

**Male reproduction**

- ***Understand normal sexual function in males***
  - There are three main components of male sexual function; including libido, erection, and ejaculation.
  - Libido is the conscious component of sexual function. Libido is sensitive to testosterone levels as well as to general nutrition, health, and drugs.
  - Erection is a neurovascular response to certain psychologic and/or tactile stimuli. Higher cortical input and a sacral parasympathetic reflex arc mediate the erectile response. Neural output travels through the cavernous nerves, which traverse the posterolateral aspect of the prostate. Terminating in the penile vasculature, these nonadrenergic, noncholinergic nerves liberate nitric oxide, a gas. Nitric oxide diffuses into penile arterial smooth muscle cells, causing increased production of cyclic GMP, which relaxes the arteries and allows more blood to flow through them and into the corpora cavernosa. As the corpora fill with blood, intracavernous pressure increases, which compresses surrounding venules, causing veno-occlusion and decreased venous outflow. The increased inflow of blood and decreased outflow further increase intracavernous pressure, contributing to erection.
  - Ejaculation is controlled by the sympathetic nervous system. Neural stimulation of the  $\alpha$ -adrenergic receptors in the male adnexa (eg, penis, testes, perineum, prostate, seminal vesicles) causes contractions of the epididymis, vas deferens, seminal vesicles, and prostate that transport semen to the posterior urethra. Then, rhythmic contractions of the pelvic floor muscles result in pulsatile ejaculation of the accumulated seminal fluid. At the same time, the neck of the bladder closes, preventing retrograde ejaculation of semen into the bladder.
- ***Steroid biosynthesis including production of androgens and estrogen***

## Applied reproductive physiology

### *– Understand modern reproductive techniques such as somatic cell nuclear transfer and intracytoplasmic sperm injection*

Assisted reproductive technology (ART) refers to all treatments that involve handling eggs or embryos outside the body, and this includes IVF as well as a few of its variations.

#### ○ **Somatic cell nuclear transfer**

- Somatic Cell Nuclear Transfer (SCNT) is a technique, which allows the harvesting of embryonic stem cells (ES cells). In SCNT, the egg cell's single set of chromosomes is removed. It is replaced by the nucleus from a somatic cell, which already contains two complete sets of chromosomes. So, in the resulting embryo, both sets of chromosomes come from the somatic cell.
- Step 1: Preparation of the somatic cell
  - The somatic cell, as stated, can be any type of normal cell in the body apart from the sperm or egg. A single layer of fibroblasts without any other cell types is obtained from this somatic cell.
- Step 2: Preparation of the egg/oocyte
  - Target eggs are extracted many times from a consenting donor using ovarian stimulation. The egg's nucleus is removed, and the oocyte is now called a cytoplast.
- Step 3: Nuclear transfer
  - Both fibroblast and egg are placed in a thin human serum solution. Once the donor fibroblast's nucleus is extracted from the fibroblast, it is called a karyoplast. This karyoplast is injected into the egg/cytoplast past the zona pellucida.
- Step 4: Post nuclear transfer procedures

of the adipose cell derived hormone, leptin as melanocortin agonists mimic the effects of leptin.

## **Stress and reproduction**

### ***– Different types of stressors***

- Stress can be described as a state of threatened or perceived as a threatened homeostasis. The three main types of stress are physiological stress (eg. Nutritional deficiency, osmotic challenge), psychological stress (eg. Phobias), and environmental stress (eg. Thermal, oxidative stress). Studies have shown that stress and reproduction are interrelated as stress impacts on the reproductive axis at the hypothalamus (to affect GnRH secretion) and the pituitary gland (to affect gonadotrophin secretion).

### ***– Neuroendocrine effectors***

- The neuroendocrine system involves the interaction between the nervous and endocrine system. When we are subjected to stress, the corticotropin releasing hormone (CRH) from the parvocellular paraventricular nucleus stimulate the pituitary synthesis of adrenocorticotrophic hormone that in turn stimulates the synthesis of cortisol in the adrenal cortex. Alternatively, CRH from the paraventricular nucleus may also activate the locus coeruleus and noradrenergic cell groups in pons and medulla which stimulates the synthesis of adrenaline in the adrenal medulla. Furthermore, arginine-vasopressin and oxytocin from the parvocellular paraventricular nucleus, co-localised with CRH is released into the hypophyseal-portal system to enhance the secretagogue property of CRH.

### ***– Stress response and the HPA axis***

- The HPA axis is a grouping of responses to stress by the brain and the pituitary and adrenal glands. First, the hypothalamus (a central part of the brain) releases a compound called corticotrophin releasing factor (CRF)