

Caffeine Does not Activate the Brain Structures Involved in Drug Addiction

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The purpose of the study was to examine the changes in cerebral functional activity measured as rates of glucose utilisation after the administration of increasing doses of caffeine ranging from 1 to 10 mg/kg that are relevant to the daily human consumption. Indeed the mean daily intake of caffeine is 1-2 mg/kg/day for the general population, increases to 2.4-4.0 mg/kg/day in the USA and the UK and reaches even 7.0 mg/kg/day in Scandinavia. It is well known that caffeine stimulates locomotor activity, disturbs sleep and influences mood. With the technique used, the authors were able to confirm the high sensitivity of the caudate nucleus, which mediates locomotor activity, and of the raphe nuclei and locus coeruleus, which mediate sleep and mood to very low doses of caffeine (1 mg/kg). These data are in line with the high sensitivity of the latter functions to caffeine.

The second part of the talk was devoted to dependence. Caffeine has been hypothesized as a potential drug of abuse for over a decade. However since caffeine is not fulfilling enough criteria, it was not considered as a drug of dependence according to the 1992 APA classification. In 1994, Strain et al. found 16 out of 99 subjects that were considered as dependent on caffeine, but most of them had a previous history of drug abuse and a higher incidence of psychiatric illnesses than in the general population. Thus, the possible dependence on caffeine became of great concern among consumers. Here, the authors showed that, at doses ranging from 1 to 5 mg/kg/day, caffeine does not activate functional activity in the shell of the nucleus accumbens, which is the key structure for addiction and reward. The activation of this area occurs only at high doses of caffeine (10 mg/kg) which increase glucose utilisation also in the core of the nucleus accumbens as well as in most other brain regions. This widespread unspecific response is likely to reflect the numerous adverse side effects that occur after the consumption of high doses of caffeine. Likewise, human studies performed by the same group show that 250 mg caffeine given in a cup of decaffeinated coffee do not induce any change in functional activity in the nucleus accumbens while nicotine which has a high addictive potential increases blood flow in that region of the human brain. Thus the present data confirm the well-described sensitivity of motor activity, sleep and mood to caffeine while they do not confirm the addictive potential of caffeine reported in the study by Strain et al. (1994).