Polycystic ovarian syndrome (PCOS) is the most common neuro-endocrine disorder of women of reproductive age, characterized by excess androgen, ovulatory dysfunction and polycystic ovaries. PCOS is also linked with several metabolic dysfunctions including type 2 diabetes mellitus, obesity, cardiovascular disorders and psychological co-morbidities, viz., anxiety, depression and mood disorders. Although the prevalence of and the discomfort caused by PCOS is very high, very little is known about its clear patho-etiolo. Thereby, the current study was aimed at understanding the status of various regulatory molecules to decipher the neuro-endocrine pathology of PCOS, using rodent model. Letrozole, an aromatase inhibitor, was used for PCOS induction. Results of the present study demonstrate that letrozole is able to mimic reproductive, metabolic and neuro-endocrine characteristics similar to the human PCOS condition. Studies suggest that increased GnRH pulsatility and concurrently elevated LH/FSH ratio may underpin the pathology. Moreover, the pulsatile release of GnRH/LH results from the coordinated actions of steroids, neuro-peptides and neurotransmitters in discrete areas of brain. In this context, the current study clearly demonstrates the involvement of neuropeptides kisspeptin, Neurokinin B, Dynorpin and RFRP3 in steroid-mediated feedback regulation that is hampered in PCOS condition. Furthermore, the current study, for the first time, depicts that along with ovary and adrenal, steroidogenesis is also altered in several areas of the brain, suggesting a putative role of local steroids (neurosteroids) in PCOS pathology. We also aptly demonstrate that increased adrenal androgen, a key feature of PCOS, is due to increased responsiveness of adrenal gland that results into activation of a signalling cascade, leading to overproduction of androgens as well as corticosterone from PCOS adrenals. Further, a neurotransmitter evaluation revealed that the GnRH-stimulatory neurotransmitters are elevated whereas GnRH-inhibitory neurotransmitters are decreased in PCOS condition, which is clearly the cause of increased GnRH/LH release. Additionally, our results indicate that the disease causes a pro-inflamed state of endocrine and neuronal tissues that is linked with altered neuronal signalling and behaviour modulations. Present study concludes that PCOS is associated with an altered brain microenvironment, resulting into neuro-endocrine and psychological complications. This is the first study which holistically demonstrates that PCOS is a reproductive disease having clear associations with all other organ systems, thus addressing the different targets which can be explored for a detailed understanding.
Polycystic ovary syndrome is characterized by hyperactivity of the ovarian sympathetic nervous system, increases in the content and release of norepinephrine, as well as decreases in the number of β-adrenoreceptors. In the present study, β-adrenoreceptors in the ovaries of rats with polycystic ovary syndrome were blocked and analyzed the resultant effects on ovulation, hormone secretion and the enzymes responsible for the synthesis of catecholamines. Methods. Activation of ovarian sympathetic nerves in polycystic ovary syndrome. Endocrinology. Prepubertal rat ovary: hormonal modulation of beta-adrenergic receptors and of progesterone response to adrenergic stimulation. Biology of Reproduction.

Normal metabolism of androgens in females
Androgens are synthesized in ovaries in follicles
Peak of synthesis of androgens in ovaries comes when follicle is 5-8 mm in size
Ovarian androgens (testosterone, androstendion) are converted into estrogens (estradiol, estron)

Patients with PCOS have more or less manifesting resistance to insulin (defect of insulin receptors)
Blood level of glucose increases
Obesity appears
Compensatory, levels of insulin and insulin-like growth factor-1 are increased
That substances cause high synthesis of androgens and estrogens by fat tissue
Process does not depend from pituitary

Polycystic ovarian syndrome (PCOS) is universally recognised as the commonest endocrinopathy of women. The definition and the aetiological hypotheses of PCOS are continuously evolving to accommodate expanding knowledge on the syndrome, which is now known to be more complex than purely a reproductive disorder. Increased androgen synthesis, disrupted folliculogenesis and insulin resistance lie at the pathophysiological core of PCOS. An intriguing concept involves the perpetuation of a vicious circle with endocrine/reproductive and metabolic components. An unfavourable metabolic environment may u