From error to tetraploid

Anaphase is not the point of no return, say Qinghua Shi and Randall King (Harvard Medical School, Boston, MA). If cells make errors in anaphase chromosome segregation, they mount a rescue operation. The final stages of cytokinesis shut down, producing tetraploid cells that might even be able to regenerate functional diploid cells.

Shi and King started out looking for different chromosome missegregation rates in various cell lines. They noticed that the rate of missegregation was 45–166-fold higher in spontaneously arising binucleated cells than in cells with normal divisions. In time-lapse experiments, these aberrant cells did not delay in mitosis but reversed their division process just before cytokinesis completion. The thin, remaining bridge between dividing cells opened back up, yielding a binucleate cell.

Extrapolating from experiments using probes for four chromosomes, it is likely that there is a segregation error during virtually all divisions that produce new binucleates. Chromosomes were not always obstructing the division furrow, so the thin, remaining bridge between dividing cells opened back up, yielding a binucleate cell.

Aberrant segregation (right) yields tetraploid binucleates.

The virtues of opting out of the diploid world depend on what happens to tetraploids. David Pellman (Harvard Medical School) has recently shown that tetraploids lacking p53 promote tumorigenesis, but tetraploids with p53 may not behave so badly. There may even, suggests King, be a pathway from tetraploids back to functional, nonaneuploid diploids. “If that were true,” he says, “there would be a full pathway for the resolution of errors.”

References: Fujiwara, T., et al. 2005. Nature. doi:10.1038/nature04217. Shi, Q., and R.W. King. 2005. Nature. doi:10.1038/nature03958.