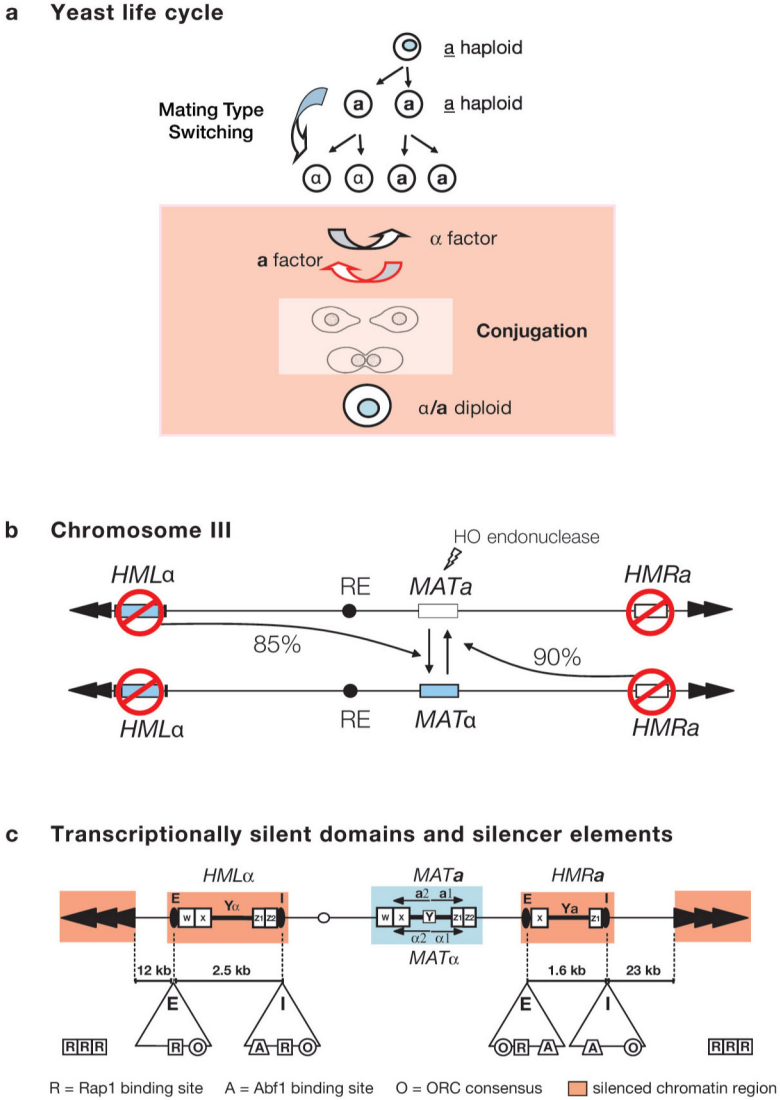

Figure 3. Mating Type Switching in Yeast

(*a*) Homothallic yeast strains are able to switch mating type after one division cycle. The switch occurs before DNA replication so that both mother and daughter cells assume the new mating type. (*b*) The position of the silent and expressed mating-type loci on chromosome III are shown here. The active *MAT* locus is able to switch through gene conversion roughly once per cell cycle, due to a double-strand break induced by the HO endonuclease. The percentages indicated show the frequency with which the gene conversion event replaced the *MAT* locus with the opposite mating-type information. The directionality of switching is guaranteed by the recombination enhancer (RE) on the left arm of chromosome III. (*c*) Repression at the silent mating-type loci *HMR* and *HML* is mediated by two silencer DNA elements that flank the silent genes. These silencers are termed E (for essential) or I (for important) (Brand et al. 1997) and provide binding sites for Rap1 (R), Abf1 (A), and ORC (O). Artificial silencers can be created using various combinations of the redundant binding sites, although their efficiency is less than that of the native silencers. *HMLα* and *HMR***a** are 12 kb and 23 kb, respectively, from the telomeres of chromosome III. Telomeric heterochromatin domains at chromosome III are silenced independently from the HM loci in a process that is initiated at the telomeres through multiple binding sites for Rap1 (R).