

# In the Realm of Hungry Ghosts: Close Encounters with Addiction

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## CHAPTER 18 Trauma, Stress, and the Biology of Addiction

### Highlighted Notes

The idea that the environment shapes brain development is a very straightforward one, even if the details are immeasurably complex. Think of a kernel of wheat. No matter how genetically sound a seed may be, factors such as sunlight, soil quality, and irrigation must act on it properly if it is to germinate and grow into a healthy adult plant. Two identical seeds, cultivated under opposing conditions, would yield two different plants: one tall, robust, and fertile; the other stunted, wilted, and unproductive. The second plant is not diseased: it only lacked the conditions required to reach its full potential. Moreover, if it does develop some sort of plant ailment in the course of its life, it would be easy to see how a deprived environment contributed to its weakness and susceptibility. The same principles apply to the human brain.

The three dominant brain systems in addiction- the opioid attachment - reward system, the dopamine - based incentive – motivation apparatus, and the self-regulation areas of the prefrontal cortex — are all exquisitely fine - tuned by the environment.

To various degrees, in all addicted persons these systems are out of kilter. The same is true, we will see, of the fourth brain - body system implicated in addiction: the stress - response mechanism.

Happy, attuned emotional interactions with parents stimulate a release of natural opioids in an infant's brain. This endorphin surge promotes the attachment relationship and the further development of the child's opioid and dopamine circuitry.

On the other hand, stress reduces the numbers of both opiate and dopamine receptors. Healthy growth of these crucial systems — responsible for such essential drives as love, connection, pain relief, pleasure, incentive, and motivation — depends, therefore, on the quality of the attachment relationship.

When circumstances do not allow the infant and young child to experience consistently secure interactions or, worse, expose him to many painfully stressing ones, maldevelopment often results. Dopamine levels in a baby's brain fluctuate depending on the presence or absence of the parent.

In four - month - old monkeys' major alterations of dopamine and other neurotransmitter systems were found after only six days of separation from their mothers. "In these experiments," writes Dr. Steven Dubovsky, "loss of an important attachment appears to lead to less of an important neurotransmitter in the brain. Once these circuits stop functioning normally, it becomes more and more difficult to activate the mind."

We know from animal studies that social - emotional stimulation is necessary for the growth of the nerve endings that release dopamine and for the growth of receptors to which dopamine needs to

bind to do its work. Even adult rats and mice kept in long - term isolation will have a reduced number of dopamine receptors in the midbrain incentive circuits and, notably, in the frontal areas implicated in addiction. Rats separated from their mothers at an early stage display permanent disruption of the dopamine incentive - motivation system in their midbrains.

As we already know, abnormalities in this system play a key role in the onset of addiction and craving. Predictably, in adulthood these maternally deprived animals exhibit a greater propensity to self - administer cocaine.

And it doesn't take extreme deprivation: in another study, rat pups deprived of their mother's presence for only one hour a day during their first week of life grew up to be much more eager than their peers to take cocaine on their own.

So the presence of consistent parental contact in infancy is one factor in the normal development of the brain's neurotransmitter systems; the absence of it makes the child more vulnerable to "needing" drugs of abuse later on to supplement what her own brain is lacking. Another key factor is the quality of the contact the parent provides, and this, as we saw in the previous chapter, depends very much on the parent's mood and stress level.

All mammalian mothers — and many human fathers, as well — give their infants sensory stimulation that has long - term positive effects on their offspring's brain chemistry. Such sensory stimulation is so necessary for the human infant's healthy biological development that babies who are never picked up simply die. They stress themselves to death.

Premature babies who must live in incubators for weeks or months have faster brain growth if they are stroked for just ten minutes a day. When I learned such facts in the research literature, I recalled with appreciation a custom I had often observed among my Indo - Canadian patients during my years in family practice. As they were speaking with me during their early postnatal visits, these mothers would massage their babies all over their bodies, gently kneading them from feet to head. The infants were in bliss. Humans hold and cuddle and stroke, rats lick. A 1998 study found that rats whose mothers had given them more licking and other kinds of nurturing contact during their infancy had, as adults, more efficient brain circuitry for reducing anxiety. They also had more receptors on their nerve cells for benzodiazepines, which are natural tranquilizing chemicals found in the brain.

I think here of my many patients who, on top of cocaine and heroin addictions, have been hooked since their adolescence on street - peddled "benzo" drugs like Valium to calm their jangled nervous systems. For a dollar a tablet, they get an artificial hit of the benzodiazepines their own brains can't supply. Their need for tranquilizers says much about their infancy and early childhood. Parental nurturing determines the levels of other key brain chemicals, too — including serotonin, the mood messenger enhanced by anti - depressants like Prozac.

Peer-reared monkeys separated from their mothers in laboratory experiments have lower lifelong levels of serotonin than do monkeys brought up by their mothers. In adolescence these same monkeys are more aggressive and are far more likely to consume alcohol in excess. We see similar effects with other neurotransmitters that are essential in regulating mood and behavior, such as norepinephrine.

Even slight imbalances in the availability of these chemicals are manifested in aberrant behaviors such as fearfulness and hyperactivity and increase the individual's sensitivity to stressors for a lifetime. In turn, such acquired traits increase the risk of addiction. Another effect of early maternal deprivation appears to be a permanent decrease in the production of oxytocin, which, as mentioned in Chapter Fourteen, is one of our love chemicals. (As noted earlier, oxytocin is not an opioid. Therefore, it has no relationship whatsoever with narcotic drugs like Oxycet or OxyContin ; only the names are similar.)

It is critical to our experience of loving attachments and even to maintaining committed relationships. People who have difficulty forming intimate relationships are at risk for addiction. They may turn to drugs as social lubricants.

Not only can early childhood experience lead to a dearth of “good” brain chemicals; it can also result in a dangerous overload of others. Maternal deprivation and other types of adversity during infancy and childhood result in chronically high levels of the stress hormone cortisol.

In addition to damaging the midbrain dopamine system, excess cortisol shrinks important brain centers such as the hippocampus — a structure important for memory and for the processing of emotions — and disturbs normal brain development in many other ways, with lifelong repercussions.

Another major stress chemical that's permanently overproduced after insufficient early maternal contact is vasopressin, which is implicated in high blood pressure.

A child's capacity to handle psychological and physiological stress is completely dependent on the relationship with his parent or parents. Infants have no ability to regulate their own stress apparatus, and that's why they will stress themselves to death if they are never picked up. We acquire that capacity gradually as we mature — or we don't, depending on our childhood relationships with our caregivers.

A responsive, predictable nurturing adult plays a key role in the development of our healthy stress-response neurobiology. <sup>12</sup> In the words of one researcher, “maternal contact alters the neurobiology of the infant.” <sup>13</sup> (Note that in the human context, “maternal” does not necessarily refer to a female mothering figure or to a biological parent. It can also refer to primary caregivers of either gender.)

Children who suffer disruptions in their attachment relationships will not have the same biochemical milieu in their brains as will their well-attached and well-

nurtured peers. As a result, their experiences and interpretations of their environment, and their responses to it, will be less flexible, less adaptive, and less conducive to health and maturity. Their vulnerability both to the mood - enhancing effects of drugs and to drug dependency will increase.

We know from animal studies, for example, that early weaning can have an influence on later substance intake: rat pups weaned from their mothers at two weeks of age had, as adults, a greater propensity to drink alcohol than did pups weaned just one week later.

“Overall, these studies provide evidence that stress and trauma are common factors associated with consumption of alcohol at an early age as a means to self - regulate negative or painful emotions,” write the ACE researchers.