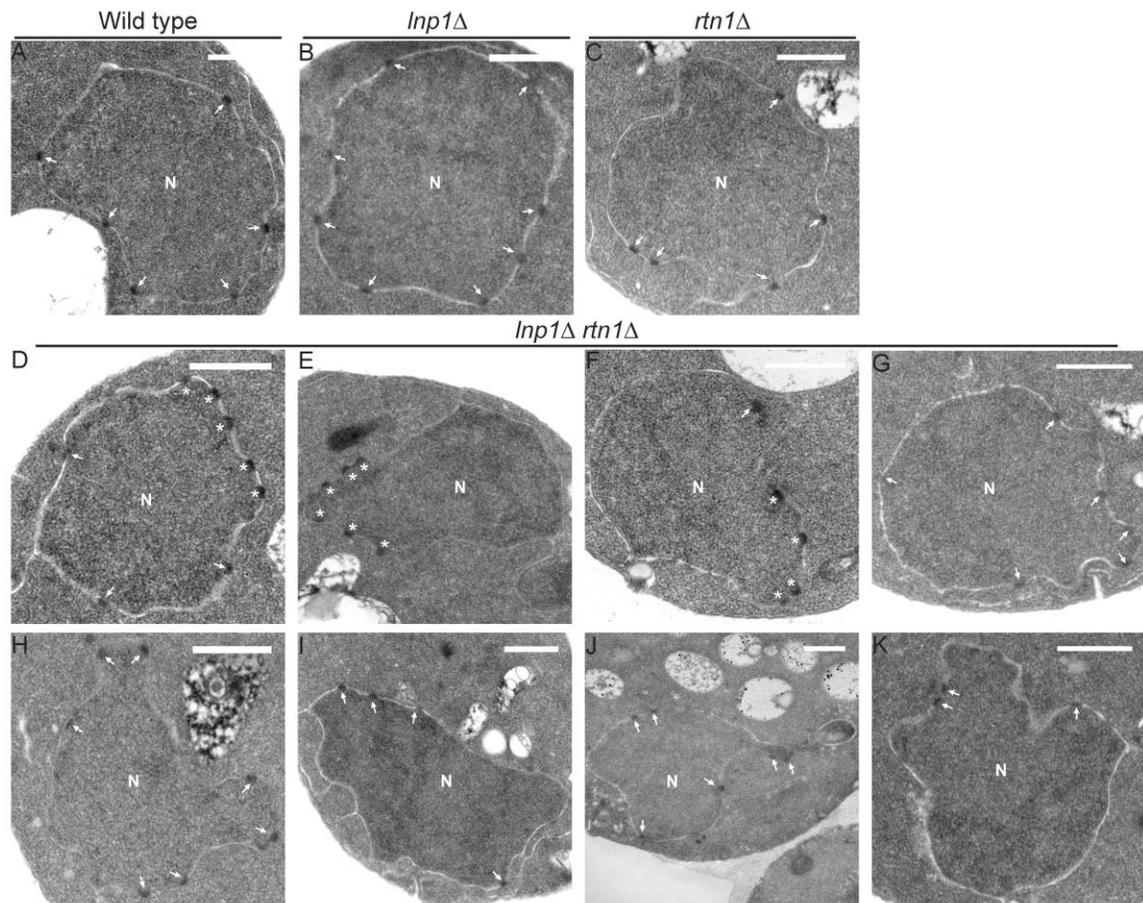


Supplemental Materials

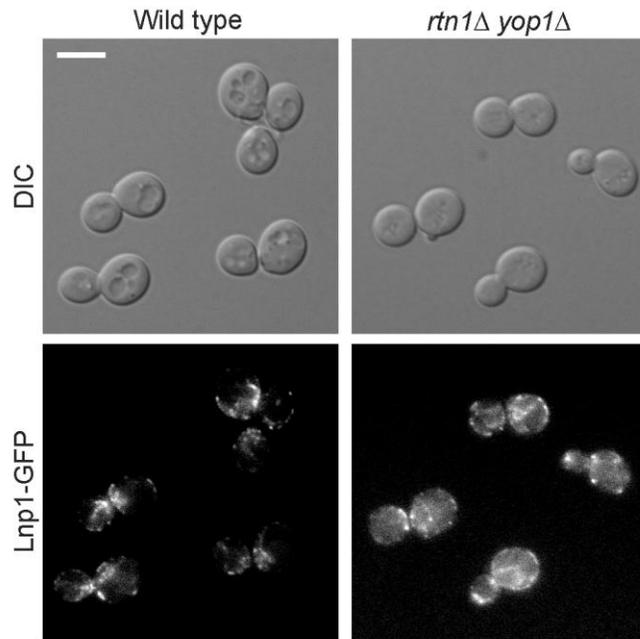
Molecular Biology of the Cell

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Supplemental Figure 1. Parental (A), *lnp1Δ*(B), *rtn1Δ*(C), or *lnp1Δ rtn1Δ* (D-K) cells were grown to early log phase at 23°C and processed for TEM. Scale bar, 500 nm. N marks the nucleus. Arrows point to NPCs. Asterisks indicate NPCs in regions of NPC clusters.



Supplemental Figure 2. Parental and *rtn1Δyop1Δ* cells expressing Lnp1-GFP were grown to early log phase at 25°C and were visualized by fluorescence microscopy. Scale bar, 5 μm.



Supplemental Figure 3. Mutants were grown to early log phase at 25°C and five-fold serially diluted onto YPD plates at the indicated temperatures.

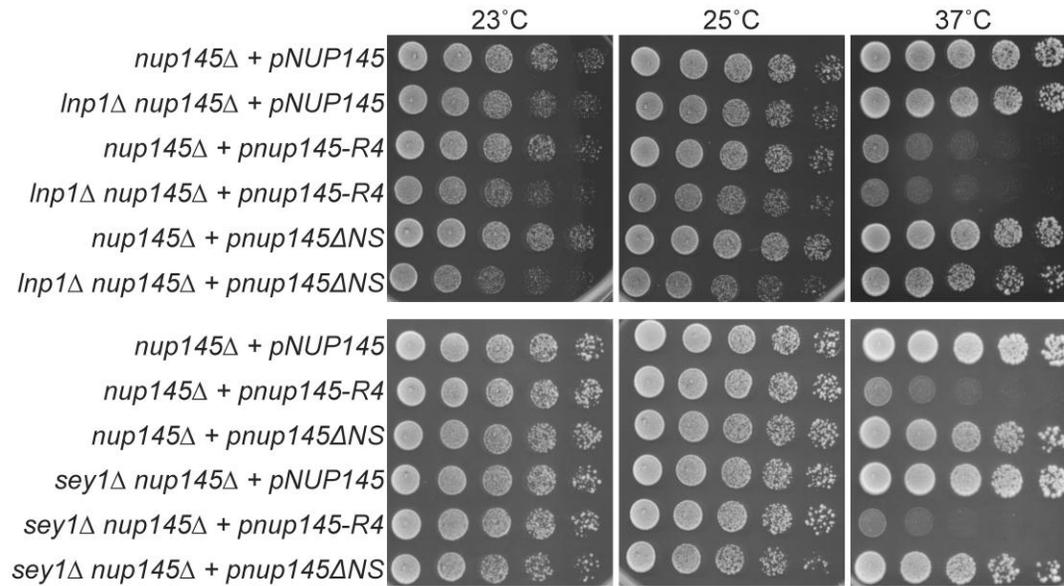


Table S1 Yeast strains used in this study.

Strain	Genotype	Source
BY4741	<i>MATa his3Δ1 leu2Δ0 LYS2 met15Δ0 ura3Δ0</i>	(Mortimer and Johnston, 1986)
BY4742	<i>MATa his3Δ1 leu2Δ0 lys2Δ0 MET15 ura3Δ0</i>	(Mortimer and Johnston, 1986)
Nic96-GFP	<i>MATa NIC96-GFP:HIS3 his3Δ1 leu2Δ0 met15Δ0 ura3Δ0</i>	(Huh <i>et al.</i> , 2003)
Sec61-GFP	<i>MATa SEC61-GFP:HIS3 his3Δ1 leu2Δ0 met15Δ0 ura3Δ0</i>	(Huh <i>et al.</i> , 2003)
Lnp1-GFP	<i>MATa LNP1-GFP:HIS3 his3Δ1 leu2Δ0 met15Δ0 ura3Δ0</i>	(Huh <i>et al.</i> , 2003)
Rtn1-GFP	<i>MATa RTN1-GFP:HIS3 his3Δ1 leu2Δ0 met15Δ0 ura3Δ0</i>	(Huh <i>et al.</i> , 2003)
NMY32	<i>his3 200 trp1-901 leu2-3,112 ade2 LYS2::(lexAop)4-HIS3 URA3::(lexAop)8-lacZ ade2::(lexAop)8-ADE2 GAL4</i>	Dualsystems Biotech
LGY101	<i>MATα ura3-52 his3Δ200 leu2Δ1 rat7-1(ts)</i>	(Gorsch <i>et al.</i> , 1995)
<i>lnp1Δ</i>	<i>MATa lnp1::KanR his3Δ1 leu2Δ0 met15Δ0 ura3Δ0</i>	(Winzeler <i>et al.</i> , 1999)
<i>nup53Δ</i>	<i>MATa nup53::KanR his3Δ1 leu2Δ0 met15Δ0 ura3Δ0</i>	(Winzeler <i>et al.</i> , 1999)
<i>nup59Δ</i>	<i>MATa nup59::KanR his3Δ1 leu2Δ0 met15Δ0 ura3Δ0</i>	(Winzeler <i>et al.</i> , 1999)
<i>nup84Δ</i>	<i>MATa nup84::KanR his3Δ1 leu2Δ0 met15Δ0 ura3Δ0</i>	(Winzeler <i>et al.</i> , 1999)
<i>nup85Δ</i>	<i>MATa nup85::KanR his3Δ1 leu2Δ0 met15Δ0 ura3Δ0</i>	(Winzeler <i>et al.</i> , 1999)
<i>nup100Δ</i>	<i>MATa nup100::KanR his3Δ1 leu2Δ0 met15Δ0 ura3Δ0</i>	(Winzeler <i>et al.</i> , 1999)
<i>nup133Δ</i>	<i>MATa nup133::KanR his3Δ1 leu2Δ0 met15Δ0 ura3Δ0</i>	(Winzeler <i>et al.</i> , 1999)
<i>nup120Δ</i>	<i>MATa nup120::KanR his3Δ1 leu2Δ0 met15Δ0 ura3Δ0</i>	(Winzeler <i>et al.</i> , 1999)
<i>pom152Δ</i>	<i>MATa per152::KanR his3Δ1 leu2Δ0 met15Δ0 ura3Δ0</i>	(Winzeler <i>et al.</i> , 1999)
<i>pom34Δ</i>	<i>MATa per34::KanR his3Δ1 leu2Δ0 met15Δ0 ura3Δ0</i>	(Winzeler <i>et al.</i> , 1999)
<i>pom33Δ</i>	<i>MATa pom33::KanR his3Δ1 leu2Δ0 met15Δ0 ura3Δ0</i>	(Winzeler <i>et al.</i> , 1999)
<i>per33Δ</i>	<i>MATa per33::KanR his3Δ1 leu2Δ0 met15Δ0 ura3Δ0</i>	(Winzeler <i>et al.</i> , 1999)

<i>rtn1Δ</i>	<i>MATα rtn1::KanRhis3Δ1leu2Δ0met15Δ0ura3Δ0</i>	(Winzeler <i>et al.</i> , 1999)
<i>sey1Δ</i>	<i>MATα sey1::KanRhis3Δ1leu2Δ0met15Δ0ura3Δ0</i>	(Winzeler <i>et al.</i> , 1999)
Swy4047	<i>MATα Nup133::KanR RTN1-GFP:HIS3his3Δ1leu2Δ0lys2Δ0ura3Δ0</i>	This Study
Swy4798	<i>MATα Nup133::KanR SEY1-GFP:HIS3his3Δ1leu2Δ0met15Δ0ura3Δ0</i>	This Study
Swy4802	<i>MATα rtn1::KanR sey1::KanRhis3Δ1leu2Δ0ura3Δ0</i>	This Study
Swy5285	<i>MATα nup145::KanR his3Δ1 leu2Δ0 lys2Δ0 ura3Δ0 pNup145:URA</i>	This Study
Swy5390	<i>MATα Inp1::KanR NIC96-GFP:HIS3his3Δ1leu2Δ0ura3Δ0</i>	This Study
Swy5432	<i>MATα nup133::KanR LNP1-GFP:HIS3his3Δ1leu2Δ0ura3Δ0</i>	This Study
Swy5433	<i>MATα rtn1::KanR yop1::KanR LNP1-GFP:HIS3his3Δ1leu2Δ0ura3Δ0</i>	This Study
Swy5459	<i>MATα Inp1::KanR rtn1::KanRhis3Δ1leu2Δ0met15Δ05ura3Δ0</i>	This Study
Swy5462	<i>MATα Inp1::KanR rtn1::KanR NIC96-GFP:HIS3his3Δ1leu2Δ0lys2Δ0ura3Δ0</i>	This Study
Swy5463	<i>MATα Inp1::KanR rtn1::KanR NIC96-GFP:HIS3his3Δ1leu2Δ0met15Δ0ura3Δ0</i>	This Study
Swy5464	<i>MATα Inp1::KanR sey1::KanR NIC96-GFP:HIS3 his3Δ1 leu2Δ0 ura3Δ0</i>	This Study
Swy5465	<i>MATα Inp1::KanR sey1::KanR NIC96-GFP:HIS3 his3Δ1 leu2Δ0 ura3Δ0</i>	This Study
Swy5485	<i>MATα Inp1::KanR pom152::HIS3 his3Δ1leu2Δ0lys2Δ0ura3Δ0</i>	This Study
Swy5486	<i>MATα Inp1::KanR rtn1::KanRhis3Δ1leu2Δ0lys2Δ0ura3Δ0</i>	This Study
Swy5488	<i>MATα Inp1::KanR pom34::his3Δ1leu2Δ0lys2Δ0ura3Δ0</i>	This Study
Swy5489	<i>MATα Inp1::KanR pom34::HIS3 pom152::HIS3 his3Δ1leu2Δ0lys2Δ0ura3Δ0</i>	This Study
Swy5534	<i>MATα rtn1::KanR NIC96-GFP:HIS3his3Δ1leu2Δ0met15Δ0ura3Δ0</i>	This Study
Swy5535	<i>MATα rtn1::KanR NIC96-GFP:HIS3his3Δ1leu2Δ0lys2Δ0ura3Δ0</i>	This Study
Swy5563	<i>MATα Inp1::KanR rtn1::KanR sey1::KanR NIC96-GFP:HIS3his3Δ1leu2Δ0lys2Δ0ura3Δ0</i>	This Study
Swy5564	<i>MATα Inp1::KanR rtn1::KanR sey1::KanR NIC96-GFP:HIS3his3Δ1leu2Δ0lys2Δ0ura3Δ0</i>	This Study
Swy5589	<i>MATα Inp1::loxP-spHIS5rtn1::KanRhis3Δ1leu2Δ0lys2Δ0met15Δ0ura3Δ0</i>	This Study
Swy5847	<i>MATα ura3-52 his3Δ200 leu2Δ1 rat7-1(ts) LNP1-GFP:HIS</i>	This Study
Swy5869	<i>MATα Inp1::KanR nup133::KanRhis3Δ1leu2Δ0met15Δ0ura3Δ0</i>	This Study

Swy5918	<i>MATα Inp1::KanR nup59::KanRhis3Δ1leu2Δ0met15Δ0ura3Δ0</i>	This Study
Swy5919	<i>MATα Inp1::KanR nup59::KanRhis3Δ1leu2Δ0met15Δ0ura3Δ0</i>	This Study
Swy5926	<i>MATα Inp1::KanRnup145::KanR his3Δ1 leu2Δ0 lys2Δ0 ura3Δ0 pNup145:URA</i>	This Study
Swy5931	<i>MATα nup120::KanR LNP1- GFP:HIS3his3Δ1leu2Δ0met15Δ0ura3Δ0</i>	This Study
Swy5932	<i>MATα Inp1::KanR nup120::KanRhis3Δ1leu2Δ0met15Δ0ura3Δ0</i>	This Study
Swy5957	<i>MATα Inp1::KanR nup53::KanR nup59::KanRhis3Δ1leu2Δ0met15Δ0ura3Δ0</i>	This Study
Swy5974	<i>MATα Inp1::KanRnup85::KanR his3Δ1 leu2Δ0 lys2Δ0ura3Δ0 pNup145:URA</i>	This Study
Swy5976	<i>MATα nup53::KanR nup59::KanRhis3Δ1leu2Δ0lys2Δ0ura3Δ0</i>	This Study
Swy5984	<i>MATα Inp1::KanR nup100::KanRhis3Δ1leu2Δ0met15Δ0ura3Δ0</i>	This Study
Swy5991	<i>MATα rtn1::KanR sey1::KanR NIC96- GFP:HIS3his3Δ1leu2Δ0met15Δ0ura3Δ0</i>	This Study
Swy5992	<i>MATα rtn1::KanR sey1::KanR NIC96- GFP:HIS3his3Δ1leu2Δ0met15Δ0lys2Δ0ura3Δ0</i>	This Study
Swy5993	<i>MATα Inp1::KanRnup84::KanR his3Δ1 leu2Δ0 met15Δ0 ura3Δ0 pNup145:URA</i>	This Study
Swy6015	<i>MATα Inp1::KanRura3-52 his3Δ200 leu2Δ1 rat7-1(ts)</i>	This Study
Swy6017	<i>MATα nup85::KanR sey1::KanR his3Δ1 leu2Δ0 met15Δ0ura3Δ0</i>	This Study
Swy6034	<i>MATα sey1::KanR NIC96- GFP:HIS3his3Δ1leu2Δ0lys2Δ0met15Δ0ura3Δ0</i>	This Study
Swy6046	<i>MATα rtn1::KanR sey1::KanR SEC61-GFP:HIS3his3Δ1leu2Δ0 ura3Δ0</i>	This Study
Swy6047	<i>MATα Inp1::KanR SEC61- GFP:HIS3his3Δ1leu2Δ0lys2Δ0ura3Δ0</i>	This Study
Swy6048	<i>MATα sey1::KanR SEC61-GFP:HIS3his3Δ1leu2Δ0ura3Δ0</i>	This Study
Swy6049	<i>MATα Inp1::KanR sey1::KanR SEC61- GFP:HIS3his3Δ1leu2Δ0ura3Δ0</i>	This Study
Swy6050	<i>MATα Inp1::KanR rtn1::KanR SEC61- GFP:HIS3his3Δ1leu2Δ0lys2Δ0ura3Δ0</i>	This Study
Swy6095	<i>MATα Inp1::KanR rtn1::KanR sey1::KanR SEC61- GFP:HIS3his3Δ1leu2Δ0ura3Δ0</i>	This Study
Swy6104	<i>MATα rtn1::KanR SEC61-GFP:HIS3his3Δ1leu2Δ0lys2Δ0 ura3Δ0</i>	This Study

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Table S2 Plasmids used in this study

Plasmid	Description	Resource
pMal-Cri	MBP expression vector	New England Biosciences
pRS315	<i>CEN/LEU2</i>	(Sikorski and Hieter, 1989)
pRS316	<i>CEN/URA3</i>	(Sikorski and Hieter, 1989)
pRS425	<i>2u/LEU2</i>	(Christianson <i>et al.</i> , 1992)
pRS315.NDC1	<i>NDC1/CEN/LEU2</i>	(Chial <i>et al.</i> , 1998)
pSJ1287	<i>pBT3-STE-Ndc1</i>	(Casey <i>et al.</i> , 2012)
pSJ1469	<i>pR3N-Yop1</i>	(Casey <i>et al.</i> , 2012)
Psw300	<i>CEN/HIS3/NUP145-R4</i>	(Emtage <i>et al.</i> , 1997)
Psw388	<i>CEN/HIS3/Nup145ΔNS</i>	(Emtage <i>et al.</i> , 1997)
Psw3190	<i>CEN/LEU2/POM34-MYC-SUC2-MYC</i>	This Study
Psw3192	<i>CEN/LEU2/POM152-MYC-SUC2-MYC</i>	This Study
Psw3420	<i>CEN/LEU2/RTN1-GFP</i>	(Dawson <i>et al.</i> , 2009)
Psw3421	<i>CEN/LEU2/rtn1-K48I-GFP</i>	(Dawson <i>et al.</i> , 2009)
Psw3905	<i>CEN/LEU2/LNP1</i>	This Study
Psw3906	<i>2u/LEU2/LNP1</i>	This Study
Psw3975	<i>MBP-LNP1cterm</i>	This Study
Psw4000	<i>CEN/LEU2/LNP1-MYC-SUC2-MYC</i>	This Study
Psw4001	<i>pR3N-RTN1</i>	This Study
Psw4028	<i>2u/LEU2/RTN1</i>	This Study
Psw4029	<i>2u/LEU2/LNP1-GFP</i>	This Study
Psw4031	<i>2u/LEU2/rtn1-K48I</i>	This Study
Psw4032	<i>2u/LEU2/LNP1Dzfn-GFP</i>	This Study
Psw4071	<i>MBP-LNP1ctermDzfn</i>	This Study
Psw4086	<i>CEN/LEU2/LNP1Dzfn</i>	This Study
Psw4087	<i>2u/LEU2/LNP1Dzfn</i>	This Study

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