Supplementary Table 1. Transgenic strains used in this study. The strains are ordered as they appear in each figure and, where relevant, are also given a descriptive name.

Figure 1

Strain name	**Mutant background**	**Array name**	**DNA on array**
OH13575 **"PHB>AVA"**	*him-5 (e1490)*	*otIs612*	*MVC12 (flp-18p::nlg-1::gfp11) 15ng/ul, MVC6 (gpa-6p::nlg-1::gfp1- 10) 15ng/ul, MVC11 (flp-18p::mcherry) 10ng/ul, MVC15 (nlp- 1::mcherry) 10ng/ul, pRF4 50ng/ul*
OH14099 **"PHA>AVG"**	*him-5 (e1490)*	*otIs630*	*srg-13::BirA::nrx-1 25ng/ul, inx-18p::AP::nlg-1 25 ng/ul, inx-18p::wcherry 10ng/ul, unc-122::streptavidin::2xsfGFP 25 ng/ul, pRF4 50 ng/ul*
OH13577 **"PHB>AVG"**	*him-5 (e1490)*	*otIs614*	*inx-18p::nlg-1::gfp11 30ng/ul, MVC6 (gpa-6p::nlg-1::gfp1-10) 30ng/ul, MVC15 (nlp-1::mcherry) 5ng/ul, inx-18p::wcherry 10ng/ul, pRF4 50ng/ul*
OH13691 "**AVG>DA9"**	*him-5 (e1490)*	*otEx6342*	*inx-18p::nlg-1::gfp1-10 30ng/ul, pEVL194 (acr-2::nlg-1::gfp11) 30ng/ul, inx-18p::wCherry 15 ng/ul; pRF4 50ng/ul*

Figure 2

OH15339	*tax-4 (p678); him-5 (e1490)*		
CB4088	*him-5 (e1490)*		

Figure 3

OH13575 **"PHB>AVA"**	*him-5 (e1490)*	*otIs612*	*MVC12 (flp-18p::nlg-1::gfp11) 15ng/ul, MVC6*

			(gpa-6p::nlg-1::gfp1- 10) 15ng/ul, MVC11 (flp-18p::mcherry) 10ng/ul, MVC15 (nlp- 1::mcherry) 10ng/ul, pRF4 50ng/ul
OH14099 **"PHA>AVG"**	*him-5 (e1490)*	*otIs630*	*srg-13::BirA::nrx-1 25ng/ul, inx-18p::AP::nlg-1 25 ng/ul, inx-18p::wcherry 10ng/ul, unc-122::streptavidin::2xsfGFP 25 ng/ul, pRF4 50 ng/ul*
OH15576	*mod-5 (n3314); him-5 (e1490)*	*otIs612*	*MVC12 (flp-18p::nlg-1::gfp11) 15ng/ul, MVC6 (gpa-6p::nlg-1::gfp1- 10) 15ng/ul, MVC11 (flp-18p::mcherry) 10ng/ul, MVC15 (nlp- 1::mcherry) 10ng/ul, pRF4 50ng/ul*
OH15577	*mod-5 (n3314); him-5 (e1490)*	*otIs630*	*srg-13::BirA::nrx-1 25ng/ul, inx-18p::AP::nlg-1 25 ng/ul, inx-18p::wcherry 10ng/ul, unc-122::streptavidin::2xsfGFP 25 ng/ul, pRF4 50 ng/ul*
OH15400	*him-5 (e1490)*	*nIs107*	*tbh-1::gfp*
OH15401	*him-8 (e1489)*	*otIs517*[a]	*tph-1::SL2::YFP::H2B fosmid, ttx-3::mCherry*
OH15334 **"PHB>AVA ADF^{p}::tph-1 line 1"**	*otIs612; him-5 (e1490)*	*otEx7142*	*pKA805 [psrh-142::tph-1::GFP]*[b]*, ttx-3::GFP*
OH15212 **"PHB>AVA ADF^{p}::tph-1 line 2"**	*otIs612; him-5 (e1490)*	*otEx7063*	*pKA805 [psrh-142::tph-1::GFP]*[b]*, ttx-3::GFP*
OH15342 **"PHB>AVA NSM^{p}::tph-1**	*otIs612; him-5 (e1490)*	*otEx7147*	*pKA807 [pceh-2::tph-1::GFP]*[b]*, ttx-3::GFP*

line 1"			
OH15294 **"PHB>AVA NSM^{p}::tph-1 line 2"**	*otIs612; him-5 (e1490)*	*otEx7123*	*pKA807 [pceh-2::tph-1::GFP]*[b]*, ttx-3::GFP*
OH15343 **"PHA>AVG ADF^{p}::tph-1 line 1"**	*otIs630; him-5 (e1490)*	*otEx7148*	*pKA805 [psrh-142::tph-1::GFP]*[b]*, ttx-3::GFP*
OH15295 **"PHA>AVG ADF^{p}::tph-1 line 2"**	*otIs630; him-5 (e1490)*	*otEx7124*	*pKA805 [psrh-142::tph-1::GFP]*[b]*, ttx-3::GFP*
OH15344 **"PHA>AVG NSM^{p}::tph-1 line 1"**	*otIs630; him-5 (e1490)*	*otEx7149*	*pKA807 [pceh-2::tph-1::GFP]*[b]*, ttx-3::GFP*
OH15345 **"PHA>AVG NSM^{p}::tph-1 line 2"**	*otIs630; him-5 (e1490)*	*otEx7150*	*pKA807 [pceh-2::tph-1::GFP]*[b]*, ttx-3::GFP*
OH15041 **"*lim-4* PHB>AVA"**	*lim-4 (ky403); him-5 (e1490)*	*otIs612*	*MVC12 (flp-18p::nlg-1::gfp11) 15ng/ul, MVC6 (gpa-6p::nlg-1::gfp1- 10) 15ng/ul, MVC11 (flp-18p::mcherry) 10ng/ul, MVC15 (nlp- 1::mcherry) 10ng/ul, pRF4 50ng/ul*
OH15208 **"*lim-4* PHA>AVG"**	*lim-4 (ky403); him-5 (e1490)*	*otEx6347*[c]	*srg-13::BirA::nrx-1 25ng/ul, inx-18p::AP::nlg-1 25 ng/ul, inx-18p::wcherry 10ng/ul, unc-122::streptavidin::2xsfGFP 25 ng/ul, pRF4 50 ng/ul*

[a]*otIs517* is a *tph-1* transcriptional fosmid reporter, containing ~36kb of the genomic locus surrounding *tph-1* (presumed to contain all regulatory information) and with *tph-1* uniquely tagged with YFP.
[b]pKA805 and pKA807 were gifts from Kaveh Ashrafi.
[c]The extrachromosomal array for labeling PHA>AVG connectivity was used here due to genetic linkage between *lim-4* and *otIs630*.

Figure 4

OH14916 **"*ser-1* PHB>AVA"**	*ser-1 (ok345); him-5 (e1490)*	*otIs612*	*MVC12 (flp-18p::nlg-1::gfp11) 15ng/ul, MVC6 (gpa-6p::nlg-1::gfp1- 10) 15ng/ul, MVC11 (flp-18p::mcherry) 10ng/ul, MVC15 (nlp- 1::mcherry) 10ng/ul, pRF4 50ng/ul*
OH14907 **"*ser-4* PHB>AVA"**	*ser-4 (ok512); him-5 (e1490)*	*otIs612*	*MVC12 (flp-18p::nlg-1::gfp11) 15ng/ul, MVC6 (gpa-6p::nlg-1::gfp1- 10) 15ng/ul, MVC11 (flp-18p::mcherry) 10ng/ul, MVC15 (nlp- 1::mcherry) 10ng/ul, pRF4 50ng/ul*
OH14906 **"*ser-5* PHB>AVA"**	*ser-5 (ok3087); him-5 (e1490)*	*otIs612*	*MVC12 (flp-18p::nlg-1::gfp11) 15ng/ul, MVC6 (gpa-6p::nlg-1::gfp1- 10) 15ng/ul, MVC11 (flp-18p::mcherry) 10ng/ul, MVC15 (nlp- 1::mcherry) 10ng/ul, pRF4 50ng/ul*
OH14907 **"*ser-7* PHB>AVA"**	*ser-7(tm1325); him-5 (e1490)*	*otIs612*	*MVC12 (flp-18p::nlg-1::gfp11) 15ng/ul, MVC6 (gpa-6p::nlg-1::gfp1- 10) 15ng/ul, MVC11 (flp-18p::mcherry) 10ng/ul, MVC15 (nlp- 1::mcherry) 10ng/ul, pRF4 50ng/ul*
OH15578 **"*mod-1* PHB>AVA"**	*mod-1 (ok103); him-5 (e1490)*	*otIs612*	*MVC12 (flp-18p::nlg-1::gfp11) 15ng/ul, MVC6 (gpa-6p::nlg-1::gfp1- 10) 15ng/ul, MVC11 (flp-18p::mcherry) 10ng/ul, MVC15 (nlp- 1::mcherry) 10ng/ul, pRF4 50ng/ul*
OH14894 **"*ser-4* PHA>AVG"**	*ser-4 (ok512); him-5 (e1490)*	*otIs630*	*srg-13::BirA::nrx-1 25ng/ul, inx-18p::AP::nlg-1 25 ng/ul, inx-18p::wcherry 10ng/ul, unc-122::streptavidin::2xsfGFP 25 ng/ul, pRF4 50 ng/ul*
OH14983 **"*ser-5* PHA>AVG"**	*ser-5 (ok3087); him-5 (e1490)*	*otIs630*	*srg-13::BirA::nrx-1 25ng/ul, inx-18p::AP::nlg-1 25 ng/ul, inx-18p::wcherry 10ng/ul,*

			unc-122::streptavidin::2xsfGFP 25 ng/ul, pRF4 50 ng/ul
OH15289 **"PHB^{p}::ser-4 PHB>AVA"**	*ser-4 (ok512); otIs612; him-5 (e1490)*	*otEx7120*	*gpa-6p::ser-4::SL2::tagRFP, ttx-3::GFP*
OH15346 **"PHB^{p}::ser-4 PHB>AVA"**	*ser-4 (ok512); otIs612; him-5 (e1490)*	*otEx7151*	*gpa-6p::ser-4::SL2::tagRFP, ttx-3::GFP*
OH15162 **"AVA^{p}::ser-4 PHB>AVA"**	*ser-4 (ok512); otIs612; him-5 (e1490)*	*otEx7043*	*flp-18p::ser-4::SL2::tagRFP, ttx-3::GFP*
OH15279 **"AVA^{p}::ser-4 PHB>AVA"**	*ser-4 (ok512); otIs612; him-5 (e1490)*	*otEx7110*	*flp-18p::ser-4::SL2::tagRFP, ttx-3::GFP*
OH15228 **"PHA^{p}::ser-4 PHA>AVG"**	*ser-4 (ok512); otIs630; him-5 (e1490)*	*otEx7077*	*srg-13p::ser-4::SL2::tagRFP, ttx-3::GFP*
OH15229 **"PHA^{p}::ser-4 PHA>AVG"**	*ser-4 (ok512); otIs630; him-5 (e1490)*	*otEx7078*	*srg-13p::ser-4::SL2::tagRFP, ttx-3::GFP*
OH15348 **"AVG^{p}::ser-4 PHA>AVG"**	*ser-4 (ok512); otIs630; him-5 (e1490)*	*otEx7152*	*inx-18p::SER-4::SL2::tagRFP, ttx-3::GFP*
OH15161 **"AVG^{p}::ser-4 PHA>AVG"**	*ser-4 (ok512); otIs630; him-5 (e1490)*	*otEx7042*	*inx-18p::SER-4::SL2::tagRFP, ttx-3::GFP*
OH15349 **"PHB^{p}::ser-4 PHA>AVG"**	*ser-4 (ok512); otIs630; him-5 (e1490)*	*otEx7153*	*gpa-6p::ser-4::SL2::tagRFP, ttx-3::GFP*
OH15350 **"PHB^{p}::ser-4 PHA>AVG"**	*ser-4 (ok512); otIs630; him-5 (e1490)*	*otEx7154*	*gpa-6p::ser-4::SL2::tagRFP, ttx-3::GFP*
OH15351 **"osm-6::gfp"**	*him-8 (e1489)*	*oyIs59*	*osm-6::gfp*

Extended Data Figures:
All strains used in extended data figures have been detailed in main text figures. In brief:
Extended Data Fig. 1: OH13575 *otIs612; him-5 (e1490)*, OH14099 *otIs630; him-5 (e1490)*, OH13577 *otIs614; him-5 (e1490)*, OH13691 *otEx6342; him-5 (e1490)*

Extended Data Fig. 2: OH15339 *tax-4 (p678); him-5 (e1490),* CB4088 *him-5 (e1490)*

Extended Data Fig. 3: OH13575 *otIs612; him-5 (e1490)*, OH14099 *otIs630; him-5 (e1490),* OH15576 *mod-5 (n3314); otIs612; him-5 (e1490)*, OH15577 *mod-5 (n3314);*

otIs630; him-5 (e1490), OH15582 *cat-2 (e1112); otIs612; him-5 (e1490)*, OH15583 *cat-2 (e1112); otIs630; him-5 (e1490)*

Extended Data Fig. 4: OH15400 *nIs107; him-5 (e1490),* OH15401 *otIs517; him-8 (e1489)*

Extended Data Fig. 5: OH15400 *nIs107; him-5 (e1490),* OH15584 *tbh-1 (n3247); otIs517; him-8 (e1489),* OH15585 *ser-6 (tm2146); otIs517; him-8 (e1489)*

Extended Data Fig. 6: OH13575 *otIs612; him-5 (e1490)*, OH14099 *otIs630; him-5 (e1490),* OH14979 *tph-1 (n4622); otIs612; him-5 (e1490),* OH15083 *ttx-3 (ot22); unc-86 (n846); otIs612; him-5 (e1490)*

Extended Data Fig. 7: OH13575 *otIs612; him-5 (e1490)*, OH14099 *otIs630; him-5 (e1490),* OH14907 *ser-4 (ok512); otIs612; him-5 (e1490),* OH14894 *ser-4 (ok512); otIs630; him-5 (e1490),* OH15289 *otEx7120 ser-4 (ok512); otIs612; him-5 (e1490),* OH15228 *otEx7077; ser-4 (ok512); otIs630; him-5 (e1490),* OH15349 *otEx7153; ser-4 (ok512); otIs630; him-5 (e1490)*

Extended Data Fig. 8: OH14907 *ser-4 (ok512); otIs612; him-5 (e1490),* OH14894 *ser-4 (ok512); otIs630; him-5 (e1490)*, OH15250 *ser-4 (ok512); otIs517; him-8 (e1489)*