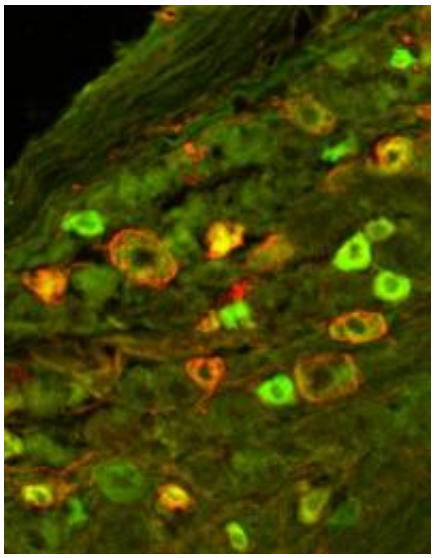
New animal model to study craniofacial pain by manipulating genes

25 March 2010



Pictured is a closeup of trigeminal nerve cells. Credit: Ewa Balkowiec-Iskra, M.D., Ph.D.

Using a novel animal model to study craniofacial pain, researchers at Oregon Health & Science University's School of Dentistry have discovered that when tissues are inflamed, the nerve cells carrying pain information from the head to the brain produce in large quantities a protein involved in pain signaling.

The finding could play a significant role in the development of new treatments for craniofacial pain conditions, such as migraines, temporomandibular joint (TMJ) disorder, trigeminal neuralgia, and toothache. The findings were published online on March 9, and will appear in one of the upcoming issues of the journal *Neuroscience*.

According to the National Institutes of Health (NIH), approximately 10 percent of Americans suffer from chronic pain conditions, and inflammatory craniofacial pain is one of the most frequent.

Head pain is signaled to the brain by the trigeminal nerve. The trigeminal nerve sends information about pain associated with migraines, TMJ disorder, trigeminal neuralgia, head and neck cancer, periodontal disease, dental procedures, and other conditions. Yet, the molecular mechanisms of trigeminal pain are not well understood. Studies suggest most craniofacial pain disorders are caused by inflammation.

The OHSU dental school research team previously found that trigeminal nerve cells make a molecule called brain-derived neurotrophic factor (BDNF), which plays a critical role in the development and normal functioning of the nervous system. They also showed that stimulation of trigeminal nerve cells, as experienced during craniofacial pain, leads to the release of BDNF and, in a separate study, noted that BDNF is involved in the mechanisms of migraines. Now, the team has found that tooth pulp inflammation of as few as two molar teeth leads to a dramatic and widespread increase in BDNF production by trigeminal nerve cells, even those not connected to the teeth.

"Thanks to a tremendous collaborative effort of experts in several different disciplines of dentistry and neuroscience, we were able to develop an amazing model to study molecular mechanisms of craniofacial pain using genetic manipulations," said Agnieszka Balkowiec, M.D., Ph.D., principal investigator, associate professor of integrative biosciences in the OHSU School of Dentistry, and adjunct assistant professor of physiology and pharmacology in the OHSU School of Medicine. "With this model, we will finally be able to dissect specific mechanisms of BDNF action and its role in inflammatory pain conditions."

More information:
http://dx.doi.org/10.1016/j.neuroscience.2010.03.002

Provided by Oregon Health & Science University