

Oxytocinergic System: A Proposal

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Received: April 17, 2018; **Accepted:** May 07, 2018; **Published:** May 18, 2018

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Introduction

Since 1910, when Ott and Scott [1] published their discovers about the oxytocin participation in milk ejection, the comprehension about function and role of oxytocin in several physiological functions didn't stop enlarging and growing. In birth, through his action over uterus contractions, in uterus contractions in women's orgasm and men's erection [2,3], for instance. However, this approach always considers its peripheral effects. After this, some oxytocin effects had been reported to have actions over behavioural traits, like we can see in publishings of Pedersen and Prange [4] and Winslow and co-workers [5], reporting the oxytocin actions over, respectively, maternal behaviour and pair bonding. Since then, the increasing data about the oxytocin's function in behaviour and its central action can't be ignored. In this short proposal, we'll consider the opportunity or utility of thinking about oxytocin as a system, instead of a single neurotransmitter.

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Neurotransmitter or Hormone: Central and Peripheral Actions of Oxytocin

Once a molecule could have his function defined through the way it acts over the organism, not for his special chemical properties we can think about oxytocin as a hormone or neurotransmitter. If it is released into the bloodstream and have his effects on distant organs, we used to consider a particular molecule a "hormone". If this release takes place in a close and specific locus, very close to the releasing point and with specific effects, we used to consider this molecule a "neurotransmitter". So, oxytocin has both functions and its neurotransmitter action has been heavily and abundantly reported in academic publishing since decades ago to more recent studies [6-10].

More recently we found the oxytocin participation in broader traits, as social behaviour [11-13] in a great spectrum of functions and actions, like affiliative and romantic behaviours [14], empathy [15,16] or the oxytocin's effect in social contact [17,18] and the benefits of oxytocin-releasing over stress [19,20]. This kind of publishing list goes far and far [21].

Special mention to the Porge's work [22], who assembled great amount of data about a social behaviour system, including a particular theory that gathers these results in a comprehensive whole, presenting the idea that the mammals have three systems: social engagement system (relax and interact, oxytocin being the main neurotransmitter), mobilization system (to face the challenges, stress-like reactions) and immobilization (feigning

death, passive avoidance). In the same direction, we have the Cozolino works [23], who consider the human relationships in a neural point of view, presenting the importance of oxytocin in attachment too. There is a great number of publishing about the importance of oxytocin in social behaviour or even and especially the importance of this molecule to regulate stress reactions in a very beneficial way, in this way our research about oxytocin effects on stress reaction in a model of social stress: the findings were indicative that oxytocin exerts an inhibitory effect on cortisol levels, pointing oxytocin have an inhibitory effect over stress reaction [24].

In a very informative and insightful publishing, Lee and co-workers [25] reviewed the actions of oxytocin and noticed that all these actions can be understood under a single line: interaction, social behaviour, friendship, bonding, reproduction and nurture. In this line of thinking they consider oxytocin "the great facilitator of life" (indeed, the title of his article).

Reasons for an Oxytocinergic System Research

Some consider this kind of proposal simply "philosophical", or, in other words, purely logical questions with no empirical consequences. We consider it in a very different way. When you think about dopamine like a "rewarding system" we can

understand a lot of behaviours better, like addiction or the search for something “better” in human behaviour. Or when we consider the clinical approach of serotonin, we think better when we consider how it can be relevant to the human mood with great consequences for the affective disorders treatment. This progress does not come considering simply or uniquely a molecule effect, isolated from a class or behaviour that we have studying at the moment. When we think of emotions in the context of mammalian survival we can understand its action much better and in an insightful way, like in Panksepp analysis [26,27].

Bringing to the discussion Nicholas Tinbergen's teachings [28], the researchers must always have in mind the different classes of causes. Considering the action of a single molecule the researcher is in the field of “proximate explanations”. And when the researcher considers a “system”, involving a certain class of behaviour, he is able to step forward to “ultimate explanations”, what brings the full picture. So, it is not a simple matter of “philosophical” question, but the very ground of Evolutionary Psychology. Not considering this can bring a lot of unfortunate misleading and misinterpretation of the results.

It is so because we are trying to understand an organism, not a single chemical interaction isolated from the context where it happens – the animal itself (despite the fact that without understanding the chemical interaction we can't understand the whole). Simplifying the complex to achieve a better comprehension of the whole is an approach that has brought to us much of our actual knowledge [29]. So, when we have solid material and information about a molecule and its action through a range of functions and behaviours, and we can see that these actions belong to the same class, is time to consider if we don't have a “system”.

Which advantage does it bring to us?

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The same that we have found in considering a “noradrenergic system” or a “dopaminergic system”. A concept like “oxytocinergic system” makes question formulation easier formulating questions, design experimental essays and the interpretation of the results can be much more accurate [30].

Conclusions

The research about complex behaviour has had a great benefit and improvement when we consider not just a punctual effect of a molecule, but its action in a broader context. Why not think about oxytocin as a system with a particular function and purposes instead of a simple molecule? It is time to change it and subscribe “oxytocin” officially a system of social behaviour with great function against the hazardous chronic stress effects. We say “officially” because it already happens informally. Despite in scientific publishing, one doesn't find the expression “oxytocinergic system” we think about oxytocin as a system of social behaviour. It seems to us that is a great advance and means a guidance for the future research and discussion of the results of essays and can put the question that drives the research in a more accurate way. Adding to it, this allows the approximation of social issues and psychological questions to the laboratory, what we can see – very richly in stress studies, for instance.

We also consider it could be a great progress for the teaching and training of students in the field, presenting the subject in a more organized way allowing a deeper understanding of the architecture of behaviour, linking it with the purposes of life and the general lines of the biological way of thinking.

After all, the understanding of the particular effect of a molecule only gets this true meaning when we consider the broader effect in a singular class of behaviour that have this purpose in the pursuit of living well. And in its lays the ultimate porpoise of the scientific labour: the understanding and improvement of the well-being with significance.

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