Oxytocin: could the 'trust hormone' rebond our troubled world?

Lack of trust is at the root of many of the world's problems, says American neuroeconomist Paul Zak, who claims to have found the brain chemical responsible for empathy. But could oxytocin really help to solve social issues?

Mark Honigsbaum
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Paul Zak believes oxytocin could help give people more empathy. Photograph: Bryce Duffy

Listening to Paul Zak extol the virtues of oxytocin, the "love hormone", is like hearing a preacher sing the praises of the Promised Land. His idea of a harmonious oxytocin-fuelled society is so seductive you find yourself almost praying it were true. At the same time, you cannot help but wonder if it might be an illusion.

Oxytocin is best known for its use in inducing labour. However, according to Zak, the director of the Centre for Neuroeconomics at Claremont Graduate University, California, it is also the "social glue" that binds families, communities, and societies, and fosters trust between strangers.

To illustrate his point, at a recent appearance at TED Edinburgh, Zak spritzed the backstage staff with oxytocin, prompting a spontaneous outbreak of group hugging. Indeed, such is Zak's faith in the bonding hormone that his licence plate reads "oxytosn". When he texts me to agree a time for our interview, the message reads "From Dr Love's

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iPhone".

When we finally speak, Zak tells me that "oxytocin is primarily a molecule of social connection. It affects every aspect of social and economic life, from who we choose to make investment decisions on our behalf to how much money we donate to charity. Oxytocin tells us when to trust and when to remain wary, when to give and when to hold back."

But of all Zak's claims, perhaps the one with the most profound social and economic implications, if true, is his assertion that oxytocin is the "essence of empathy". Indeed, Zak believes that his research provides a scientific basis for Scottish Enlightenment thinker Adam Smith's insight that humans are essentially "other-regarding" creatures, imbued at birth with a capacity for "fellow feeling" ("Even the greatest ruffian," Smith wrote in 1759, "is not entirely without it.")

"It's the ultimate moral molecule," says Zak, who describes himself as a "born-again Smithian".

In a summer punctuated by the horrific massacre in Norway and the shocking scenes of destruction and looting in London and other British cities, that claim will strike many as optimistic. But Zak goes further, arguing that many of the social and political issues that currently seem so intractable could be solved if only we could find a way of raising people's basal levels of oxytocin.

As has been demonstrated at Zak's lab in California, one way to achieve this is by getting volunteers to inhale on an oxytocin nasal spray. But trust can also be engendered by less invasive techniques, such as a 15-minute massage or by logging on to social media – practices that Zak has shown also elevate blood oxytocin levels; on a society-wide level, he argues, a similar effect could be achieved by reducing disparities in income, investing in education, and promoting greater freedom and opportunity.

The key, he says, is to kickstart a brain circuit called HOME (human oxytocin-mediated empathy). But can it really be that simple? As the London riots demonstrated, bonding with strangers and trusting the instincts of the herd can lead just as easily to bad behaviour as good. Besides, what does Zak's research tells us that we don't already know: if you're kind to strangers, then your kindness will be reciprocated? Isn't that the message of every great world religion from Christianity to Buddhism?

"We don't need the glamour of neuroscience to tell us that Smith's observations about human nature are correct," argues Raymond Tallis, the author of *Aping Mankind: Neuromania, Darwinitis and the Misrepresentation of Humanity*. "What is missing in this research is the sense that economic decisions and trust are based on one's interactions at the whole person and the whole community level. The brain is just the middle man."

Oxytocin, an extract from the human posterior pituitary gland, was discovered in 1909 when the British pharmacologist Sir Henry H Dale found it could contract the uterus of a pregnant cat. He named the tract oxytocin, from the Greek for "quick" and "birth". Within two years, doctors were using oxytocin to bring on childbirth contractions. Dale later discovered that oxytocin stimulated the release, or let-down, of mother's milk by contracting the smooth-muscle cells around the mammary glands.

Today, synthetic oxytocin, also called Pitocin or Syntocinon, is often used to induce labour and to help new mothers who have trouble with milk let-down. Oxytocin is also given to women just after birth to prevent postpartum haemorrhage.

By the 1970s, scientists had realised that oxytocin was also a

neurotransmitter that acted on the limbic system, the brain's emotional centre. The game-changing insight, however, came from animal studies at the University of Maryland showing that oxytocin played an important role in fostering bonding and monogamous behaviour in prairie voles. In addition, oxytocin has been shown to facilitate nurturing behaviour in mice and rats: when oxytocin was blocked, the rodents stopped caring for their young and displayed signs of "social amnesia".

When Paul Zak, a mathematician and economist by training, stumbled upon this research in the 1990s he had an "aha" moment: the animal studies seemed to describe emerging behaviours of trust and cooperation seen in humans. Like others in his profession, he had grown frustrated with classical economic models that assumed that humans were rational actors who always sought to maximise their individual gains. In his experience, this was not how most people made decisions. He set out to replicate the animal experiments on volunteers engaged in monetary games designed to elicit trust, and then tested their blood for oxytocin. He wondered if the human subjects would show a similar spike in oxytocin?

Shortly after being granted tenure in 2001, Zak told the dean at Claremont that he wouldn't be publishing for a while but instead had acquired a centrifuge and cold freezer for storing blood products. The dean was sceptical. "He told me that I was doing 'vampire economics'," recalls Zak.

There are many variations of the "trust game" but the basic idea is that a person (player one) is given some money and told to send a portion of it to a second person (player two), who has a one-off choice to either accept or reject the proposal. If player two rejects, neither player receives anything. If the player two accepts, the money is split according to the proposal. Typically low offers, less than a third of player one's endowment, are rejected as stingy, ensuring that both players get nothing.

To test reciprocity, the game is varied so that both players begin with an equal endowment, £10 say, but this time player one's gift is tripled, and player two is then given the choice of sending some money back to player one (the exchanges are conducted via computer to ensure anonymity). For example, player one offers £3. Player two now has £19 (£10 plus three times £3) and if he were to repay player one's generosity by, for instance, sending him £4 back, player one would leave the game with £11 and both would be better off. In neuroeconomic parlance, the gift from player one is a "trust signal" that prompts player two to reciprocate in kind.

When Zak tested the blood of players who had demonstrated trustworthy behaviour, he found that their oxytocin levels had increased in proportion to the monetary transfer. When he tweaked the experiment by making the transfer amount dependent on the random draw of a ping-pong ball, he found that those who were trusted had oxytocin levels 41% higher than the controls. In other words, it was the signal of trust and not the receipt of money that had prompted the surge of oxytocin.

While this was strong evidence of a correlation, however, it was not proof. Zak re-ran the experiment but this time got half the participants to inhale oxytocin 50 minutes before playing (despite claims that oxytocin induces loving feelings similar to ecstasy, in fact most people notice no change in their affective state). Those who received the oxytocin spray sent back 17% more money compared with the placebo group. Not only that but the number of people who showed maximal trust – sending their entire endowment to a stranger – increased from 21% in the placebo group to 45% in the oxytocin group.

He has achieved these results in repeated tests, including variations of the game to check for cognitive impairment (in one, players are asked to donate earnings to the Red Cross or the Red Crescent Society: oxytocin

prompts 48% higher donations but only to the Red Cross, a charity with which north American participants are more familiar and comfortable).

Zak's conclusions are unequivocal. "Trust is chemical," he writes in one paper. "Social norms, one's development history, and even current events affect trust, but these do so by modulating OT release." Or, as he put it to me via his Love phone: "HOME is a positive feedback loop. It literally feels good to do good."

But Zak's proselytism does not end there. In recent papers and a forthcoming book, *The Moral Molecule: Vampire Economics and the New Science of Good and Evil*, Zak argues that oxytocin holds the key to human morality, policing the "self-other divide" and subtly prodding us towards virtuous behaviour.

For Zak, oxytocin solves the puzzle of why, in practice, people tend to be more trustworthy than the classic economic model predicts. But if we are wired for trust rather than naked self-interest and the oxytocin system is really so powerful, why isn't everyone virtuous all the time, and why did people in the riots trash and burn their own neighbourhoods?

Zak invokes another hormone: testosterone. At times of stress, he argues, we are physiologically in "survival mode", prompting the release of testosterone and its bioactive metabolite, DHT. These stress hormones prevent oxytocin from binding to brain receptors, tipping the balance towards distrust and away from pro-social behaviour. This process, he says, explains "the petty evils normally virtuous people exhibit". In some cases, this bad behaviour may also be exacerbated by genetic and environmental factors.

In his blood-test experiments, for instance, Zak found that 5% of participants did not release oxytocin when trusted. These individuals, he says, "have some of the traits of psychopaths". There is also evidence that the oxytocin receptors in rats' forebrains tend to atrophy when maternal nurturing is "insufficient". Furthermore, he found that women who had been abused in childhood tended not to release oxytocin when prompted by trust signals in the games.

In the case of the riots, Zak believes that most of the looters were probably "neurologically intact". The most likely explanation for the mass criminality was that the line as to what was morally acceptable within social groups in the affected areas shifted, prompting the rioters to identify with "bad" influences. In other words, it was a perfect storm of testosterone and "the wrong kind" of oxytocin.

It is at this point that, according to author Raymond Tallis, the alarm bells should be ringing. "My sense of the riots is that the breakdown in trust didn't result from a sudden, catastrophic oxytocin shortage but relates to such things as education and parental attitudes. In other words, there's nothing that neuroeconomics can tell us that isn't better explained at a sociological level."

Zak argues that by measuring changes in the blood rather than relying on fuzzy images from brain scans, his research is immune to the criticisms usually levelled at neuroscientists. But Tallis questions whether gauging blood oxytocin levels is a substitute for measuring the presence of the hormone in the brain. "I might be similarly disposed to trust my fellow human beings when I've had a couple of pints of beer," he says. "But it doesn't follow that my whole attitude to being more disposed to others is due to my brain alcohol level. Indeed, another couple of pints on another occasion might have a very different effect."

Tallis's fundamental objection, however, is that the game scenarios employed by Zak and other neuroeconomists do not come close to mimicking real-life economic and social interactions. "I don't have anything against oxytocin *per se*, it's a very fine molecule. It makes breasts secrete milk, it makes uteruses contract, it gives women

orgasms. Does it really need another job?"

This is not the first time neuroscience has waxed lyrical about a brain chemical: similar claims were made about dopamine and serotonin. Indeed, in one paper, Zak appears to hedge his bets by showing that these are also involved in the HOME circuit.

However, Zak's faith is unshaken by the sceptics' objections. "Our experiments are as causal as you can get, and the results have been replicated many times," he tells me. "I wish you were nearby so I could put you on some to see how it feels."

It's a tempting offer.