Ocytocine&protection

BIOLOGIE & SANTÉ 2011

L'oxytocine a une action analgésique et neuro-protectrice pendant la naissance: implications cliniques

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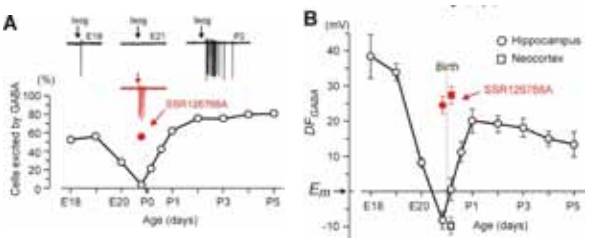
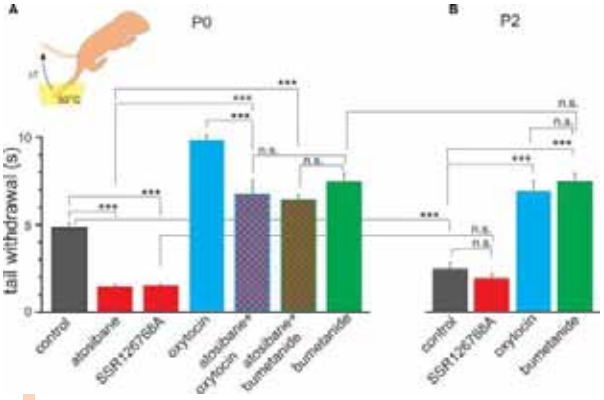
Introduction/ Objective

Delivery is a stressful event associated with high risks to the fetal brain. We propose that delivery is associated with a preparation that reduces these risks and therefore these natural adaptation mechanisms must be preserved and reinforced in order to reduce the likelihood of early insults. Studies performed in this lab over past 2 decades have identified basic mechanisms underlying the brain function early in development including the perinatal period. One of the principal elements determining the developmental difference is a paradoxical excitatory action of neurotransmitter GABA via GABA(A) chloride permeable receptor-channels. More recently, we have demonstrated that GABA transiently switches its action from excitatory to inhibitory during birth. This switch is due to the reduction of $[Cl^-]_i$. We have also shown that maternal oxytocin plays the key role in this neonatal switch. These findings provide basis for our hypothesis of the fetal brain adaptation to delivery, in which the key mechanism involves oxytocin-mediated reduction of $[Cl^-]_i$ and inhibitory switch of GABA signaling.. Finally, we also explored the hypothesis that oxytocin exerts analgesic actions on newborns during delivery.

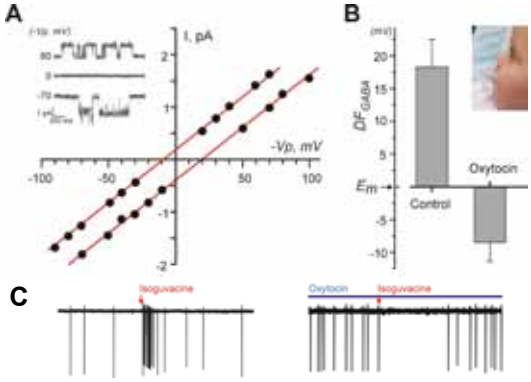


Newborn Analgesia Mediated by Oxytocin during Delivery

The mechanisms controlling pain in newborns during delivery are poorly understood. We explored the hypothesis that oxytocin exerts analgesic actions on newborns during delivery. Using a thermal tail-flick assay, we report that pain sensitivity is two-fold lower in rat pups immediately after birth than 2 days later. Oxytocin reduced depolarizing DFGABA in isolated neonatal trigeminal neurons. Therefore, endogenous oxytocin exerts an analgesic action in newborn pups that involves a reduction of the depolarizing action of GABA on nociceptive neurons.



Important role of GABA in human brain maturation and its modulation by oxytocin



Oxytocin changes the chloride gradient, and therefore the driving force of GABA from depolarizing to hyperpolarizing, in human dysplastic tissue. (A) Current-voltage curve of an individual GABA channels of pyramidal neurons (B) mean curves. (C) GABA excites neurons in dysplastic tissue but inhibits them in the presence of oxytocin.

Conclusion

Therefore, the same hormone that triggers delivery also acts as a natural pain killer revealing a novel facet of the protective actions of oxytocin in the fetus at birth.

CONTACT :

Pr. Ben-Ari
INMED- U901
Email: ben-ari@inmed.univ-mrs.fr

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• Effects of oxytocin on GABA signalling in the foetal brain during delivery. Khazipov R, Tyzio R, Ben-Ari Y. Prog Brain Res. 2008;170:243-57.

•Newborn Analgesia Mediated by Oxytocin during Delivery. Mazzuca M, Minlebaev M, Shakirzyanova A, Tyzio R, Taccola G, Janackova S, Gataullina S, Ben-Ari Y, Giniatullin R, Khazipov R. Front Cell Neurosci. 2011 Apr 12;5:3