**Neurotransmitters**

Neurotransmitters are chemicals that transmit impulses between different parts of the brain. Two neurotransmitters are thought to be important in the control of aggressive behaviour:

**Serotonin**

**S**erotonin exerts a calming effect on neuronal firing in the brain. Researchers claim that low levels of serotonin in the pre frontal cortex removes this calming effect, so individuals are less able to control their aggressive responses to emotional stimuli. Research on the role of serotonin in aggression has shown:

**‐ Mann et al (1990):**

The study found that drugs which reduced serotonin increased hostility and aggression in males (but

not females).

**‐ Scerbo and Raine (1993):**

This meta-analysis supported a link between low levels of serotonin and aggression.

**‐ Bond (2005):**

The study found that antidepressants which increased serotonin reduced irritability and impulsive

aggression.

**‐ Raleigh et al (1991):**

Vervet monkeys were given Tryptophan (a chemical that increases serotonin). The study found that

monkeys who were given higher levels of the chemical were less aggressive and vice versa.

‐ This study raises questions regarding ethical issues. (Potential IDA).

**‐ Ferrari et al (2003):**

A rat was allowed to fight at the same time for 10 days. On the 11th day, that rat wasn’t allowed to fight. The researchers found that serotonin and dopamine levels in the rat’s brain had decreased significantly, suggesting the rat’s brain had altered in order to prepare it for the onset of aggressive behaviour.

‐ **Baddaway (2006):**

Found that alcohol abuse caused major disturbances in serotonin metabolism. Alcohol abuse often leads to aggressive behaviour. This study therefore also demonstrates that changes in serotonin levels can lead to aggressive behaviour.

**- Mann et al (1996):**

Found that suicide victims with high serotonin receptor density chose more violent methods of suicide.

**Dopamine**

Research on the role of dopamine in aggression has shown:

**‐ Lavine (1997):**

Amphetamines which increased dopamine increased aggressive behaviour.

**‐ Buitelaar (2003):**

Anti psychotics which reduced dopamine reduced aggressive behaviour amongst violent

delinquents.

**‐ Couppis and Kennedy (2008):**

Dopamine is produced in response to rewarding stimuli such as food. The researchers gave dopamine to mice, and found that this activated a reward pathway in the animals’ brains. They concluded that people deliberately seek to behave aggressively because they find it rewarding.

**Evaluation of neurotransmitters as an explanation of aggression:**

+ Clear empirical research support.

‐ Much of the evidence on the link between serotonin/dopamine and aggression is correlational‐ we cannot say there is a cause and effect relationship. There may be a third variable which affects aggression levels. For example, serotonin and dopamine control other behavioural functions‐ it may be their effect on these functions which cause aggressive behaviour.

**Hormones**

Hormones are produced by the endocrine system to regulate and control bodily functions. Two hormones are believed to be important in the control of aggressive behaviour:

**Testosterone**

Testosterone is produced by men in the testes and in smaller amounts by women in the adrenal gland (through the conversion of DHEA). Testosterone is known as an “androgen hormone”‐ it produces male characteristics. Research on the role of testosterone in aggression has shown:

**‐ Archer et al (1991) and Book et al (2001):**

These meta analyses found a weak positive correlation between high testosterone levels and aggression.

**‐ Lindman et al (1987):**

The study found a positive correlation between high testosterone levels and aggression in drunken males.

**‐ Wagner et al (1979):**

The researchers castrated male mice, and found that the mice displayed decreased levels of aggression. When injected with testosterone, their aggression levels increased.

**‐ Olweus et al (1980 + 1988):**

Samples of institutionalised male delinquents were compared to samples of male students. The delinquent sample showed slightly higher levels of testosterone, and of this sample, those with a history of violent crime showed higher levels of testosterone. However, these relationships were not statistically significant. However, the study also found that adolescents with higher levels of testosterone were more likely to respond aggressively to pressures from their teachers/peers.

**‐ Kreuz and Rose (1972):**

The study found no significant differences in testosterone levels amongst 21 males who had been classified as “fighting” or “non fighting” whilst in prison. However, 10 of these prisoners who had a history of violent crime during adolescence had higher testosterone levels than the 11 without such a history.

**Cortisol**

Cortisol is produced by the adrenal medulla to calm the body after the stress response. There is a link between cortisol and aggression. Cortisol is thought to lead to aggression because it is important in inhibiting other hormones which contribute to aggression.

**‐ Virkuunen (1985):** The study found low levels of cortisol in habitual violent offenders.

**‐ Tennes and Kreye (1985):** The study found low levels of cortisol in violent schoolchildren.

**‐ McBurnett et al (2000):** This study examined 38 boys aged 7‐12 over a period of 4 years who had been referred to a clinic for problem behaviours. Boys with lower cortisol levels displayed x3 the number of aggressive symptoms and were consistently named as the most aggressive by their peers.

**‐ Gerra et al (1997):** The study found that participants with high levels of cortisol displayed higher levels of aggression.

**Evaluation of hormones as an explanation of aggression:**

‐ Some studies have found a link between cortisol/testosterone levels and aggression, while others have not, meaning the relationship between these two variables is unclear. Much of the research in this area is based on small samples from male prisons and provides correlational evidence only.

‐ Some researchers argue that testosterone is more associated with dominance, which in turn leads to aggressive behaviour.

**General evaluation of neurotransmitters and hormones as an explanation of aggression:**

‐ Much of the research into the link between neurotransmitters/hormones and aggression has been carried out in Western societies using male participants, meaning there are clear gender and cultural bias in this area.

‐ Research carried out on animals difficult to generalise to humans. Some of the studies in this field using animals also raise ethical issues.

‐ Reductionism: Examining the effect of biology alone on our behaviour is oversimplified.