACCAGAATTATGTTCACTGGGTATACGCAC GAAGAGCTAAAAAATATCATTGATTTAAGACTGAAGGGGTTGAACGACTCATTTTTCTATGTTGATACAAAAACTGGCAATGCTATTTTGATTGAT GCGGCTGGAAACGACACTACAGTTAAGCAAACGTTGCCTGAAGACGTGAGGAAAGTTCGCTTAAGAATGAGTGCTGATGCCATTGAAATAGC TTCGAGAAAAGTAGCAAGTGTTAGTGGTGATGCAAGAAGAGCATTGAAGGTTTGTAAAAGAGCAGCTGAAATTGCTGAAAAACACTATATGGC TAAGCATGGTTATGGATATGATGGAAAGACGGTTATTGAAGATGAAAATGAGGAGCAAATATACGATGATGAAGACAAGGATCTTATTGAAAGTA ACAAAGCCAAAGACGATAATGATGACGATGATGACAATGATGGGGTACAAACAGTTCACATCACGCACGTTATGAAAGCCTTAAACGAAACTTT AAATTCTCATGTAATTACGTTTATGACGCGACTTTCATTTACAGCAAAACTGTTTATTTATGCATTATTAAACTTGATGAAAAAGAACGGATCTCAA GAGCAAGAACTGGGCGATATTGTCGATGAAATCAAGTTACTTATTGAAGTAAATGGCAGTAATAAGTTTGTCATGGAGATAGCCAAAACATTGTT CCAACAGGGAAGTGATAATATTTCTGAACAATTGAGAATTATATCATGGGATTTCGTTCTCAATCAGTTACTTGACGCGGGAATATTGTTTAAACA AACTATGAAGAACGATAGAATATGTTGTGTCAAGCTAAATATATCAGTAGAAGAAGCCAAAAGAGCCATGAATGAGGATGAGACATTGAGAAATT TATAG

Construct	DNA sequence
orc1-ΔBAH-ΔIDR (Δ48-188, Δ236-345)	ATGGCAAAAACGTTGAAGGATTTACAGGGTTGGGAGATAATAACAACTGATGAGCAGGGAAATATAATCGATGGAGGTCAGAAGAGATTACGC CGAAGAGGTGCAAAAACTGAACATTACTTAAAGAGAAGTTCTGATGGAATTGAGGATGTCAAAGCTTACATAAAGAAAGTGGAGCCAAGGGAA GCCCAGGAATATTTGAAAGATTTAACACTTCCATCAAAGAAGAAAGAGATCAAAAGAGGTCCTCAAAAGAAAGATAAGGCTACTCAAACGGCA CAAATATCTTCATGCCGTGCAAATAATACTCCTGTGATTAGGAAATTTACAAAAAAGAATGTTGCTAGGGCGAAAAAGAAATATACCCCGTTTTC GAAAAGATTTAAATCTATAGCTGCAATACCAGATTTAACTTCATTACCTGAATTTTACGGAAATTCTTCGGAATTGATGGCATCAAGGTTTGAAAA CAAATTAAAAACAACCCAAAAGCATCAGATTGTAGAAACAATTTTTTCTAAAGTCAAAAAACAGTTGAACTCTTCGTATGTCAAAGAAGAAATATT GAAGTCTGCAAATTTCCAAGATTATTTACCGGCTAGGGAGAATGAATTCGCCTCAATTTATTTAAGTGCATATAGTGCCATTGAGTCCGACTCCG CTACTACTATATACGTGGCTGGTACGCCTGGTGTAGGGAAAACTTTAACCGTAAGGGAAGTCGTAAAGGAACTACTATCGTCTTCTGCACAACG AGAAATACCAGACTTTCTTTATGTGGAAATAAATGGATTGAAAATGGTAAAACCCACAGACTGTTACGAAACTTTATGGAACAAAGTGTCAGGA GAAAGGTTAACATGGGCAGCTTCAATGGAGTCACTAGAGTTTTACTTTAAAAGAGTTCCAAAAAATAAGAAGAAAACCATTGTAGTCTTGTTGG ACGAACTCGATGCCATGGTAACGAAATCTCAAGATATTATGTACAATTTTTTCAATTGGACTACTTACGAAAATGCCAAACTTATTGTCATTGCAG TAGCCAATACAATGGACTTACCAGAACGTCAGCTAGGCAATAAGATTACTTCAAGAATTGGGTTTACCAGAATTATGTTCACTGGGTATACGCAC GAAGAGCTAAAAAATATCATTGATTTAAGACTGAAGGGGTTGAACGACTCATTTTTCTATGTTGATACAAAAACTGGCAATGCTATTTTGATTGAT GCGGCTGGAAACGACACTACAGTTAAGCAAACGTTGCCTGAAGACGTGAGGAAAGTTCGCTTAAGAATGAGTGCTGATGCCATTGAAATAGC TTCGAGAAAAGTAGCAAGTGTTAGTGGTGATGCAAGAAGAGCATTGAAGGTTTGTAAAAGAGCAGCTGAAATTGCTGAAAAACACTATATGGC TAAGCATGGTTATGGATATGATGGAAAGACGGTTATTGAAGATGAAAATGAGGAGCAAATATACGATGATGAAGACAAGGATCTTATTGAAAGTA ACAAAGCCAAAGACGATAATGATGACGATGATGACAATGATGGGGTACAAACAGTTCACATCACGCACGTTATGAAAGCCTTAAACGAAACTTT AAATTCTCATGTAATTACGTTTATGACGCGACTTTCATTTACAGCAAAACTGTTTATTTATGCATTATTAAACTTGATGAAAAAGAACGGATCTCAA GAGCAAGAACTGGGCGATATTGTCGATGAAATCAAGTTACTTATTGAAGTAAATGGCAGTAATAAGTTTGTCATGGAGATAGCCAAAACATTGTT CCAACAGGGAAGTGATAATATTTCTGAACAATTGAGAATTATATCATGGGATTTCGTTCTCAATCAGTTACTTGACGCGGGAATATTGTTTAAACA AACTATGAAGAACGATAGAATATGTTGTGTCAAGCTAAATATATCAGTAGAAGAAGCCAAAAGAGCCATGAATGAGGATGAGACATTGAGAAATT TATAG
Codon-optimized Orc1-BAH (Δ48-188)	GGCGCGCCTATAAAACAATGAAGAGAAGATGGAAGAAGAACTTCATTGCTGTTTCTGCTGCTAACAGATTCAAGAAGATTTCTTCTTCTGGTG CTTTGGAAAACTTGTACTTCCAAGGTGAAATGGCTAAGACTTTGAAGGACTTGCAAGGTTGGGAAATTATTACTACTGACGAACAAGGTAACAT TATTGACGGTGGTCAAAAGAGATTGAGAAGAAGAGGTGCTAAGACTGAACACTACTTGAAGAGATCTTCTGACGGTATTGAAGACGTTAAGGC TTACATTAAGAAGGTTGAACCAAGAGAAGCTCAAGAATACTTGAAGGACTTGACTTTGCCATCTAAGAAGAAGGAAATTAAGAGAGGTCCACA AAAGAAGGACAAGGCTACTCAAACTGCTCAAATTTCTGACGCTGAAACTAGAGCTACTGACATTACTGACAACGAAGACGGTAACGAAGACGA ATCTTCTGACTACGAATCTCCATCTGACATTGACGTTTCTGAAGACATGGACTCTGGTGAAATTTCTGCTGACGAATTGGAAGAAGAAGAAGA CGAAGAAGAAGACGAAGACGAAGAAGAAAAGGAAGCTAGACACACTAACTCTCCAAGAAAGAGAGGTAGAAAGATTAAGTTGGGTAAGGAC GACATTGACGCTTCTGTTCAACCACCACCAAAGAAGAGAGGTAGAAAGCCAAAGGACCCATCTAAGCCAAGACAAATGTTGTTGATTTCTTCT TGTAGAGCTAACAACACTCCAGTTATTAGAAAGTTCACTAAGAAGAACGTTGCTAGAGCTAAGAAGAAGTACACTCCATTCTCTAAGAGATTCA AGTCTATTGCTGCTATTCCAGACTTGACTTCTTTGCCAGAATTCTACGGTAACTCTTCTGAATTGATGGCTTCTAGATTCGAAAACAAGTTGAAG ACTACTCAAAAGCACCAAATTGTTGAAACTATTTTCTCTAAGGTTAAGAAGCAATTGAACTCTTCTTACGTTAAGGAAGAAATTTTGAAGTCTGC TAACTTCCAAGACTACTTGCCAGCTAGAGAAAACGAATTCGCTTCTATTTACTTGTCTGCTTACTCTGCTATTGAATCTGACTCTGCTACTACTAT TTACGTTGCTGGTACTCCAGGTGTTGGTAAGACTTTGACTGTTAGAGAAGTTGTTAAGGAATTGTTGTCTTCTTCTGCTCAAAGAGAAATTCCA GACTTCTTGTACGTTGAAATTAACGGTTTGAAGATGGTTAAGCCAACTGACTGTTACGAAACTTTGTGGAACAAGGTTTCTGGTGAAAGATTGA CTTGGGCTGCTTCTATGGAATCTTTGGAATTCTACTTCAAGAGAGTTCCAAAGAACAAGAAGAAGACTATTGTTGTTTTGTTGGACGAATTGGA CGCTATGGTTACTAAGTCTCAAGACATTATGTACAACTTCTTCAACTGGACTACTTACGAAAACGCTAAGTTGATTGTTATTGCTGTTGCTAACA CTATGGACTTGCCAGAAAGACAATTGGGTAACAAGATTACTTCTAGAATTGGTTTCACTAGAATTATGTTCACTGGTTACACTCACGAAGAATTG AAGAACATTATTGACTTGAGATTGAAGGGTTTGAACGACTCTTTCTTCTACGTTGACACTAAGACTGGTAACGCTATTTTGATTGACGCTGCTG GTAACGACACTACTGTTAAGCAAACTTTGCCAGAAGACGTTAGAAAGGTTAGATTGAGAATGTCTGCTGACGCTATTGAAATTGCTTCTAGAAA GGTTGCTTCTGTTTCTGGTGACGCTAGAAGAGCTTTGAAGGTTTGTAAGAGAGCTGCTGAAATTGCTGAAAAGCACTACATGGCTAAGCACG GTTACGGTTACGACGGTAAGACTGTTATTGAAGACGAAAACGAAGAACAAATTTACGACGACGAAGACAAGGACTTGATTGAATCTAACAAGG CTAAGGACGACAACGACGACGACGACGACAACGACGGTGTTCAAACTGTTCACATTACTCACGTTATGAAGGCTTTGAACGAAACTTTGAAC TCTCACGTTATTACTTTCATGACTAGATTGTCTTTCACTGCTAAGTTGTTCATTTACGCTTTGTTGAACTTGATGAAGAAGAACGGTTCTCAAGA ACAAGAATTGGGTGACATTGTTGACGAAATTAAGTTGTTGATTGAAGTTAACGGTTCTAACAAGTTCGTTATGGAAATTGCTAAGACTTTGTTCC AACAAGGTTCTGACAACATTTCTGAACAATTGAGAATTATTTCTTGGGACTTCGTTTTGAACCAATTGTTGGACGCTGGTATTTTGTTCAAGCAA ACTATGAAGAACGACAGAATTTGTTGTGTTAAGTTGAACATTTCTGTTGAAGAAGCTAAGAGAGCTATGAACGAAGACGAAACTTTGAGAAACT TGTAAATTGAATTGAATTGAAATCGATAGATCAATTTTTTTCTTTTCTCTTTCCCCATCCTTTACGCTAAAATAATAGTTTATTTTATTTTTTGAATAT TTTTTATTTATATACGTATATATAGACTATTATTTATCTTTTAATGATTATTAAGATTTTTATTAAAAAAAAATTCGCTCCTCTTTTAATGCCTTTATGCC CCGGGCTGCAGGAATTCGATATCAAGCTTATCGATACCGTCGACCTCGAG
Codon-optimized Orc1-IDR (Δ236-345)	GGCGCGCCTATAAAACAATGAAGAGAAGATGGAAGAAGAACTTCATTGCTGTTTCTGCTGCTAACAGATTCAAGAAGATTTCTTCTTCTGGTG CTTTGGAAAACTTGTACTTCCAAGGTGAAATGGCTAAGACTTTGAAGGACTTGCAAGGTTGGGAAATTATTACTACTGACGAACAAGGTAACAT TATTGACGGTGGTCAAAAGAGATTGAGAAGAAGAGGTGCTAAGACTGAACACTACTTGAAGAGATCTTCTGACGGTATTAAGTTGGGTAGAGG TGACTCTGTTGTTATGCACAACGAAGCTGCTGGTACTTACTCTGTTTACATGATTCAAGAATTGAGATTGAACACTTTGAACAACGTTGTTGAAT TGTGGGCTTTGACTTACTTGAGATGGTTCGAAGTTAACCCATTGGCTCACTACAGACAATTCAACCCAGACGCTAACATTTTGAACAGACCATT GAACTACTACAACAAGTTGTTCTCTGAAACTGCTAACAAGAACGAATTGTACTTGACTGCTGAATTGGCTGAATTGCAATTGTTCAACTTCATTA GAGTTGCTAACGTTATGGACGGTTCTAAGTGGGAAGTTTTGAAGGGTAACGTTGACCCAGAAAGAGACTTCACTGTTAGATACATTTGTGAAC CAACTGGTGAAAAGTTCGTTGACATTAACATTGAAGACGTTAAGGCTTACATTAAGAAGGTTGAACCAAGAGAAGCTCAAGAATACTTGAAGG ACTTGACTTTGCCATCTAAGAAGAAGGAAATTAAGAGAGGTCCACAAAAGAAGGACAAGGCTACTCAAACTGCTCAAATTTCTTCTTGTAGAG CTAACAACACTCCAGTTATTAGAAAGTTCACTAAGAAGAACGTTGCTAGAGCTAAGAAGAAGTACACTCCATTCTCTAAGAGATTCAAGTCTATT GCTGCTATTCCAGACTTGACTTCTTTGCCAGAATTCTACGGTAACTCTTCTGAATTGATGGCTTCTAGATTCGAAAACAAGTTGAAGACTACTCA AAAGCACCAAATTGTTGAAACTATTTTCTCTAAGGTTAAGAAGCAATTGAACTCTTCTTACGTTAAGGAAGAAATTTTGAAGTCTGCTAACTTCC AAGACTACTTGCCAGCTAGAGAAAACGAATTCGCTTCTATTTACTTGTCTGCTTACTCTGCTATTGAATCTGACTCTGCTACTACTATTTACGTTG CTGGTACTCCAGGTGTTGGTAAGACTTTGACTGTTAGAGAAGTTGTTAAGGAATTGTTGTCTTCTTCTGCTCAAAGAGAAATTCCAGACTTCTT GTACGTTGAAATTAACGGTTTGAAGATGGTTAAGCCAACTGACTGTTACGAAACTTTGTGGAACAAGGTTTCTGGTGAAAGATTGACTTGGGC TGCTTCTATGGAATCTTTGGAATTCTACTTCAAGAGAGTTCCAAAGAACAAGAAGAAGACTATTGTTGTTTTGTTGGACGAATTGGACGCTATG GTTACTAAGTCTCAAGACATTATGTACAACTTCTTCAACTGGACTACTTACGAAAACGCTAAGTTGATTGTTATTGCTGTTGCTAACACTATGGA CTTGCCAGAAAGACAATTGGGTAACAAGATTACTTCTAGAATTGGTTTCACTAGAATTATGTTCACTGGTTACACTCACGAAGAATTGAAGAACA TTATTGACTTGAGATTGAAGGGTTTGAACGACTCTTTCTTCTACGTTGACACTAAGACTGGTAACGCTATTTTGATTGACGCTGCTGGTAACGA CACTACTGTTAAGCAAACTTTGCCAGAAGACGTTAGAAAGGTTAGATTGAGAATGTCTGCTGACGCTATTGAAATTGCTTCTAGAAAGGTTGCT TCTGTTTCTGGTGACGCTAGAAGAGCTTTGAAGGTTTGTAAGAGAGCTGCTGAAATTGCTGAAAAGCACTACATGGCTAAGCACGGTTACGGT TACGACGGTAAGACTGTTATTGAAGACGAAAACGAAGAACAAATTTACGACGACGAAGACAAGGACTTGATTGAATCTAACAAGGCTAAGGAC GACAACGACGACGACGACGACAACGACGGTGTTCAAACTGTTCACATTACTCACGTTATGAAGGCTTTGAACGAAACTTTGAACTCTCACGTT ATTACTTTCATGACTAGATTGTCTTTCACTGCTAAGTTGTTCATTTACGCTTTGTTGAACTTGATGAAGAAGAACGGTTCTCAAGAACAAGAATT GGGTGACATTGTTGACGAAATTAAGTTGTTGATTGAAGTTAACGGTTCTAACAAGTTCGTTATGGAAATTGCTAAGACTTTGTTCCAACAAGGTT CTGACAACATTTCTGAACAATTGAGAATTATTTCTTGGGACTTCGTTTTGAACCAATTGTTGGACGCTGGTATTTTGTTCAAGCAAACTATGAAG AACGACAGAATTTGTTGTGTTAAGTTGAACATTTCTGTTGAAGAAGCTAAGAGAGCTATGAACGAAGACGAAACTTTGAGAAACTTGTAAATTG AATTGAATTGAAATCGATAGATCAATTTTTTTCTTTTCTCTTTCCCCATCCTTTACGCTAAAATAATAGTTTATTTTATTTTTTGAATATTTTTTATTTA TATACGTATATATAGACTATTATTTATCTTTTAATGATTATTAAGATTTTTATTAAAAAAAAATTCGCTCCTCTTTTAATGCCTTTATGCCCCGGGCTG CAGGAATTCGATATCAAGCTTATCGATACCGTCGACCTCGAG

Construct	DNA sequence
Codon- optimized Orc1-Walker B (D569Y)	GCGCGCCTATAAAACAATGAAGAGAAGATGGAAGAAGAACTTCATTGCTGTTTCTGCTGCTAACAGATTCAAGAAGATTTCTTCTTCTGGTGCT TTGGAAAACTTGTACTTCCAAGGTGAAATGGCTAAGACTTTGAAGGACTTGCAAGGTTGGGAAATTATTACTACTGACGAACAAGGTAACATTA TTGACGGTGGTCAAAAGAGATTGAGAAGAAGAGGTGCTAAGACTGAACACTACTTGAAGAGATCTTCTGACGGTATTAAGTTGGGTAGAGGT GACTCTGTTGTTATGCACAACGAAGCTGCTGGTACTTACTCTGTTTACATGATTCAAGAATTGAGATTGAACACTTTGAACAACGTTGTTGAATT GTGGGCTTTGACTTACTTGAGATGGTTCGAAGTTAACCCATTGGCTCACTACAGACAATTCAACCCAGACGCTAACATTTTGAACAGACCATTG AACTACTACAACAAGTTGTTCTCTGAAACTGCTAACAAGAACGAATTGTACTTGACTGCTGAATTGGCTGAATTGCAATTGTTCAACTTCATTAG AGTTGCTAACGTTATGGACGGTTCTAAGTGGGAAGTTTTGAAGGGTAACGTTGACCCAGAAAGAGACTTCACTGTTAGATACATTTGTGAACC AACTGGTGAAAAGTTCGTTGACATTAACATTGAAGACGTTAAGGCTTACATTAAGAAGGTTGAACCAAGAGAAGCTCAAGAATACTTGAAGGA CTTGACTTTGCCATCTAAGAAGAAGGAAATTAAGAGAGGTCCACAAAAGAAGGACAAGGCTACTCAAACTGCTCAAATTTCTGACGCTGAAAC TAGAGCTACTGACATTACTGACAACGAAGACGGTAACGAAGACGAATCTTCTGACTACGAATCTCCATCTGACATTGACGTTTCTGAAGACATG GACTCTGGTGAAATTTCTGCTGACGAATTGGAAGAAGAAGAAGACGAAGAAGAAGACGAAGACGAAGAAGAAAAGGAAGCTAGACACACTAA CTCTCCAAGAAAGAGAGGTAGAAAGATTAAGTTGGGTAAGGACGACATTGACGCTTCTGTTCAACCACCACCAAAGAAGAGAGGTAGAAAGC CAAAGGACCCATCTAAGCCAAGACAAATGTTGTTGATTTCTTCTTGTAGAGCTAACAACACTCCAGTTATTAGAAAGTTCACTAAGAAGAACGT TGCTAGAGCTAAGAAGAAGTACACTCCATTCTCTAAGAGATTCAAGTCTATTGCTGCTATTCCAGACTTGACTTCTTTGCCAGAATTCTACGGTA ACTCTTCTGAATTGATGGCTTCTAGATTCGAAAACAAGTTGAAGACTACTCAAAAGCACCAAATTGTTGAAACTATTTTCTCTAAGGTTAAGAAG CAATTGAACTCTTCTTACGTTAAGGAAGAAATTTTGAAGTCTGCTAACTTCCAAGACTACTTGCCAGCTAGAGAAAACGAATTCGCTTCTATTTA CTTGTCTGCTTACTCTGCTATTGAATCTGACTCTGCTACTACTATTTACGTTGCTGGTACTCCAGGTGTTGGTAAGACTTTGACTGTTAGAGAAG TTGTTAAGGAATTGTTGTCTTCTTCTGCTCAAAGAGAAATTCCAGACTTCTTGTACGTTGAAATTAACGGTTTGAAGATGGTTAAGCCAACTGA CTGTTACGAAACTTTGTGGAACAAGGTTTCTGGTGAAAGATTGACTTGGGCTGCTTCTATGGAATCTTTGGAATTCTACTTCAAGAGAGTTCCA AAGAACAAGAAGAAGACTATTGTTGTTTTGTTGGACGAATTGTATGCTATGGTTACTAAGTCTCAAGACATTATGTACAACTTCTTCAACTGGAC TACTTACGAAAACGCTAAGTTGATTGTTATTGCTGTTGCTAACACTATGGACTTGCCAGAAAGACAATTGGGTAACAAGATTACTTCTAGAATTG GTTTCACTAGAATTATGTTCACTGGTTACACTCACGAAGAATTGAAGAACATTATTGACTTGAGATTGAAGGGTTTGAACGACTCTTTCTTCTAC GTTGACACTAAGACTGGTAACGCTATTTTGATTGACGCTGCTGGTAACGACACTACTGTTAAGCAAACTTTGCCAGAAGACGTTAGAAAGGTTA GATTGAGAATGTCTGCTGACGCTATTGAAATTGCTTCTAGAAAGGTTGCTTCTGTTTCTGGTGACGCTAGAAGAGCTTTGAAGGTTTGTAAGA GAGCTGCTGAAATTGCTGAAAAGCACTACATGGCTAAGCACGGTTACGGTTACGACGGTAAGACTGTTATTGAAGACGAAAACGAAGAACAAA TTTACGACGACGAAGACAAGGACTTGATTGAATCTAACAAGGCTAAGGACGACAACGACGACGACGACGACAACGACGGTGTTCAAACTGTT CACATTACTCACGTTATGAAGGCTTTGAACGAAACTTTGAACTCTCACGTTATTACTTTCATGACTAGATTGTCTTTCACTGCTAAGTTGTTCATT TACGCTTTGTTGAACTTGATGAAGAAGAACGGTTCTCAAGAACAAGAATTGGGTGACATTGTTGACGAAATTAAGTTGTTGATTGAAGTTAACG GTTCTAACAAGTTCGTTATGGAAATTGCTAAGACTTTGTTCCAACAAGGTTCTGACAACATTTCTGAACAATTGAGAATTATTTCTTGGGACTTC GTTTTGAACCAATTGTTGGACGCTGGTATTTTGTTCAAGCAAACTATGAAGAACGACAGAATTTGTTGTGTTAAGTTGAACATTTCTGTTGAAGA AGCTAAGAGAGCTATGAACGAAGACGAAACTTTGAGAAACTTGTAAATTGAATTGAATTGAAATCGATAGATCAATTTTTTTCTTTTCTCTTTCCC CATCCTTTACGCTAAAATAATAGTTTATTTTATTTTTTGAATATTTTTTATTTATATACGTATATATAGACTATTATTTATCTTTTAATGATTATTAAGATTT TTATTAAAAAAAAAATTCGCTCCTCTTTTAATGCCTTTATGCCTCGAG
Codon- optimized Orc1-BAH-IDR (Δ48-188, Δ236-345)	GGCGCGCCTATAAAACAATGAAGAGAAGATGGAAGAAGAACTTCATTGCTGTTTCTGCTGCTAACAGATTCAAGAAGATTTCTTCTTCTGGTG CTTTGGAAAACTTGTACTTCCAAGGTGAAATGGCTAAGACTTTGAAGGACTTGCAAGGTTGGGAAATTATTACTACTGACGAACAAGGTAACAT TATTGACGGTGGTCAAAAGAGATTGAGAAGAAGAGGTGCTAAGACTGAACACTACTTGAAGAGATCTTCTGACGGTATTGAAGACGTTAAGGC TTACATTAAGAAGGTTGAACCAAGAGAAGCTCAAGAATACTTGAAGGACTTGACTTTGCCATCTAAGAAGAAGGAAATTAAGAGAGGTCCACA AAAGAAGGACAAGGCTACTCAAACTGCTCAAATTTCTTCTTGTAGAGCTAACAACACTCCAGTTATTAGAAAGTTCACTAAGAAGAACGTTGCT AGAGCTAAGAAGAAGTACACTCCATTCTCTAAGAGATTCAAGTCTATTGCTGCTATTCCAGACTTGACTTCTTTGCCAGAATTCTACGGTAACTC TTCTGAATTGATGGCTTCTAGATTCGAAAACAAGTTGAAGACTACTCAAAAGCACCAAATTGTTGAAACTATTTTCTCTAAGGTTAAGAAGCAAT TGAACTCTTCTTACGTTAAGGAAGAAATTTTGAAGTCTGCTAACTTCCAAGACTACTTGCCAGCTAGAGAAAACGAATTCGCTTCTATTTACTTG TCTGCTTACTCTGCTATTGAATCTGACTCTGCTACTACTATTTACGTTGCTGGTACTCCAGGTGTTGGTAAGACTTTGACTGTTAGAGAAGTTGT TAAGGAATTGTTGTCTTCTTCTGCTCAAAGAGAAATTCCAGACTTCTTGTACGTTGAAATTAACGGTTTGAAGATGGTTAAGCCAACTGACTGTT ACGAAACTTTGTGGAACAAGGTTTCTGGTGAAAGATTGACTTGGGCTGCTTCTATGGAATCTTTGGAATTCTACTTCAAGAGAGTTCCAAAGA ACAAGAAGAAGACTATTGTTGTTTTGTTGGACGAATTGGACGCTATGGTTACTAAGTCTCAAGACATTATGTACAACTTCTTCAACTGGACTACT TACGAAAACGCTAAGTTGATTGTTATTGCTGTTGCTAACACTATGGACTTGCCAGAAAGACAATTGGGTAACAAGATTACTTCTAGAATTGGTTT CACTAGAATTATGTTCACTGGTTACACTCACGAAGAATTGAAGAACATTATTGACTTGAGATTGAAGGGTTTGAACGACTCTTTCTTCTACGTTG ACACTAAGACTGGTAACGCTATTTTGATTGACGCTGCTGGTAACGACACTACTGTTAAGCAAACTTTGCCAGAAGACGTTAGAAAGGTTAGATT GAGAATGTCTGCTGACGCTATTGAAATTGCTTCTAGAAAGGTTGCTTCTGTTTCTGGTGACGCTAGAAGAGCTTTGAAGGTTTGTAAGAGAGC TGCTGAAATTGCTGAAAAGCACTACATGGCTAAGCACGGTTACGGTTACGACGGTAAGACTGTTATTGAAGACGAAAACGAAGAACAAATTTA CGACGACGAAGACAAGGACTTGATTGAATCTAACAAGGCTAAGGACGACAACGACGACGACGACGACAACGACGGTGTTCAAACTGTTCAC ATTACTCACGTTATGAAGGCTTTGAACGAAACTTTGAACTCTCACGTTATTACTTTCATGACTAGATTGTCTTTCACTGCTAAGTTGTTCATTTAC GCTTTGTTGAACTTGATGAAGAAGAACGGTTCTCAAGAACAAGAATTGGGTGACATTGTTGACGAAATTAAGTTGTTGATTGAAGTTAACGGTT CTAACAAGTTCGTTATGGAAATTGCTAAGACTTTGTTCCAACAAGGTTCTGACAACATTTCTGAACAATTGAGAATTATTTCTTGGGACTTCGTT TTGAACCAATTGTTGGACGCTGGTATTTTGTTCAAGCAAACTATGAAGAACGACAGAATTTGTTGTGTTAAGTTGAACATTTCTGTTGAAGAAG CTAAGAGAGCTATGAACGAAGACGAAACTTTGAGAAACTTGTAAATTGAATTGAATTGAAATCGATAGATCAATTTTTTTCTTTTCTCTTTCCCCA TCCTTTACGCTAAAATAATAGTTTATTTTATTTTTTGAATATTTTTTATTTATATACGTATATATAGACTATTATTTATCTTTTAATGATTATTAAGATTTTT ATTAAAAAAAAAATTCGCTCCTCTTTTAATGCCTTTATGCCCCGGGCTGCAGGAATTCGATATCAAGCTTATCGATACCGTCGACCTCGAG