ARE SOCIAL EXPERIENCES SHAPING OXYTOCIN AND RESILIENCE?

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Overview

• Social needs: born to connect
• Brain: experience-based development
• Oxytocin
  – what is it?
• How social experiences shape our endogenous oxytocin system
  – Impact of adversity
• Outcome: environment impacts on oxytocin system
Role of early social experiences

Babies are ready to connect: does someone respond?

• Early experiences shape expectations
  – attachment but also affect biological systems.
• Understanding still growing

A secure base has a positive effect on behaviour, but also brain development, stress regulation, neurotransmitters ....

• Key question: what is good enough to have a normal development?
• Start at the other end: what is known to impact?
Experience-based development

• Animals and humans need social experiences:
  – You need warmth and responsive parental care
  – You need play and interaction with peers
  – You need to learn how to respond to situations

Result is adaptive behaviour,
  – Ability to predict situations
  – Impacts on developing stress system
  – Impacts on developing brain and regulatory systems (animals and humans)
How is development impacted?

Are these early experiences translated into
- receptor numbers and location?
- how neurons connect?
- how genes are read?
- set points and responsiveness of regulating systems?
- responsiveness of immune system?...

Probably all of the above...

After birth human brain still matures and set points determined in experience-dependent manner.

Your body has a memory too... Some components remain plastic through life, others only in specific critical time windows.

(Johnson and Buisman-Pijlman, 2016)
Impact of early life adversity

• Adversity impacts on many aspects of child health and wellbeing, also into adulthood
• Mental health problems and addiction higher in people with trauma, abuse, neglect and other adversity
  – Impact yes/no versus cumulative
  – Who is less affected?
  – What is the biological fingerprint?
• Social deprivation linked to lower levels oxytocin

My interest is oxytocin.
What is oxytocin?

• Neuropeptide and hormone
• Present in women and man
• Produced in PVN Hypothalamus to blood and brain
• Oxytocin has OXT receptors in the brain and body
• Basal release and triggered release
• Increased release:
  – birth
  – Lactation
  – Social contact, hugs
    • Parent child contact
    • friends
  – Stressful situations and fear
Wide range of effects...we are still learning

Helps people live in close communities and care for others:

• Many studies looking at
  – Prime for bonding
  – Increased trust
  – Increased awareness of social cues
  – Increased salience of social contact
  – Decreased anxiety
  – Decreased pain
  – Increased cognitive control
  – Increased social cognition
  – Decreased general cognition
  – Decreased the effect of drugs
  – Decreased withdrawal effects
Oxytocin system

- Peptide released into blood and diffuse into brain
- Oxytocin receptors in body and brain

So local oxytocin receptor activation explains effects?
- No
- Plus effects are context dependent
The wider reach of oxytocin...

The interactions may explain the large range of behaviours influenced by oxytocin.

A **fine-tuned** interaction with feedback loops likely optimal.

Large individual differences in oxytocin levels.

Oxytocin levels context specific (alone, friend).

Result of activation of other systems?

**Buisman-Pijlman et al. 2014**
Balance between systems important

Optimal function

Less optimal development....

What determines balance? Impact of social experiences and trauma?
Origin of individual differences in oxytocin

**Individual difference**

- Genetic differences in Oxytocin receptors and methylation impact on behaviour
- Gender differences exist (estrogen)
- Clinical populations have different oxytocin levels
- Oxytocin neurons and receptors still change at least in first 3 years
- Adversity, stress and drugs can affect oxytocin levels
- Timing matters

Hypothesis based on literature review
Example of alcohol use as outcome (Buisman-Pijlman et al., 2014)
Where to start...

What we don’t know

• Development experience dependent manner...but:
  – What is the normal range in man and women, and kids...?
  – Why the large individual differences?
  – What is a maladaptive range?
  – How long does the system remain plastic?
  – How severe does adversity need to be to impact behaviour?
  – Can we truly normalise maladaptive levels?
  
  – Can we use intranasal oxytocin to improve function?
  – What is impact of chronic oxytocin administration?
  – What is impact of this in kids?
Develop research tools

Develop saliva sampling for oxytocin in lab:
- Saliva collection in babies (passive drool)
- Elisa analysis of saliva samples (low level OT)

Develop task to observe interaction: nappy change
Mildly stressful but authentic

Adapt objective scale to score observed behaviour
Feeding scale by Foss (1995) adapted as it looks at child behavior, parent behavior and how they interact.
- Score blind from video: gaze, touch, vocal, interaction
- Parenting can take many forms:
  - Responding to child trying to connect
  - “Non-functional” communication and touch
  - Responding to needs
  - Task focused
  - Rough or harsh
Studies

Aim 1: establish saliva oxytocin measurement in Adelaide
Aim 2: test a bonding measure that is objective and simple

Feasibility study oxytocin and bonding perinatally (N=8)
- Trimester 3 measure oxytocin and bonding (midwifery WCH)
- Day 3: oxytocin mums and bubs pre-post interaction
- Using scale describing mother and child communication
- Effect of drug use during pregnancy....difficult

Feasibility study oxytocin and bonding in infants (N=9)
- Use Mother-child health check in northern suburbs (CYH)
- Mother-child interaction in 6-12 month old
- Pre-post measurement of oxytocin
- Scale showed large range of parenting behaviour
- Observered behaviour did not correlate with questionaires
- Low participation through CYH
Healthy young women

Aim 3: establish saliva oxytocin range and confounders

Study oxytocin in healthy women 18-40; N=53
– One time point
– Focus on possible confounders
  • Profile of Mood States (POMS), Perceived Stress Scale (PSS-4), and Beck Depression Inventory-II (BDI-II) scales
  • Menstrual phase and contraception used
  • Past month use of alcohol, nicotine, drugs

– Median age 21
– Little ethnic diversity
– Alcohol use common, no correlation
– Oxytocin mean 453.34 pg/ml
  • Wide range
  • No clear confounder
– Further leads
  • Correlation with mood?
  • Contraception use?
  (Edwards, 2015)
Future

Great interest in oxytocin as mediator of adversity and as treatment.

• Impact of oxytocin administration during birth on bonding and oxytocin levels (PhD student UniSA)
• Study birth cohort data to pinpoint impact of OTR genes and adversity on oxytocin and wellbeing later (UK)
• Study populations at risk of adversity and oxytocin (Israel a.o.)
• Study use of oxytocin in drug using population to reduce anxiety (UK)

....different studies can provide different answers. Large data sets and indepth child studies essential.
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Great overview ABC Catalyst
http://www.abc.net.au/catalyst/stories/4402591.htm