Cortés et al., http://www.jcb.org/cgi/content/full/jcb.201202015/DC1

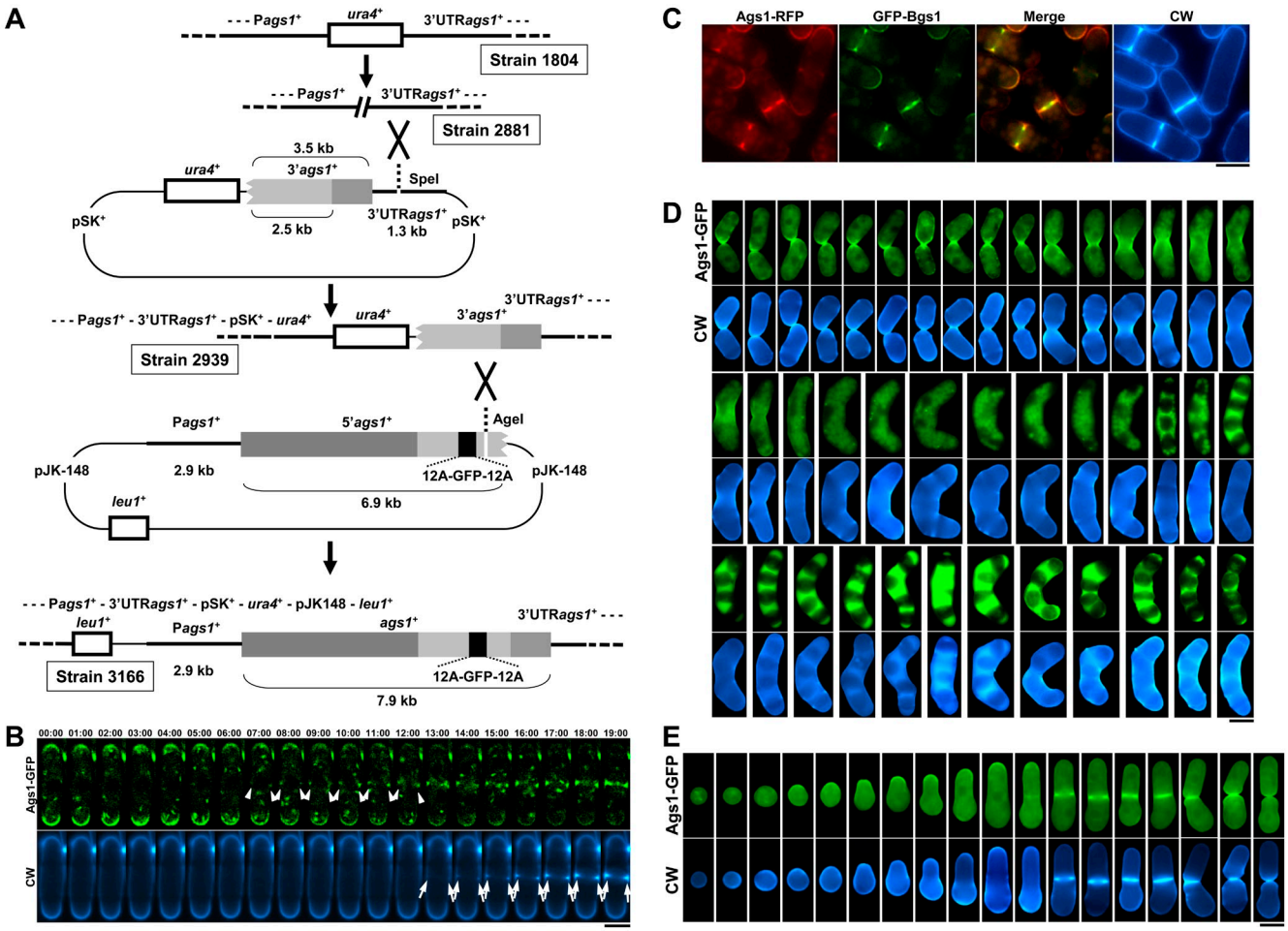


Figure S1. **Like Bgs1, Ags1 localizes to all sites of wall synthesis during both the vegetative and sexual phases of the life cycle.** (A) Scheme showing the sequential steps followed to obtain *ags1*Δ strains containing an integrated *ags1*$^+$*-GFP* copy (see Materials and methods). The *ags1*$^+$ *5′* and 3′ fragments are shown as gray boxes, in which the 2.5-kb overlapping region is shown as a light gray box. The 0.7-kb 12A-*GFP*-12A fragment, shown as a black box, can be inserted into any site of *ags1*$^+$ *5′* sequence, before the AgeI linearization site. (B) Ags1 localizes like Bgs1 in the contractile ring very early in cytokinesis, before the septum is detected by Calcofluor white (CW) staining. However, contrary to Bgs1, Ags1 does not disappear from the poles during cytokinesis until late septation. *ags1*$^+$*-GFP* cells growing in YES medium at 28°C were transferred to fresh YES medium containing 5 µg/ml CW and visualized by time-lapse CW staining and GFP fluorescence microscopy at 28°C. Arrowhead: localization of Ags1 in the medial ring before septum synthesis; Arrow: appearance of the septum structure. Elapsed time is shown in minutes. (C) Ags1 and Bgs1 colocalize at the division site (contractile ring and septum) and growing poles. Early log-phase *ags1*$^+$*-RFP GFP-bgs1*$^+$ cells growing in YES medium at 28°C were visualized for CW staining (50 µg/ml) and GFP and RFP fluorescence. Bar, 5 µm. (D) Ags1 is present and localized to all sites of cell wall synthesis during sexual differentiation. Homothallic *ags1*$^+$*-GFP* h90 cells grown in EMM to early stationary phase were transferred onto SPA plates and incubated at 28°C. Samples were collected after 3, 5, 8, 24, and 48 h and visualized by phase contrast (not depicted), CW staining (50 µg/ml), and GFP fluorescence. Cells and zygotes representative of each mating and sporulation step were selected and ordered to show a sexual phase progression. (E) Ags1 is present and localized to all sites of cell wall synthesis during spore germination. Homothallic *ags1*$^+$*-GFP* h90 strain was grown and sporulated for 10 d as in D. The spores were collected and incubated in YES liquid medium at 28°C. Samples were taken after 2, 3, 7, 8, 9, 10, and 11 h, and observed as in D. Spores illustrative of each germination step were selected and ordered to show a germination progression. Bar, 5 µm.

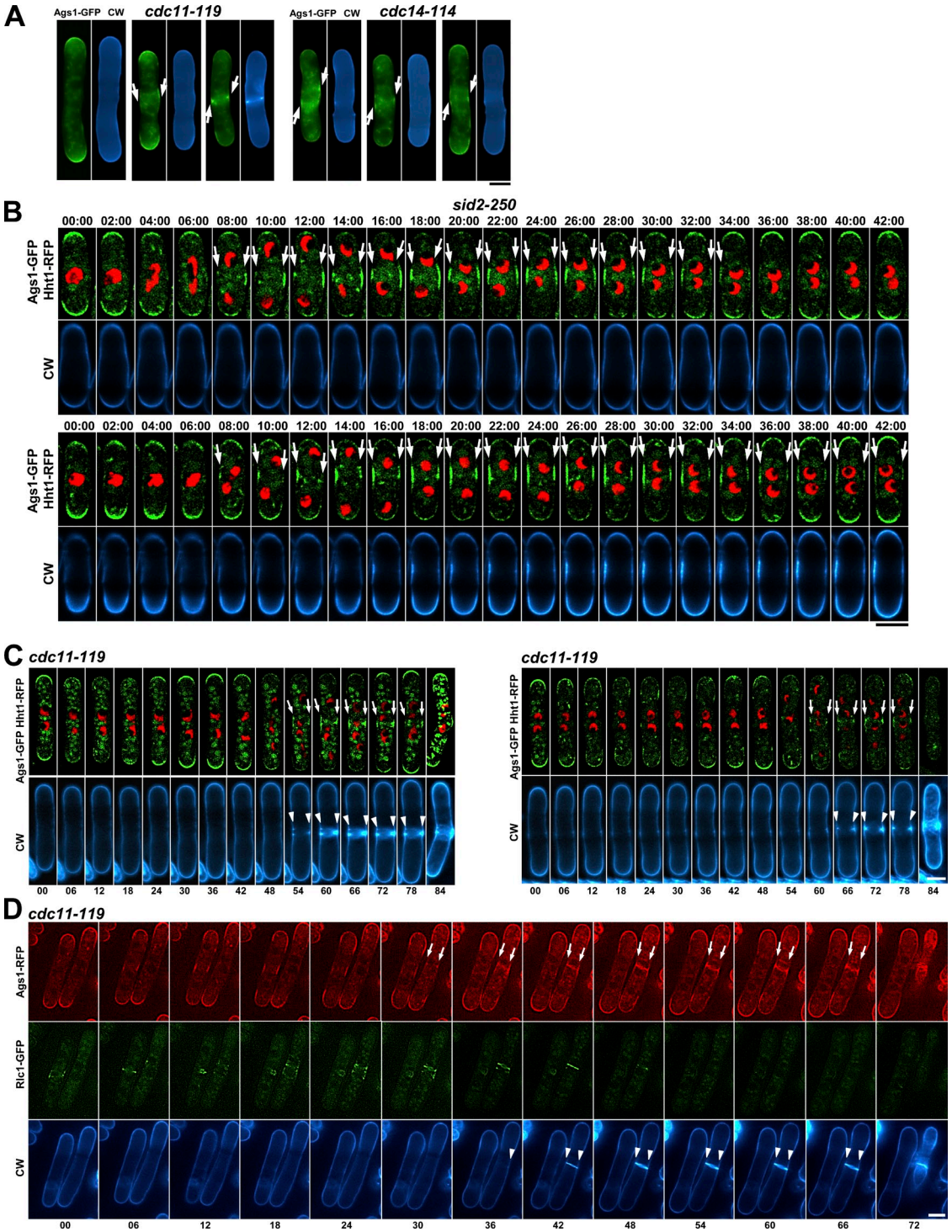


Figure S2. **Ags1 does not depend of the SIN pathway for its movement from the poles to the medial zone during cytokinesis.** (A) SIN mutant cells expressing *ags1⁺-GFP* were grown in YES medium at 25°C and shifted to 36°C for 4 h. (B) *sid2-250 ags1⁺-GFP hht1⁺-RFP* cells growing in YES medium at 25°C were shifted to 36°C for 2 h, transferred to fresh YES medium containing 5 µg/ml CW, and visualized by time-lapse CW staining (5 µg/ml) and GFP and RFP fluorescence at 36°C. Arrow: Ags1-GFP localization in the medial region after nuclear mitosis in the SIN mutant cell. Two examples representative of Ags1-GFP movement from the poles to the medial region after nuclear mitosis (see histone Hht1-RFP) are shown. (C) Ags1 localizes to the medial septum-like structures formed in the absence of a functional SIN. *cdc11-119 ags1⁺-GFP hht1⁺-RFP* cells were grown and visualized as in B. Two examples representative of Ags1-GFP movement and localization to the septum-like structures (see CW staining) after nuclear mitosis (see histone Hht1-RFP) are shown. (D) *cdc11-119 ags1⁺-RFP rlc1⁺-GFP* cells were grown and visualized as in B. Arrow: Ags1-GFP localization in the septum-like structure after mitosis and CAR assembly in the SIN mutant cell; arrowhead: septum-like structure detected by CW staining. Elapsed time is shown in minutes. Bar, 5 µm.

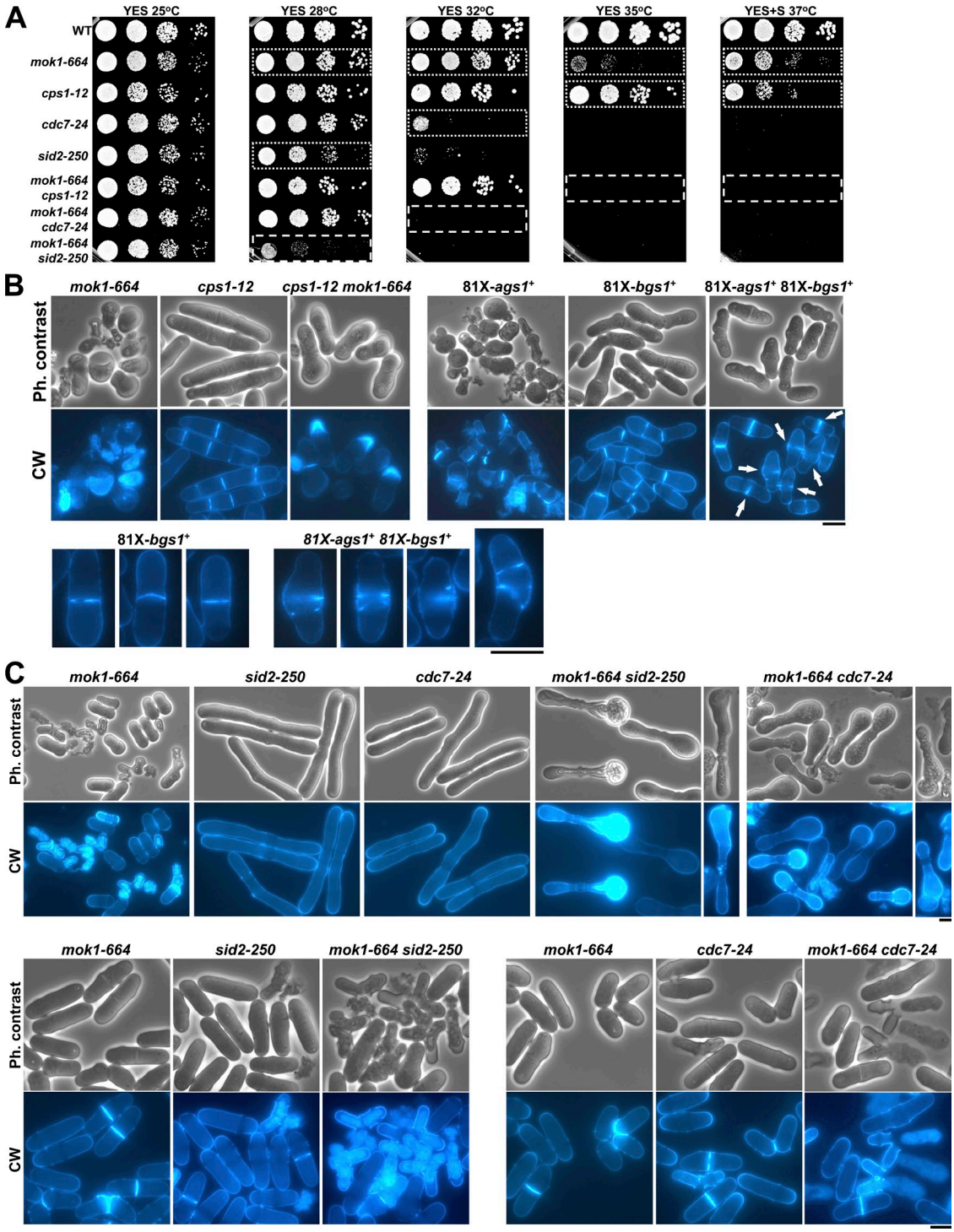


Figure S3. ***ags1⁺* presents genetic interactions with *bgs1⁺* and SIN genes.** The loss of Bgs1 function suppresses the lytic phenotype of Ags1 absence or *mok1-664* mutation and promotes strong cytokinesis defects. The absence of septa of the SIN mutants suppresses the septum lysis phenotype of *mok1-664* but promotes a new lysis at the poles. (A) The double mutants of *mok1-664* with the Bgs1 mutant *cps1-12* or with the SIN mutants *cdc7-24* or *sid2-250* are more thermosensitive than the single mutants. Early log-phase cells were adjusted to 10^7 cells/ml, 1:10 serial diluted, spotted onto YES and YES+S plates, and incubated at 25, 28, 32, 35, and 37°C for 3–4 d. The plates that displayed differences in growth between single and double mutant are shown. (B) The Bgs1 absence or *cps1-12* mutation suppresses the lytic phenotype of Ags1 absence or *mok1-664* mutation. In both cases the double mutants present strong septation defects. The *cps1-12 mok1-664* double mutation originates arrested cells with no septa and the combined Bgs1 Ags1 absence promotes stronger septation defects. The single and double *cps1-12* and *mok1-664* mutants were grown in YES+S at 37°C for 15 h. The single and double *ags1⁺* and *bgs1⁺* repression cells were grown in EMM+S+T for 15 h. The cells were visualized by phase-contrast and CW-staining microscopy. Arrow: increased septation defects of double *ags1⁺ bgs1⁺* repression cells. (C) The absence of septa of SIN mutants (high restrictive temperature) suppresses the septum lysis phenotype of *mok1-664* mutant but promotes a new lysis at the poles, whereas when the SIN mutants are able to form septa (low restrictive temperature) the septum lysis phenotype of *mok1-664* mutant is greatly increased. The single and double *cdc7-24* or *sid2-250* and *mok1-664* mutants were grown in YES for 6 h at 37°C (top panels) or for 2 h at 28°C (*sid2-250*) or 32°C (*cdc7-24*) (bottom panels). Cells were imaged as in B. Bar, 5 µm.

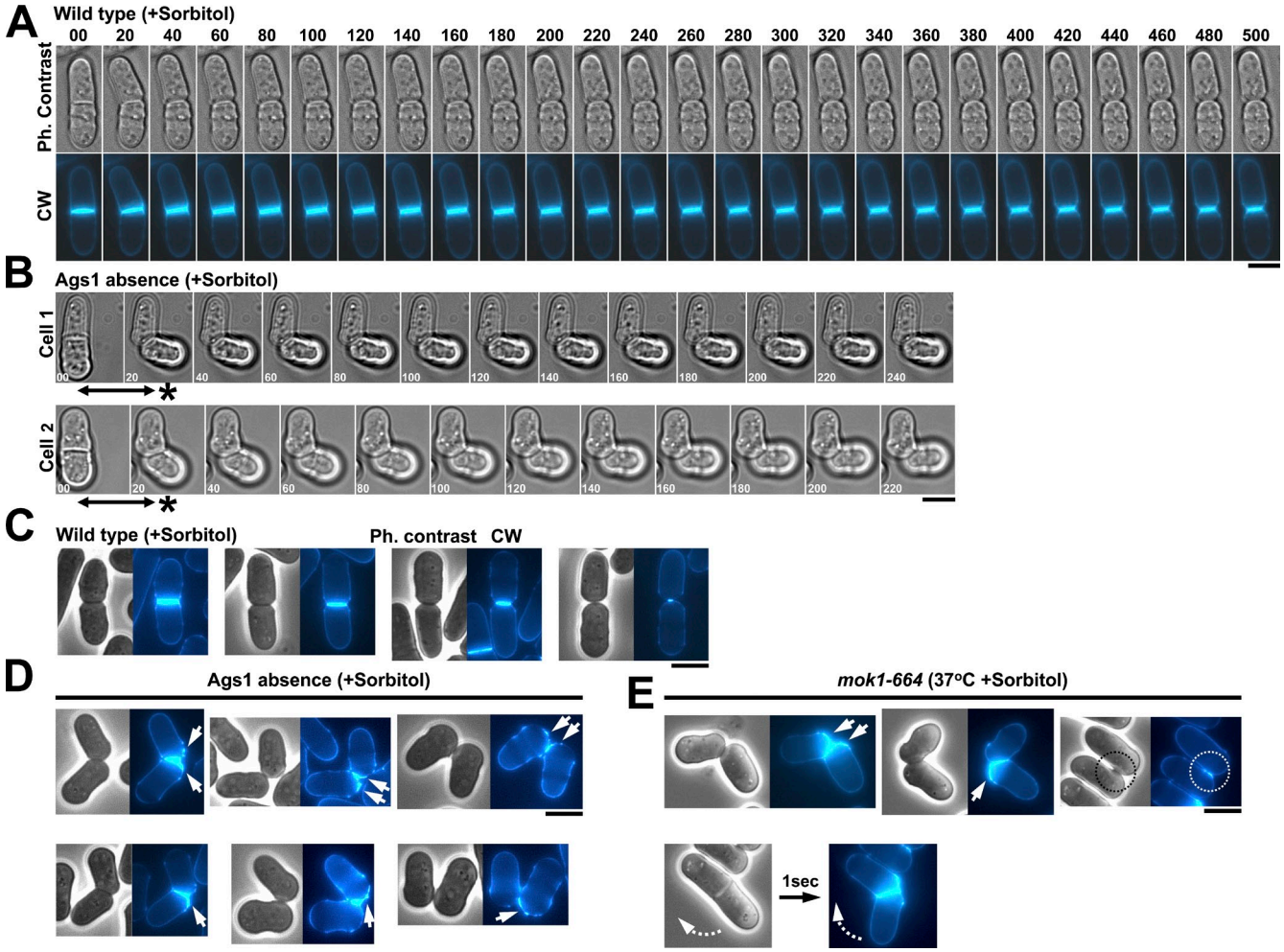
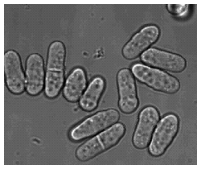
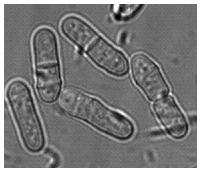


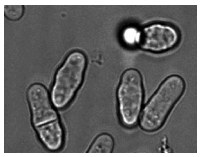
Figure S4. **Ags1-depleted or defective sister cells display a side-explosive cell separation due to tearing of a weak primary septum that remains attached to the new pole of one or both sister cells.** After the side-explosive cell separation the cells remain attached through the septum edging area. (A) Steady cell separation in wild-type cells. Cells were grown in EMM+S+T for 7 h and visualized by time-lapse phase-contrast and CW (5 µg/ml)-staining microscopy. Elapsed time is shown in seconds. (B) The absence of Ags1 originates cells with an immediate side-explosive cell separation. Cells were grown and imaged by time-lapse phase-contrast microscopy as in A. Asterisk: time needed after cell separation start for maximal new end curvature. (C) Wild-type cells separate symmetrically and gradually. Phase-contrast and CW-staining micrographs of log-phase wild-type cells grown in EMM+S+T at 28°C. (D) Ags1-depleted sister cells show the remains of primary septum in the pole of either both (top panels) or only one cell after asymmetrical side-explosive cell separation and tearing of primary septum. Ags1-depleted cells were grown in EMM+S+T for 8 h and visualized as in C. (E) The Ags1-defective *mok1-664* mutant shows the same side-explosive cell separation as the Ags1-depleted cells, with remnants of primary septum in one or both poles or just the septum edging. The cell separation occurs instantly (curved arrow) during the time spent for two image captures of the same cell. Cells were grown in YES+S at 37°C for 7 h and visualized as in C. Arrow: CW-stained remains of primary septum in the new end of both or just one sister cell. Circle: residual CW-stained primary septum in the septum edging. Bar, 5 µm.



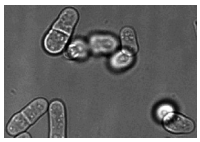
Video 1. **Representative field showing the lysis of either one or both sister cells at the beginning of cell separation of *S. pombe* Ags1-depleted cells.** 81X-*ags1*$^+$ cells were grown in the presence of thiamine for 3 h and imaged by time-lapse phase-contrast microscopy, using an inverted microscope (model IX71; Olympus) equipped with a Personal DeltaVision system (Applied Precision). Frames were taken every 20 s for 120 min. To decrease the movie size, the interval of frames around each cell lysis is exclusively shown.



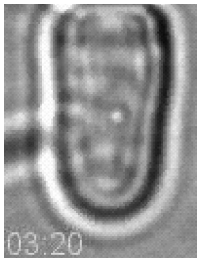
Video 2. **Representative field showing the progressive and symmetrical cell separation of *S. pombe* wild-type cells.** Wild-type cells were grown in the presence of thiamine for 3 h and imaged by time-lapse phase-contrast microscopy, using an inverted microscope (model IX71; Olympus) equipped with a Personal DeltaVision system (Applied Precision). Frames were taken every 20 s for 89 min. To decrease the movie size, the frames exclusively show the cell separation stage.



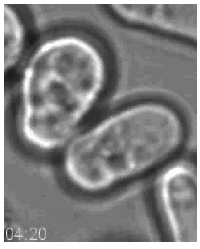
Video 3. **Representative field showing the instantaneous and asymmetrical cell separation of *S. pombe* Ags1-depleted cells.** 81X-*ags1*$^+$ cells were grown in the presence of thiamine for 3 h and imaged by time-lapse phase-contrast microscopy, using an inverted microscope (model IX71; Olympus) equipped with a Personal DeltaVision system (Applied Precision). Frames were taken every 20 s for 89 min. To decrease the movie size, the frames exclusively show the cell separation stage.



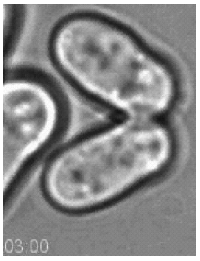
Video 4. **Representative field showing the instantaneous and asymmetrical cell separation of *S. pombe* Ags1-depleted cells growing in the presence of sorbitol.** 81X-*ags1*$^+$ cells were grown in the presence of thiamine and 1.2 M sorbitol for 4 h and imaged by time-lapse phase-contrast microscopy, using an inverted microscope (model IX71; Olympus) equipped with a Personal DeltaVision system (Applied Precision). Frames were taken every 20 s for 69 min. To decrease the movie size, the frames exclusively show the cell separation stage.



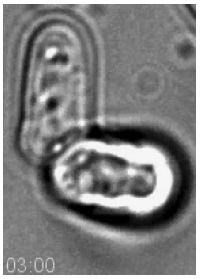
Video 5. **Progressive and symmetrical cell separation of a *S. pombe* wild-type cell.** Wild-type cells were grown in the presence of thiamine for 3 h and imaged by time-lapse phase-contrast microscopy, using an inverted microscope (model IX71; Olympus) equipped with a Personal DeltaVision system (Applied Precision). Frames were taken every 20 s for 6 min.



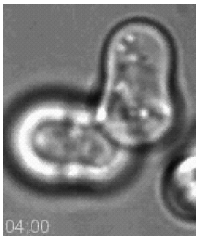
Video 6. **Instantaneous and asymmetrical cell separation of an Ags1-depleted cell.** 81X-*ags1*$^+$ cells were grown in the presence of thiamine for 3 h and imaged by time-lapse phase-contrast microscopy, using an inverted microscope (model IX71; Olympus) equipped with a Personal DeltaVision system (Applied Precision). Frames were taken every 20 s for 6 min.



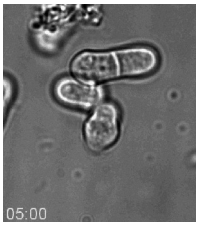
Video 7. **Instantaneous and asymmetrical cell separation of an Ags1-depleted cell.** 81X-*ags1*$^{+}$ cells were grown in the presence of thiamine for 3 h and imaged by time-lapse phase-contrast microscopy, using an inverted microscope (model IX71; Olympus) equipped with a Personal DeltaVision system (Applied Precision). Frames were taken every 20 s for 6 min.



Video 8. **Instantaneous and asymmetrical cell separation of an Ags1-depleted cell growing in the presence of sorbitol.** 81X-*ags1*$^{+}$ cells were grown in the presence of thiamine and 1.2 M sorbitol for 4 h and imaged by time-lapse phase-contrast microscopy, using an inverted microscope (model IX71; Olympus) equipped with a Personal DeltaVision system (Applied Precision). Frames were taken every 20 s for 6 min.



Video 9. **Instantaneous and asymmetrical cell separation of an Ags1-depleted cell growing in the presence of sorbitol.** 81X-*ags1*$^{+}$ cells were grown in the presence of thiamine and 1.2 M sorbitol for 4 h and imaged by time-lapse phase-contrast microscopy, using an inverted microscope (model IX71; Olympus) equipped with a Personal DeltaVision system (Applied Precision). Frames were taken every 20 s for 6 min.



Video 10. **After instantaneous and asymmetrical cell separation, the Ags1-depleted sister cells remain attached by their lateral septum cell wall region for at least two cell cycles.** 81X-*ags1*$^{+}$ cells were grown in the presence of thiamine and 1.2 M sorbitol for 4 h and imaged by time-lapse phase-contrast microscopy, using an inverted microscope (model IX71; Olympus) equipped with a Personal DeltaVision system (Applied Precision). Frames were taken every 20 s for 20 min.

Table S1. **Fission yeast strains used in this study**

Strain	Genotype	Source
33	972 h^-	P. Munz[a]
256	*cps1-12 leu1-32 ura4-Δ18* h^-	J.C. Ribas
284	*leu1-32 ura4-Δ18 his3-Δ1* h^-	J.C. Ribas
285	*leu1-32 ura4-Δ18 his3-Δ1* h^+	J.C. Ribas
419	*leu1-32 ura4-Δ18* h^-	J.C. Ribas
420	*leu1-32 ura4-Δ18* h^+	J.C. Ribas
470	*leu1-32 ura4-Δ18 his3-Δ1* h^{90}	J.C. Ribas
317	*leu1-32/leu1-32 ura4-Δ18/ura4-Δ18 his3-Δ1/his3-Δ1 ade6-M210/ade6-M216* h^-/h^+	J.C. Ribas
439	*cdc3-6 leu1-32* h^+	J.C. Ribas
572	*cdc14-118 leu1-32 ade6-M210* h^+	J.C. Ribas
574	*cdc15-140 leu1-32* h^+	J.C. Ribas
577	*cdc15-140 leu1-32* h^-	J.C. Ribas
580	*cdc16-116 ura4-Δ18* h^+	J.C. Ribas
584	*tea2-1 leu1-32 ade6-M210* h^+	P. Nurse[b]
635	*mid1-366 leu1-32* h^+	P. Nurse[b]
899	*cdc11-119 leu1-32 his3-Δ1* h^+	J.C. Ribas
900	*cdc11-119 leu1-32 his3-Δ1* h^-	J.C. Ribas
953	*tea1-50 leu1-32 ura4-Δ18* h^+	J.C. Ribas
962	*leu1-32 ura4-Δ18 ade6 crn1⁺-GFP:KanMX6* h^+	F. Chang[c]
971	*leu1-32 ura4-Δ18 ade6 crn1⁺-GFP:KanMX6* h^-	F. Chang[c]
1723	*leu1-32 ura4-Δ18 his3-Δ1 bgs1Δ::ura4⁺* P_{bgs1+}*::GFP-bgs1⁺:leu1⁺* h^+	J.C. Ribas
1771	*sec8-1 leu1-32 ura4-Δ18* h^+	J.C. Ribas
1905	*leu1-32 ura4-Δ18 ade6 for3Δ::KanMX6* h^+	P. Perez[d]
2492	*leu1-32 ura4-Δ18 for3Δ::KanMX6* h^-	J.C. Ribas
2933	*leu1-32 ura4-Δ18 crn1⁺-GFP:KanMX6 for3Δ::KanMX6* h^+	J.C. Ribas
3137	*leu1-32 ura4-Δ18 ade6 myo52Δ::ura4⁺* h^+	M.H. Valdivieso[d]
2156	*mok1-664 leu1-32 ura4-Δ18* h^+	P. Pérez
4781	*mok1-664 leu1-32 ura4-Δ18* h^-	This study
2326	*sid2-250 leu1-32 ura4-Δ18 ade6-M216* h^+	J.C. Ribas
2327	*sid2-250 leu1-32 ura4-Δ18* h^-	J.C. Ribas
3065	*cdc7-24 ura4-Δ18* h^+	J.C. Ribas
2523	*cdc12-112 ura4-Δ18* h^+	P. Pérez
2525	*leu1-32 ura4-Δ18 leu1⁺::GFP-atb2⁺:ura4⁺* h^+	V. Simanis[e]
2086	*leu1-32 ura4-Δ18 his3-Δ1 ade6* $P_{nmt1\text{-}81X}$*-ags1⁺:ura4⁺* h^-	This paper
2100	*leu1-32 ura4-Δ18* $P_{nmt1\text{-}81X}$*-bgs1⁺:ura4⁺* h^-	J.C. Ribas
2234	*leu1-32 ura4-Δ18* $P_{nmt1\text{-}81X}$*-bgs1⁺* h^-	J.C. Ribas
1127	*leu1-32/leu1-32 ura4-Δ18/ura4-Δ18 his3-Δ1/ his3-Δ1 ade6-M210/ade6-M216 ags1⁺/ags1Δ::ura4⁺* h^-/h^+	This paper
1804	*leu1-32 ura4-Δ18 his3-Δ1 ade6-M210 ags1Δ::ura4⁺* h^- p41XH-*ags1⁺*	This paper
2881	*leu1-32 ura4-Δ18 his3-Δ1 ade6-M210 ags1Δ* h^- p41XH-*ags1⁺*	This paper
2939	*leu1-32 ura4-Δ18 his3-Δ1 ade6-M210 ags1Δ* 3′UTR_{ags1+}*::ags1*$_{3704\text{-}7233}$*:ura4⁺* h^- p41XH-*ags1⁺*	This paper
3166	*leu1-32 ura4-Δ18 his3-Δ1 ade6-M210 ags1Δ* 3′UTR_{ags1+}*::ags1⁺-GFP:leu1⁺:ura4⁺* h^-	This paper
3265	*ura4-Δ18 rlc1⁺-GFP:KanMX6* h^+	V. Simanis[e]
4004	*leu1-32 ura4-Δ18 his3-Δ1 ade6-M210 ags1Δ* 3′UTR_{ags1+}*::ags1⁺-RFP:leu1⁺:ura4⁺* h^-	This paper
4047	*leu1-32 ura4-Δ18 his3-Δ1 ade6 hht1⁺-RFP:KanMX6* h^+	P. Pérez
4090	*leu1-32 ura4-Δ18 his3-Δ1 bgs1Δ::ura4⁺* P_{bgs1+}*::3XHA-bgs1⁺:leu1⁺* h^+	J.C. Ribas
4223	*leu1-32? ura4-Δ18 ade6 ags1Δ* 3′UTR_{ags1+}*::ags1⁺-RFP:leu1⁺:ura4⁺ rlc1⁺-GFP:KanMX6* h^+	This paper
4083	*leu1-32 ura4-Δ18 his3-Δ1 ade6 ags1Δ* 3′UTR_{ags1+}*::ags1⁺-GFP:leu1⁺:ura4⁺ hht1⁺-RFP:KanMX6* h^+	This paper
3846	*mid1-366 leu1-32 ura4? his3-Δ1 ade6-M210 ags1Δ* 3′UTR_{ags1+}*::ags1⁺-GFP:leu1⁺:ura4⁺* h^+	This paper
3849	*cdc3-6 leu1-32 ura4? ags1Δ* 3′UTR_{ags1+}*::ags1⁺-GFP:leu1⁺:ura4⁺* h^+	This paper
3850	*cdc15-140 leu1-32 ura4? his3-Δ1 ade6-M210 ags1Δ* 3′UTR_{ags1+}*::ags1⁺-GFP:leu1⁺:ura4⁺* h^+	This paper
3852	*cdc11-119 leu1-32 ura4? his3-Δ1 ade6-M210 ags1Δ* 3′UTR_{ags1+}*::ags1⁺-GFP:leu1⁺:ura4⁺* h^-	This paper
3853	*cdc11-119 leu1-32 ura4? his3-Δ1 ade6-M210 ags1Δ* 3′UTR_{ags1+}*::ags1⁺-GFP:leu1⁺:ura4⁺* h^+	This paper
3855	*cdc14-118 leu1-32 ura4? ade6-M210 ags1Δ* 3′UTR_{ags1+}*::ags1⁺-GFP:leu1⁺:ura4⁺* h^-	This paper
3856	*cdc16-116 leu1? ura4-Δ18 his3-Δ1 ade6-M210 ags1Δ* 3′UTR_{ags1+}*::ags1⁺-GFP:leu1⁺:ura4⁺* h^+	This paper
3858	*tea1-50 leu1-32 ura4-Δ18 ade6-M210 ags1Δ* 3′UTR_{ags1+}*::ags1⁺-GFP:leu1⁺:ura4⁺* h^+	This paper
3861	*tea2-1 leu1-32 ura4? his3-Δ1 ade6-M210 ags1Δ* 3′UTR_{ags1+}*::ags1⁺-GFP:leu1⁺:ura4⁺* h^-	This paper
4014	*sid2-250 leu1-32 ura4-Δ18 ade6 ags1Δ* 3′UTR_{ags1+}*::ags1⁺-GFP:leu1⁺:ura4⁺* h^+	This paper

Table S1. **Fission yeast strains used in this study** *(Continued)*

Strain	Genotype	Source
4179	*sid2-250 leu1-32 ura4-Δ18 ade6 ags1Δ* 3′UTR$_{ags1+}$*::ags1⁺-GFP:leu1⁺:ura4⁺ hht1⁺-mRFP:KanMX6* h⁺	This paper
4016	*cdc12-112 leu1? ura4-Δ18 his3-Δ1 ade6-M210 ags1Δ* 3′UTR$_{ags1+}$*::ags1⁺-GFP: leu1⁺:ura4⁺* h⁺	This paper
4048	*leu1-32 ura4-Δ18 his3-Δ1 ade6-M210 ags1Δ* 3′UTR$_{ags1+}$*::ags1⁺-RFP:leu1⁺:ura4⁺ bgs1Δ::ura4⁺* P$_{bgs1+}$*::GFP-bgs1⁺:leu1⁺* h⁺	This paper
4067	*leu1-32 ura4-Δ18 his3-Δ1 ade6 ags1Δ* 3′UTR$_{ags1+}$*::ags1⁺-RFP:leu1⁺:ura4⁺crn1⁺-GFP:KanMX6* h⁻	This paper
4241	*cdc3-6 leu1-32 ura4-Δ18? his3-Δ1 ade6 ags1Δ* 3′UTR$_{ags1+}$*::ags1⁺-RFP:leu1⁺:ura4⁺crn1⁺-GFP:KanMX6* h⁻	This paper
4243	*leu1-32 ura4-Δ18 his3-Δ1 ade6 for3Δ::KanMX6 ags1Δ* 3′UTR$_{ags1+}$*::ags1⁺-RFP:leu1⁺:ura4⁺crn1⁺-GFP: KanMX6* h⁻	This paper
4245	*sec8-1 leu1-32 ura4-Δ18 ade6 ags1Δ* 3′UTR$_{ags1+}$*::ags1⁺-RFP:leu1⁺:ura4⁺crn1⁺-GFP:KanMX6* h⁻	This paper
4247	*leu1-32 ura4-Δ18 ade6 myo52Δ::ura4⁺ ags1Δ* 3′UTR$_{ags1+}$*::ags1⁺-RFP:leu1⁺:ura4⁺crn1⁺-GFP:KanMX6* h⁻	This paper
3954	*leu1-32 ura4-Δ18 his3-Δ1 ade6-M210 ags1Δ* 3′UTR$_{ags1+}$*::ags1⁺-GFP:leu1⁺:ura4⁺* h^{90}	This paper
4778	*cps1-12 mok1-664 leu1-32 ura4-Δ18* h⁻	This paper
4786	*leu1-32 ura4-Δ18 ade6 ags1Δ* 3′UTR$_{ags1+}$*::ags1⁺-GFP:leu1⁺:ura4⁺ bgs1Δ::ura4⁺* P$_{bgs1+}$*::3XHA-bgs1⁺:leu1⁺* h⁺	This paper
4790	*leu1-32 ura4-Δ18 his3-Δ1 ade6 ags1Δ* 3′UTR$_{ags1+}$*::ags1⁺-RFP:leu1⁺:ura4⁺ leu1⁺::GFP-atb2⁺:ura4⁺* h⁺	This paper
4800	*cdc15-140 leu1-32? ura4-Δ18 ags1Δ* 3′UTR$_{ags1+}$*::ags1⁺-RFP:leu1⁺:ura4⁺ rlc1⁺-GFP:KanMX6* h⁺	This paper
4802	*cdc11-119 leu1-32 ura4-Δ18 ade6 ags1Δ* 3′UTR$_{ags1+}$*::ags1⁺-RFP:leu1⁺:ura4⁺ rlc1⁺-GFP:KanMX6* h⁻	This paper
4825	*leu1-32 ura4-Δ18 ade6* P$_{nmt1\text{-}81X}$*-ags1⁺:ura4⁺* P$_{nmt1\text{-}81X}$*-bgs1⁺* h⁻	This paper
4844	*cdc7-24 mok1-664 leu1-32 ura4-Δ18* h⁻	This paper
4846	*sid2-250 mok1-664 leu1-32 ura4-Δ18* h⁺	This paper

[a]Institute of General Microbiology, University of Bern, Bern, Switzerland.
[b]Laboratory of Yeast Genetics and Cell Biology, The Rockefeller University, New York, NY.
[c]Department of Microbiology, Columbia University, New York, NY.
[d]Instituto de Biología Funcional y Genómica, Salamanca, Spain.
[e]School of Life Sciences, École Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland.