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In considering the catalytic mechanisms of P450 reactions, most reactions are agreed to be catalyzed via a "Compound I" mechanism (FeO^{3+}). "Compound 0" ($\text{Fe}^{\text{III}}\cdot\text{O}_2^-$) mechanisms have been proposed as well, particularly for some C-C bond-cleaving reactions. We have used ^{18}O labeling to show that the Compound I mechanism is operative in P450 19A1 (aromatase) reactions. A Compound I mechanism has been implicated by others for P450 11A1, and we have some evidence for a Compound I mechanism with P450 17A1. We are reinvestigating the major remaining steroid C-C bond cleavage mechanism, that of P450 51A1, and the two possibilities shown here, utilizing ^{18}O and HRMS methods.

