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Mechanisms underlying alcohol withdrawal-induced pain chronification after surgery

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Chronic postsurgical pain is a serious health issue in clinical practice; however, it is unclear how acute to chronic postsurgical pain transition occurs. Previous studies have demonstrated that chronic ethanol consumption shares overlapping neural substrates with pain transmission. It has also been reported that ethanol exposure and withdrawal can regulate α -amino-3-hydroxy-5-methyl-4-isoxazolepropionic acid (AMPA) receptor activities, which are involved in the pathogenesis of postsurgical pain. In the present study, we investigated the effect of ethanol withdrawal on plantar incision-induced postsurgical pain. C57BL/6 male mice (8-10 weeks) were given unlimited access to drink different concentrations of ethanol for four weeks, and next day following 4-week ethanol administration, a 5-mm longitudinal plantar incision was made in the left hind paw of the mice. We found that withdrawal from 4-week ethanol consumption greatly prolonged plantar incision-induced mechanical pain, but ethanol withdrawal alone did not produce pain behaviors. We also found that ethanol withdrawal markedly enhanced plantar incision-induced AMPA receptor GluA1 phosphorylation in the spinal cord. Interestingly, targeted mutation of GluA1 phosphorylation significantly inhibited ethanol withdrawal-induced prolongation of incisional pain. In addition, we observed that ethanol exposure increased AMPA receptor GluA2 dynamic internalization in the cultured spinal dorsal horn neurons. As we know, AMPA receptor phosphorylation and trafficking contribute to spinal central sensitization through lowering the threshold for long-term potentiation induction and increasing the probability of synaptic plasticity. Therefore, our results suggest withdrawal from chronic alcohol consumption may induce the development of chronic postsurgical pain by regulating AMPA receptor phosphorylation and trafficking in the spinal cord.

Biography

Feng Tao is an Associate Professor in the Department of Biomedical Sciences at Texas A&M University College of Dentistry. He received his R01 award and Independent Scientist Award from NIH in 2012 and 2014, respectively. He has published more than 30 papers in peer-reviewed professional journals and he is serving as an Editorial Board Member for some professional journals.

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