Variation of plasma concentration of progesterone in stressed rats present a highly significant increase (74, 83** ± 9, 16 ng/ml) compared to the control (46, 09 ± 7 ng/ml) **(Fig.3)**.

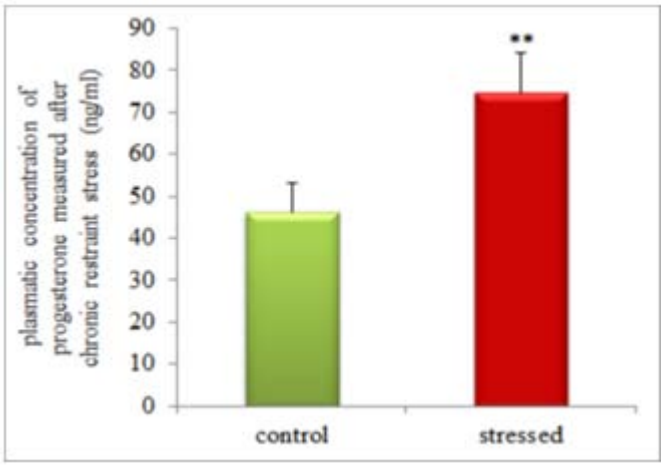

Figure 3: Variation of plasma concentration of progesterone (ng/ml).

(m ± SD; * p < 0.05; **p < 0.01; ***p < 0.001).

4.4 Open Field test (OF Spontaneous locomotor activity in postnatal day 45)

Offspring demonstrated a very significant increase of the distance travelled by females (1535 ± 51.7 cm) and males (1508.3 ± 82.9 cm) of stressed mothers compared to the control females (1196 ± 35.6 cm) and males (1186.7 ± 59.9 cm) respectively. However, there is no significant time spent in the central area of the apparatus compared to the control **(Fig.4)**.

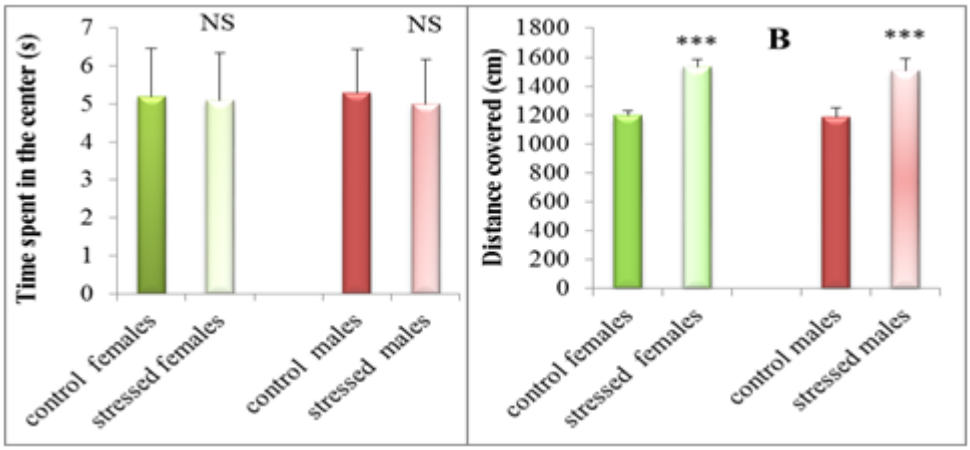

Figure 4: Effects of chronic restraint stress on behaviour of the offspring evaluated in the open field test in post natal day 45. Time spent in the center (A), distance covered (B) respectively. (m ± SD; * p < 0.05; **p < 0.01; ***p < 0.001)

5. Discussion

Numerous study have been carried out to understand the role of various lifestyle factors contributing to stress and the development of the anxiety-like and the appearance of depression-like behaviour **[3]**. The perturbation in sexual behaviour and the disturbances of the oestrus cycle **[21]**.

This experimentation showed that chronic restraint stress reduced open-arms entry in the EPM, increased immobility in the FST with elevation of plasmatic concentration of progesterone. Results met in the test of EPM suggesting elevated anxiety-like behaviour. In addition, increased immobility in the FST indicating exacerbated despair- like behaviours, suggesting that pathological changes in mood-regulating system might be induced by chronic restraint stress CRS. Stress generates behavioural modifications, and it would be responsible, at the Man, many psychiatric disorders such as the depression or the disorders related to the anxiety **[22]**. Researchers **[9,23]** noted that chronic restraint stress induced anxiety- and depression-like behaviours in rodents, reduced open-arms entry in the EPM which indicate a general motor activity **[24]**, consistent with our results. However, other studies have not confirmed such changes after CRS **[10, 25]**, but Contradiction in results might be attributed to the total duration of CRS, to the experimental procedures (e.g., light–dark phase; during restraint), and genetics factors (sex of the animal), all these might affect behavioural outcomes after CRS **[22]**. Gustavo et al. (2006) **[24]** not found such differences between protocols in the appearing of anxiety when he made a comparison between the acute, sub chronic and chronic stress, all protocols of stress were able to induce significant anxiety levels in elevated plus maze test.

We also demonstrated that restraint stress induced an elevation in plasma concentration of progesterone that can be mediated solely by adrenal gland. The same result was mentioned by Romeo et al. (2004) **[26]**.This result confirms the interaction between ovarian and adrenal steroids and the release of gonadotropin CRH **[27]**, to release ACTH, corticosterone **[28]** and adrenal progesterone **[29]**. Also Guillermo et al. (2011) **[30]** showed after application of

restraint stress an elevation in the level of progesterone. CRH, the main regulator of the HPA axis it controls the use of proopiomelanocortin peptide, by reducing the synthesis of hypothalamic GnRH by redirecting to synthesize ACTH necessary to the maintenance of homeostasis in stressful situation **[31]**. Which result a decrease in pulsatile release of LH **[32]**, this process is independent of the stress-induced cortisol level **[33]**. However, prolonged enhanced secretion of cortisol contributes to the suppression of GnRH pulse frequency, but only in the presence of ovarian steroids **[34]**, and may negatively affect the reproductive function via actions at the hypothalamus (GnRH) as well as impairing LH release induced by GnRH **[35]**.

Studies on ovariectomized sheep indicated that psychological stress or increase in plasma cortisol during psychological stress **[36]** acutely reduces LH pulse amplitude by two mechanisms. First mechanism involves cortisol action via type II glucocorticoid receptor to inhibit pituitary responsiveness to GnRH, and second by changes of hypothalamic GnRH secretion (changes in GnRH pulse amplitude and pulse frequency). This reduction contribute to the elevation indirectly of progesterone. Also chronic heat stress has been shown to be associated with elevated serum progesterone concentration in cows **[37]**. And elevated progesterone values in sheep and cattle have been associated with depressed gonadotrophin release **[38]**.Therefore, the depressed luteinizing hormone surge in ewes exposed to chronic heat stress **[39]** could be due to elevated progesterone concentration. Other investigators previously have observed that swim stress can increase progesterone as well as corticosterone secretion. Although progesterone has been considered only as a female reproductive hormone, elevated levels of plasma progesterone accompany the increase in corticosterone after stress in male rats **[40]** and male humans **[41]**. Stress-induced progesterone secretion in male and female rats is derived from the adrenal gland, because the response is abolished after adrenalectomy **[40]**.

Receptors for CRH are identified in most of the female reproductive tissues including the ovary, uterus and placental trophoblast **[42]** .And there is abundant evidence that the gonads affect the way that the HPA axis responds to stress. Van Lier et al. (2001b) **[43]** evaluated the presence of oestrogens receptors in sheep adrenal glands. Ovarian steroids have been found to increase HPA-axis activity, enhance the HPA-axis response to psychological stress, and sensitize the HPG-axis to stress-induced inhibition inhuman and rhesus monkey **[44]**.

Increasing of the distance covered in the open field test after weaning can be explained by the Hyperactivity of the offspring (locomotors). That is associated with a permanent hyperactivity of the HPA axis caused by a disturbance of serotoninergic and dopaminergic system in the central nervous system **[45]**. These changes could be mediated by in utero exposure of the developing brain to elevated levels of maternal glucocorticoids (GCs) secreted during HPA axis activities in mother by stress. That can cross the placenta barrier and reach the developing fetal brain **[46]**. Which they could affect the maturation of the fetal HPA axis and program the responsiveness of the hypothalamic–pituitary–adrenal (HPA) axis of the offspring **[47]**.

Although, other studies report that prenatal stress induced reduction in locomotion **[48]**. An increase in the levels of GABA neurotransmitter in the hypothalamus and the bed nucleus of the stria terminalis seem to be responsible for these disturbances **[49]** by causing depressive disorders at the adulthood.

6. Conclusion

Pregestational stress can affect the physiological state of the animal and the neurobehavioural development of the offspring like the gestational stress. This experiment probably put some tracks values especially for the transmission over generations of cognitive and behavioural damages.

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