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Effects of black cohosh and estrogen on the hypothalamic nuclei of ovariectomized rats at different temperatures.

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Abstract

ETHNOPHARMACOLOGICAL RELEVANCE: Cimicifuga racemosa (L.) Nutt. (CR), known as **black cohosh**, has been used in Europe as a medicinal plant for more than a century and its roots have been widely used for the treatment of menopausal symptoms. Remifemin, the main ingredient in liquid or tablet medications prepared from isopropyl alcohol extracts of **black cohosh** rhizome, has also been evaluated in clinical studies.

OBJECTIVES: To observe changes in the expression of the c-Fos protein in the **hypothalamic nuclei** of four groups of **rats**-sham-operated group (SHAM), **ovariectomized** (OVX) group, **ovariectomized** group treated with **estrogen**(OVX+E), and **ovariectomized** group treated with the isopropanol extract of Cimicifuga racemosa (OVX+ICR)-and to investigate the mechanisms of **black cohosh** and **estrogen** that take place in the **hypothalamic nuclei** of **ovariectomized rats**.

METHODS: Fifty **rats** were assigned to each of the four groups and placed in incubators at 4 °C, 10 °C, 25 °C, 33 °C, or 38 °C for 2 h. They were then anesthetized, and their brains were removed after heart perfusion. c-Fos expression in the **hypothalamic nuclei** was evaluated using immunohistochemical methods.

RESULTS: In the median preoptic nucleus (MnPO), ventromedial preoptic nucleus (VMPO), and suprachiasmatic nucleus (SCh) of the SHAM group, in the anterior **hypothalamic** area (AH) and supraoptic nucleus (SO) of all four groups, and in the paraventricular nucleus (PVN) of the SHAM, OVX and OVX+E groups, the c-Fos-positive cell densities all changed in a similar manner: the cell density decreased when the temperature was less than 25 °C and the density increased when the temperature was greater than 25 °C, demonstrating a V-type curve. The

c-Fos density was lowest at 25°C. The other **nuclei** demonstrated irregular changes. The positive cell densities in the MnPO, AH, and PVN of the SHAM, OVX+E, and OVX+ICR groups were greater than the densities measured in the OVX group at all **temperatures**, except 25 °C. Positive cell densities in the SHAM, OVX+E, and OVX+ICR groups were greater than the densities measured in the OVX groups in the MPA at 25 °C, in the VMPO at 4 °C, 33 °C, and 38 °C, in the SO at 4 °C, 10 °C, and 38 °C, and in the SCh at 33 °C.

CONCLUSION: Regardless of the temperature, positive cell densities were lower in the MnPO, MPA, VMPO, AH, SCh, SO, and PVN of the OVX groups in comparison with the densities measured in the same sites in the SHAM group. Following the administration of **black cohosh** and **estrogen**, the positive cell densities in the OVX groups increased and became closer to, or exceeded, those measured in the SHAM group, suggesting that both drugs may act on the **hypothalamic nuclei** and have therapeutic **effects** on menopausal symptoms.

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