**AUTHOR**Bayés

**DIGEST TITLE**Tracing back nerve cell communication

**DIGEST ONE-SENTENCE SUMMARY**Receptors that enable nerve cells to communicate are more diverse than previously thought.

**KEYWORDS**Science, Brain, Evolution, Neuron, Neurotransmitter

**MANUSCRIPT NUMBER**35774

**DIGEST TEXT**Nerve cells or neurons communicate with each other by releasing specific molecules in the gap between them, the synapses. The sending neuron passes on messages through packets of chemicals called neurotransmitters, which are picked up by the receiving cell with the help of receptors on its surface. Neurons use different neurotransmitters to send different messages, but one of the most common ones is glutamate.

There are two families of glutamate receptors: ionotropic receptors, which can open or close ion channels in response to neurotransmitters and control the transmission of a signal, and metabotropic receptors, which are linked to a specific protein and control the strength of signal.

Our understanding of these two receptor families comes from animals with backbones, known as vertebrates. But the receptors themselves are ancient. We can trace the first family back as far as bacteria and the second back to single-celled organisms like amoebas. Vertebrates have six classes of ionotropic and three classes of metabotropic glutamate receptor. But other multi-celled animals also have these receptors, so this picture may not be complete.

Here, Ramos-Vicente et al. mapped all major lineages of animals to reveal the evolutionary history of these receptors to find out if the receptor families became more complicated as brain power increased. The results showed that the glutamate receptors found in vertebrates are only a fraction of all the types that exist. In fact, before present-day animal groups emerged, the part of the genome that holds the ionotropic receptor genes duplicated three times. This formed four receptor subfamilies, and our ancestors had all of them. Across the animal kingdom, there are ten, not six, classes of ionotropic receptors and there is an extra class of metabotropic receptors. But only two subfamilies of ionotropic and three out of four metabotropic receptor classes are still present in vertebrates today.

The current classification of glutamate receptors centers around vertebrates, ignoring other animals. But this new data could change that. A better knowledge of these new receptors could aid neuroscientists in better understanding the nervous system. And, using this technique to study other families of proteins could reveal more missing links in evolution.

**IMAGE CREDIT**  
An interneuron (green/yellow) stained for a glutamate receptor subunit (red). Image credit: NICHD/McBain Laboratory (CC BY-NC-ND 2.0)