

Supplemental Video Legends

Supplemental Video 1. OM137 inhibits chromosome alignment at the metaphase plate and induces premature anaphase onset and mitotic exit. A *Xenopus* S3 cell was treated prior to nuclear envelope breakdown with OM137 at 100 μ M and then imaged by time lapse phase contrast microscopy. Only a minority of the chromosomes aligned at the metaphase plate but these underwent chromatid separation when the cell entered premature anaphase. The other chromosomes remained near the poles. A partial cleavage furrow was produced but then regressed. The chromosomes decondensed and a large multi-lobed nucleus reassembled. Selected frames from this video are shown in Figure 6A.

Supplemental Video 2. OM137 induces premature mitotic exit. *Xenopus* S3 cells stably expressing GFP-tubulin were treated with OM137 at 50 μ M and imaged by phase contrast (left) and fluorescence (right) microscopy. OM137 induces mitotic exit before chromosome alignment leading to decondensation of the chromosomes, reformation of the nuclear envelope and reestablishment of the interphase microtubule array. Selected frames from this video are shown in Figure 6B.

Supplemental Video 3. Nocodazole induces mitotic arrest. Ptk1 cells were treated with 100ng nocodazole for 20 min before DIC imaging commenced. Two mitotic cells are present in the field. The cell at upper right is in prometaphase and the cell at lower left is in prophase at time 0. Both cells remain arrested in prometaphase for the duration of the video. Selected frames from this video are shown in Figure 6C, upper row.

Supplemental Video 4. OM137 overrides the mitotic arrest induced by nocodazole treatment. Ptk1 cells were treated with 100ng nocodazole for 20 min before 80 μ M

OM137 was added and DIC imaging commenced. The cell in the center of the field is in prometaphase at the start of the video and rapidly exits mitosis as reflected by the decondensation of the chromosomes and reformation of the nuclear envelope. Selected frames from this video are shown in Figure 6C, bottom row.