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Genetic Canine Agression

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Abstract:
Canine aggression can pose a serious concern for public and animal welfare. Most of what we know about aggression comes from bite statistics, expert opinions and breed-specific aggressiveness. These sources can often be misleading due to biases toward large or powerful breeds. In this review, I will examine a study that suggest a small number of genes control aggression. In these studies a variety of dogs were used. Canine Behavioral Assessment and Research Questionnaire (C-BARQ) and observation were used to determine the aggressive level of each dog. The dogs used in the study were euthanized and their cerebral spinal fluid (CSF) was examined.

Serotonin and Homovanillic Acid Background Information:
5-HIAA is the main metabolite of serotonin. The serotonin transporter (aka SERT or 5-HTT) is a type of monoamine transporter protein that transports serotonin from the synaptic cleft to the presynaptic neuron. Studies in mice show that the length variation in 5-HTTLPR (serotonin-transporter-gene-linked polymorphic region) have been found to partly account for anxiety related personality disorders and it also alters the expression of 5-HTT. Serotonin has been shown to decrease impulsive behavior.

HVA is associated with dopamine levels in the brain. The dopamine transporter (DAT) gene is know to have a variable number of tandem repeat of polymorphism in the 3’ non-coding region. Differences in the repeats have been shown to affect the expression of the transporter and lead to psychiatric disorders.

Methods:
• 21 dogs were included in the aggressive group and 19 were included in the control group.
• The dogs were humanely euthanized
• CSF aliquot no. 2 was used for metabolite analysis
• Concentrations of 5-HIAA, hemovanillic acid (HVA), dopamine, MHPG, norepinephrine were measures with liquid chromatography using electrochemical detection

Results:
• 5-HIAA and HVA levels were lower in dominant-aggressive dogs than the control group (Figure 1)
• Median concentrations for 5-HIAA in aggressive group was 202.0 pmol/ml. The median concentration in the control group was 298.0 pmol/ml.
• Median concentration of HVA in aggressive group was 318.0 pmol/ml. Median concentration for control group was 553.0 pmol/ml
• This finding is consistant with studies in humans, non-human primates and rodents in which low level of 5-HIAA have been found to be associated with aggressive behavior.

References