



Androstadienone and Human Behavior - A Deep Dive Into Its Pheromonal Effect Therapies

History

Androstadienone is an endogenous steroid which has a close structural relationship to testosterone, the most common male sex hormone, from which it differs only by the removal of 2 hydrogen and 1 oxygen atom. The compound is produced from androstadienol by 3β -hydroxysteroid dehydrogenase, and can be converted into androstenone, all of which belong to the class of male sex hormones and pheromones called the 16-androstenes.

In contrast to the regular male sex hormones (Androstenediol, Testosterone, Dihydrotestosterone etc.) this class of compounds seems to have no anabolic or androgenic effects. However, it was described as a potent pheromone. It is often sold in male fragrances to increase sexual attraction from females to males in humans.

Androstadienone, in picogram quantities, has been shown to have "significant reduction of nervousness, tension and other negative feeling states" in female subjects.

The related compound Androstenone is sold as a commercial product for pig farmers to increase the chance of successful artificial insemination for female pigs.¹

Human studies

Effects on females

There is quite a lot of experimental studies of androstadienone on the behavior of human subjects due to its proposed role as a sexual pheromone. However, few is known about its effects on animals and about the hormonal effects of this compound.

According to a study from 2008, it was the most studied pheromone

at the time.² The same study found men were rated more attractive when assessed by women who had been exposed to androstadienone, an effect that was seen in other studies as well. The results suggest that androstadienone can influence women's attraction to men. Females which were exposed to androstadienone did also show lower levels of serum cortisol, a biological marker for stress, indicating a stress relieving effect of the compound.^{3,4} A further study showed a positive mood change in women when being focused.⁵ The pheromone was also found to make women more generous.⁶

Effects on males

In men, androstadienone exposure increased cooperative behaviour in an experimental game, but also showed increased stress reactions under specific conditions.^{7,8} Another study

however showed a decrease in cooperative behaviour.⁹

Further results indicate that androstadienone increased the perceived dominance of men's faces in other men, specifically among men with high social anxiety. These findings suggest a direct influence of androstadienone on dominance perception.¹⁰ This finding of faster and more anxious reaction to faces was partially attributed to activating the human fear system and processing socially relevant cues by regulating responses to faces.

Effects on both sexes

There seems to be a diversity in individuals in regard to their sensitivity to androstadienone. Some individuals are able to detect the compound at much lower levels in the air compared to their peers. It is however not clear if these individuals are also affected by the behaviour effects of the compound in a more pronounced way.¹¹

A study in 102 teenagers found that androstadienone smell was more easily recognized by females, but all subjects showed increased verbal skills and general olfactory function after exposure to androstadienone smell.¹² In a direct comparison between androstadienone with androstenol and muscone (a compound with similar smell but unrelated structure) showed that in contrast to these two compounds androstadienone significantly promoted positive mood on both males and females.¹³ Other studies found androstadienone increases mood

only in women.¹⁴

In another experimental study in 50 men and women, the smell of androstadienone demonstrated a greater allocation of attentional resources towards emotional information. It also led to a high self-reported feeling of attentiveness.¹⁵ It seems clear that both sexes are influenced by the exposure to androstadienone, which was also suggested by functional MRI studies on both sexes, which showed a clear activation in the hypothalamic region of the brain. In women, this activation was stronger though.¹⁶ Other studies showed activation of brain cortex regions responsible for various aspects of social cognition and attention.¹⁷

One non-experimental study has claimed that in adults, a greater sensitivity to androstadienone was associated with richer social lives: having more friends, increased communication with close friends and family, and more participation in organized social events and volunteer activities. It was also associated with more recent sexual activity, more frequent sexual thoughts, and viewing sex as an important part of life. General olfactory function did not explain these associations, supporting a specialized function for this pheromone during everyday life, and expanding its role to social life as well as sexual behaviour, likely mediated by enhanced attention to emotional information.¹⁸ A study suggested women rated more masculine faces as more attractive when exposed to androstadienone.¹⁹

Androstadienone was also investigated in association with voluntary arm movements of 62 participants (30 women) in response to happy and angry facial expressions. The participants' reaction speed was accelerated when exposed to androstadienone, especially when reacting to angry faces. This observation may indicate an androstadienone-related activation of the fear system leading to faster responses to threat signals, assuming an enhanced allocation of attentional resources toward threat-related social cues.²⁰ Further studies showed similar results.^{21,22}

In general the findings show that the effects of androstadienone are quite complex and context dependent. Androstadienone acts in a sex, task and emotion-specific manner and likely modulates a number of cognitive processes.²³

However, few studies also claim that androstadienone did not produce any significant social effects, calling the results of previous studies into question.^{24,25} Other studies show clear results of androstadienone, but report opposite effects to some of the previous findings.^{9,26-28}

Conclusion

A non-conscious application of androstadienone mediates human behaviour and psychophysiology with different responses and activations in men and women. In general, both sexes are affected, and the presence of androstadienone seems to have a generally promoting effect on mating

behaviour. Results show in males and females, behaviour to cope with sexual competition are initiated by the presence of androstadienone. Women tend to react more favorably and have lower stress in the presence of males. This result has promoted the addition of androstadienone in commercially sold odours and fragrances for men.

Some studies led to conflicting results, but the overall state of research seems to indicate that androstadienone is indeed a human pheromone with reproducible results.

However, the discrepancies in results between various studies further emphasize the need for further research in this area. The mediating mechanisms of these sex and sexual preference-specific effects on behavioral, psychophysiological, and neural processing of androstadienone should form the basis of further research.

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