Oxytocin (OT), a peptide hormone, is produced by neurons in the paraventricular nuclei (PVN) and supraoptic nucleus (SON) of the hypothalamus and stored in the posterior pituitary for secretion in blood. The hormone is packaged into granules and secreted along with carrier proteins called neurophysins. OT is mainly secreted from brain as well as few other tissues including the ovaries and testes, in both male and female. OT consists of nine amino acids linked with (1-6) disulphide bond and a carboxyamidated tail. The level of OT in plasma varies between 1 and 10 nmol/ml, whereas in cerebrospinal fluid it is 5 to 10 fold higher than plasma. The half life of OT is in minutes which changes according to physiology of the organism. This hormone once thought to have limited functions like female smooth muscle physiology at parturition, milk ejection and establishment of maternal behavior. Recently, OT has been shown to possess other functions such as neurotransmitter, involved in social sexual behavior and in male reproductive physiology and a few studies indicates its role in breast cancer. OT receptors have also been reported in bone cells, myoblasts, cardiomyocytes and endothelial cells, which indicate that it may have other roles at different sites which are still not explored.

For decades OT was identified as a key hormone in milk production because of its ability to induce milk ejection. This neuropeptide hormone OT is released by the posterior pituitary gland after tactile teat stimulation by the sucking calf, hand or machine milking. OT causes the contraction of myoepithelial cells surrounding the alveoli forcing the milk into the milk ducts and cisternal cavities. Many dairies use synthetically manufactured OT to facilitate milk ejection, and also as a treatment for mastitis. OT is a schedule 'IT' drug in India that means it cannot be bought or sold without a prescription. It is specifically banned under section 12 of the Prevention of Cruelty to Animals Act, 1960. OT drug have been used to stimulate breastfeeding, labor induction and to support labor in case of non-progression of parturition. Despite their importance, long-term effects of OT have only recently been investigated and showed that exposures during developmental periods could result in even higher CNS levels of OT, due to the leaky nature of the infant blood brain barrier. These high central levels of hormone could cause organizational changes later manifesting as altered behavior or growth patterns that persist into adulthood. OT has also been
shown to cause long-term changes in the expression and distribution of receptors. It has been also observed that OT exposure leads to early LH surge and GnRH release.

Although detailed information is available regarding the oxytocin system, the underlying mechanisms of reported side-effects are not always clear. In addition to peripheral affects, OT also acts as a neurotransmitter in the brain influencing many aspects of social behaviour. The last two decades have witnessed a surge in research investigating the application of OT as a method of enhancing psychological function in humans. Research involving healthy adults has linked OT with a range of effects such as reducing levels of anxiety, and increasing levels of trust, gaze to the eyes, and accurate emotion processing. Current safety information regarding the use of OT in humans is largely derived from usage by mothers to promote lactation. In India, OT injection ampules, commercially known as pitocin or syntocinon, are indiscriminately used for milking cows and buffaloes. This unrestricted use of OT may increase the level of hormone in plasma and other organs of milk consumers in the non-physiological manner. Since milk is an essential part of our daily diet, it is hypothesized that long term exposure of OT since childhood in non physiological manner may be a cause of concern.

Due to unavailability of sufficient data regarding side effects and safety of daily exposure of oral OT (through OT contaminated milk), there is a controversy regarding use of OT in cattle and thereby in milk. For this reason, the present work was designed to have a detailed study on every aspects of OT used in dairy industry and there likelyhood effects due to consumption of OT contaminated milk. This study will go in a long way in helping regulatory agencies to frame new norms regarding OT. To achieve the above mentioned goal the study was carried out with following objectives.

1. Detection and quantification of oxytocin in milk.

2. Evaluation of toxicity during nonphysiological exposure levels of oxytocin using rat as an animal model.

3. Investigation of possible mechanism of action of hormone for early puberty mechanism.

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