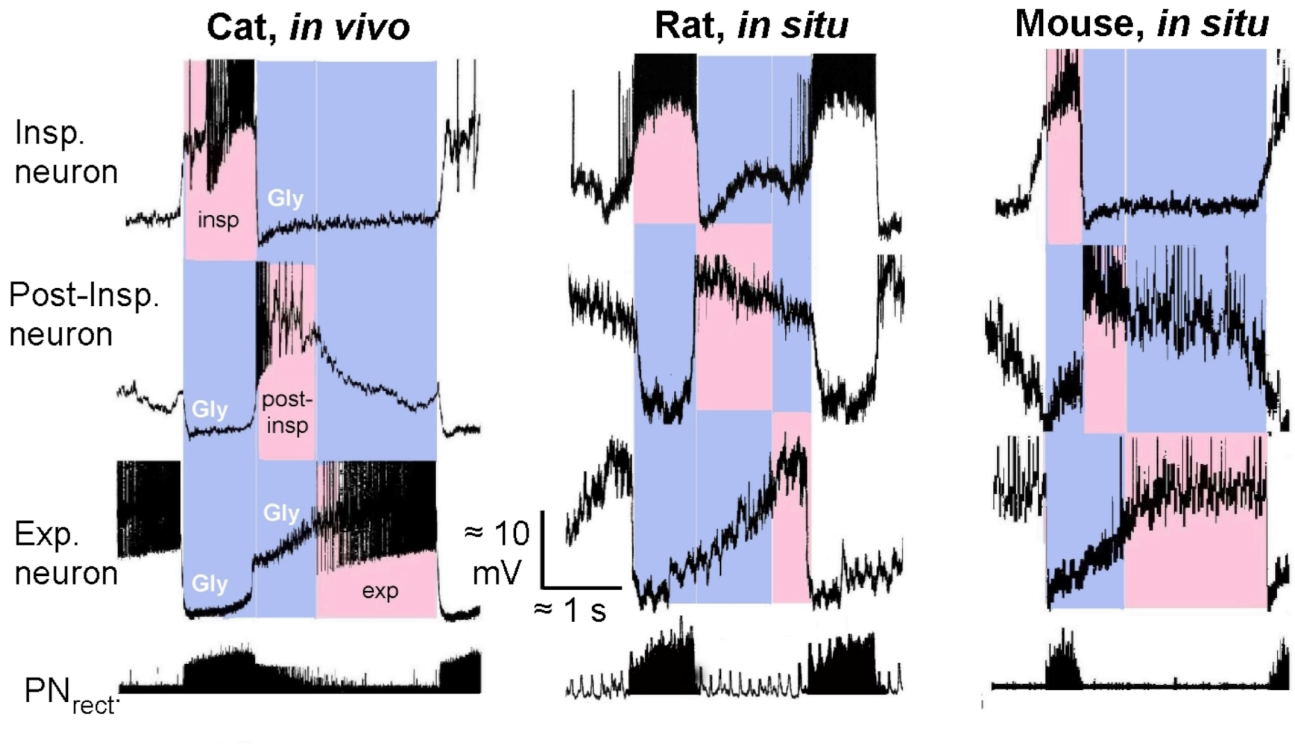
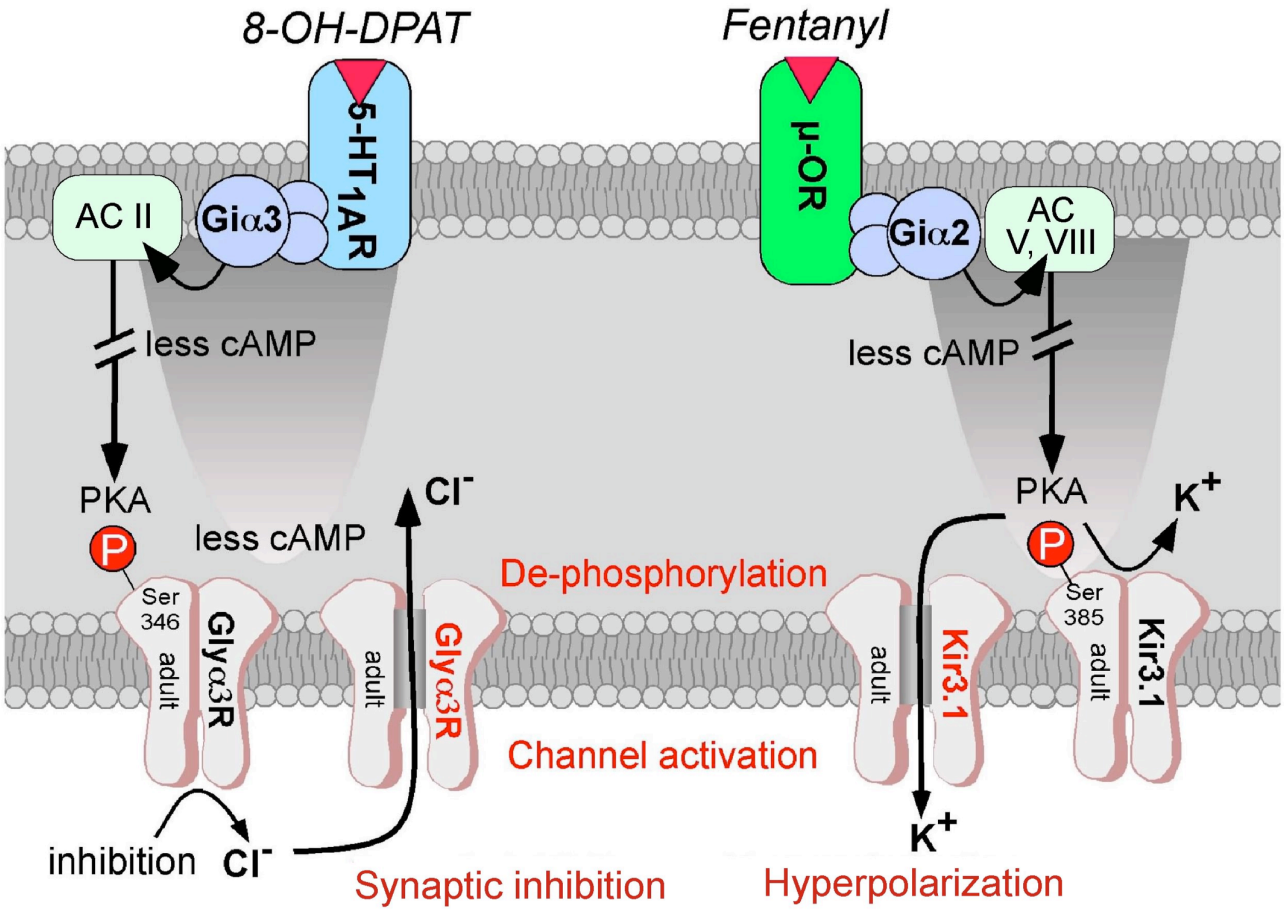
Figure S1



A three phased respiratory rhythm that is characteristic for eupneic breathing of *in vivo* mammals resulting from an antagonistic organization of the respiratory network

Under *in vivo* and *in vivo-like* conditions, the rhythmic activity of the respiratory network operates in a comparable way in a variety of mammalian animal species as illustrated for the cat, rat, and mouse. Not shown are similar recordings from the piglet. The functional role is to control inspiratory muscle contractions (via the phrenic nerve PN) controlling lung inflation, followed by a slow relaxation of inspiratory muscle contractions (post-inspiration) and finally expiratory muscle contractions. At the level of specific classes of inspiratory, post-inspiratory, and expiratory neurons in the brainstem, characteristic membrane potential oscillations originate from a sequential volley of excitatory synaptic and inhibitory synaptic inputs. Whenever one class of neurons becomes active (pink periods), antagonistic neurons are inhibited (grey areas). Such rhythmic oscillations of membrane potential reveal a clear separation between inspiratory, post-inspiratory, and expiratory phases of an oscillatory cycle. Such organization seems characteristic for breathing movements of all *in vivo* mammals.

Figure S2



Schematic illustration of the presumed signaling pathways activated by 5-HTR$_{1A}$ and μOR

It is known that 5-HTR$_{1A}$ and μOR act via different Gαi proteins, 5-HTR$_{1A}$ through Gαi3 (1) and μOR through Gαi2 (2) to inhibit different types of adenylyl cyclases, presumably AC-II (3) and AC-V (4) or AC-VIII (5), respectively. This divergence of the signaling pathways block PKA-mediated phosphorylation of GlyRα3 or K^+ channels to increase their conductance. As a consequence, activation of 5-HTR$_{1A}$ induces reinforcement of cyclic glycinergic inhibition, while μOR provokes persistent membrane hyperpolarization.

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