REPRODUCTIVE HEALTH

Course Manual

natural fertility NZ
te whakato kakano tuturu
aotearoa

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Introduction

This manual contains the core course content for the Reproductive Health course, which is a component of the Natural Fertility New Zealand (NFNZ) Fertility Educator Training Programme.

The Reproductive Health course provides students with foundational training in biological health, the clinical application of which is explored throughout the other courses in the programme.

CONTENTS

1 MALE REPRODUCTIVE SYSTEM

1.1 Objectives

The student will be able to:

1.	Given an anatomical diagram of the human head, identify the hypothalamus and pituitary gland within the brain, and explain their function in relation to the male reproductive systems.
2.	Identify the penis, scrotum, testis, prepuce/foreskin, epididymis, vas deferens, seminal vesicle, prostate gland, bladder, Bulbourethral gland, urethra and anus on an anatomical diagram of the male.
3.	Explain the function and role in reproduction of the penis, scrotum, testes, epididymis, vas deferens, seminal vesicles, prostate gland, Bulbourethral glands and urethra.
4.	Explain the difference between Testes and Testis.
5.	Explain how undescended testes may affect fertility.
6.	Explain how the scrotum maintains an ideal temperature for the testes.
7.	Explain how sperm develop under the influence of hormones.
8.	Explain how sperm travel through the male reproductive system.
9.	On an anatomical diagram of a sperm, label the three major parts.
10.	Explain the function of the three main parts of a spermatozoon.
11.	List the components of seminal fluid.
12.	State the average number of spermatozoa in an ejaculation.
13.	Explain sperm survival time in the female reproductive system, and the relationship with cervical mucus.

14.	Explain the relationship between male sex hormones and the development of male secondary sex characteristics.

1.2 Anatomy & Physiology

Male Gonad Development

Very early in prenatal life special sex cells organize into a group of cells known as **gonads.** The gonads develop into **testes** in the male and ovaries in the female. The testes begin to evolve about the seventh or eighth week of prenatal development; and at first are contained in the abdominal cavity. About the eighth or ninth month of foetal life they begin to move downwards through the inguinal canal to the **scrotum.**

After the testes pass through the inguinal canal, the tunnel-like opening begins to close so that other organs in the abdominal cavity cannot pass into the passageway. If, for some reason this canal does not close, a hernia may result, thus the male is susceptible to hernia through the inguinal canal.

The scrotum has two main functions:

1. To contain the testes.
2. To regulate temperature.

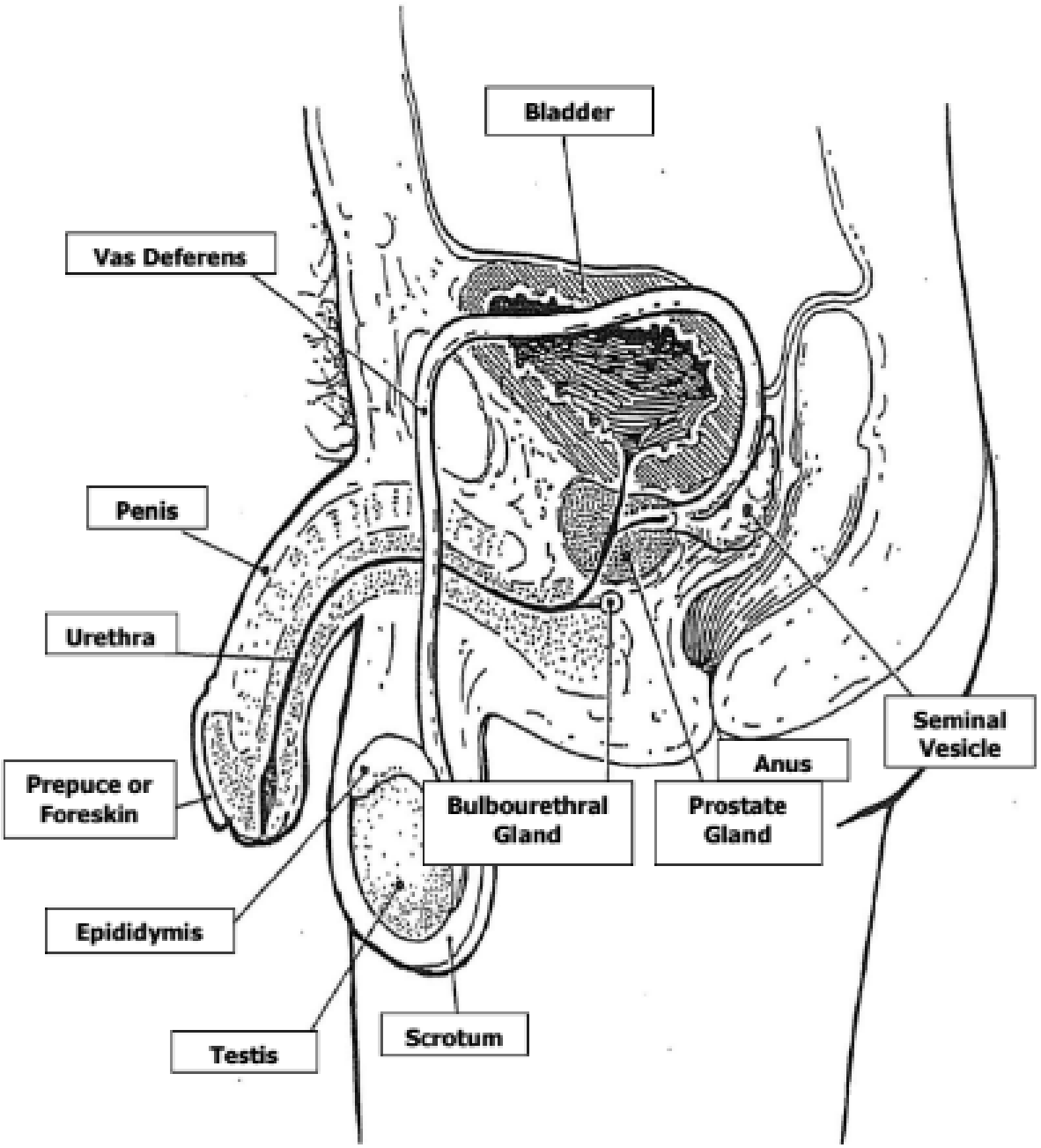
In order for the testes to effectively produce sperm, the temperature in the testes should be 1.5-2 degrees below body temperature.

The scrotum facilitates this lower temperature:

- By being outside the abdominal cavity.
- By containing a large number of sweat glands.
- By containing special muscles that contract and bring the testes closer to the body to increase temperature when the weather is cold, and release to lower them away from the body and thus reduce temperature in hot weather.

If the testes do not descend into the scrotum, fertile sperm cannot be produced and the male may be sterile. However, it is possible to correct this abnormality by surgery, and parents are advised to have the situation rectified before their son is one year old.

Immersion of the testes in very hot water may have a temporary effect in lowering the sperm count, as may continual compression of the testes by tight clothing.



B-1 Diagram of Male Reproductive System

Testes (singular: Testis)

The testes are found in the scrotum. The two major functions of the testes are:

1. To produce male sex hormones.
2. To produce sperm.

Both these functions are dormant until about ten or eleven years of age. At this time the **hypothalamus,** the part of the brain which lies immediately above the pituitary, produces releasing hormones, which flow through a special system of blood vessels to the **anterior pituitary.** The pituitary, in turn, sends out two "gonad stimulating" or **gonadotrophic** hormones.

One pituitary hormone is called **follicle stimulating hormone** (FSH). The name seems a little inappropriate as follicles are only found in the female ovary - the reason is that this hormone was first recognised in the female. FSH in the male signals the testes to produce sperm.

The other pituitary hormone is called **luteinizing hormone (LH)** or **interstitial cell stimulating hormone** (ICSH). This hormone stimulates interstitial cells to produce the male sex hormone **testosterone.** The increase of secretions of testosterone into the blood at puberty results in growth and maturation of the male reproductive system and the development of secondary sex characteristics such as greater muscle development, heavier bones, changes in shape of the facial bones, deeper voice, development of body hair, skin changes and increased metabolic rate.

Sperm production begins in very fine tubes called **seminiferous tubules.** If these tubules could be uncoiled they would extend over 1.6km. The process begins because of stimulation by the pituitary hormone FSH, but final maturation also requires testosterone.

Spermatogenesis begins at about 12 years of age, and the first ejaculation of mature sperm usually occurs at about 14 years. It is important to note that, in contrast to the female, the male must be considered fertile at all times. This potential for fertility has been known to continue into the 9th decade of life.

Sperm (Spermatozoon pl Spermatoza)

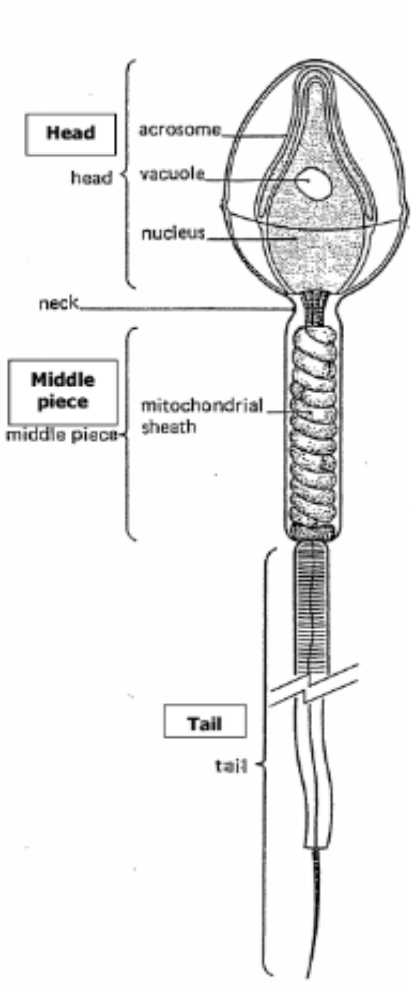
Individual spermatozoa are extremely small cells - it would take 250 of them placed head to tail to equal 1 cm. It takes approximately three months for the immature sperm (spermatogonium) to develop into a mature spermatozoon. However, it may take longer than this time for the mature sperm to pass through the very long ducts in the testes and be released at ejaculation. Sperm have a tadpole-like appearance and have three major parts: head, middle and tail.

The head

The head, which makes up about one tenth of the sperm's length, is composed of the acrosome and the nucleus.

The acrosome

This is a cap-like structure that fits over the nucleus. This cap contains a complex of enzymes, which, when released on contact with the zona pellucida, the tough outer coating of the female ovum, are capable of dissolving part of this coating and allowing the sperm to enter the ovum. Once one sperm enters the ovum, the ovum reacts to prevent the entry of any more sperm.



B-2 Diagram of a Spermatozoon

The nucleus

The nucleus of the sperm contains 23 chromosomes - half the complement required to begin a new life. The nucleus of the ovum carries a set of 23 pairs of chromosomes, but loses 23 chromosomes (one of each pair) in the process of fertilization.

Union of sperm and egg results in 23 pairs of chromosomes; one member of the pair from the egg, the other from the sperm. Of these pairs, 22 are known as autosomes. The remaining pair are known as sex chromosomes.

The female ovum carries an 'X' sex chromosome, but there are two types of sperm cells, one of which carries a 'Y' sex chromosome, and one of which carries an 'X' chromosome.

If the 'Y' variety succeeds in fertilizing the ovum an 'XY' sex chromosome pair results and a male foetus will develop. If the chromosome combination is 'XX' the foetus will be a girl. Thus it is the male sexual partner who determines the gender of the child.

The middle piece of the sperm is rich in mitochondria which give the sperm energy for active motility.

The tail responds with whip-like movements which help to propel the cell through the female genital tract.

Seminal Fluid

The fluid which is ejaculated during intercourse is called **seminal fluid**. It is composed of secretions from the seminal vesicles, prostate gland and bulbourethral glands together with sperm. Secretions from the seminal vesicles add fructose and prostaglandins to sperm as they pass. The prostate gland secretes a milky alkaline fluid. The bulbourethral gland secretes a mucus-like fluid that provides lubrication for intercourse.

Normal ejaculate volume is between 2 and 5 ml and can contain between 300-500 million sperm. 65-75% of the volume is from the seminal vesicles, 25-30% is from the prostate and less than 1% from the Bulbourethral gland. A low volume is associated with an absence or decrease of the seminal vesicle component of the ejaculate.

Normal semen pH is 7.2-8.0. pH is the commonly used term of the comparative measurements of alkalinity and acidity. Prostatic secretion is acidic while seminal vesicle fluid is alkaline. An acidic ejaculate (pH<7.2) may be associated with blockage of the seminal vesicles. Infection is usually associated with an alkaline ejaculate (pH >8.0). Azoospermia with low ejaculate volume, fructose negative and acidic ejaculate, may imply obstruction of the ejaculatory ducts. The semen is initially in a liquefied state but quickly coagulates by the action of a protein secreted by the seminal vesicles. Enzymes from the prostate gland liquefy coagulum in 20-25 minutes. Abnormal liquefaction may be caused by prostatic abnormalities, e.g. prostatitis. Increased viscosity may affect sperm motility

If a semen analysis is performed, the volume, number, motility and morphology of the sperm are assessed. White cell count and antibodies are also checked. The sample should be collected after a minimum of 48 hours and no longer than 5 days of sexual abstinence (this includes masturbation). The sample needs to be delivered to the laboratory within one hour of collection.

Normal semen values

Volume	>2ml
Count	>15 million per ml
White cell count	< 1 million per ml
IgE, IgM anti sperm antibodies	Negative
Motility	>50%
Morphology	>30% or more with normal shape
pH	7.2-8.0

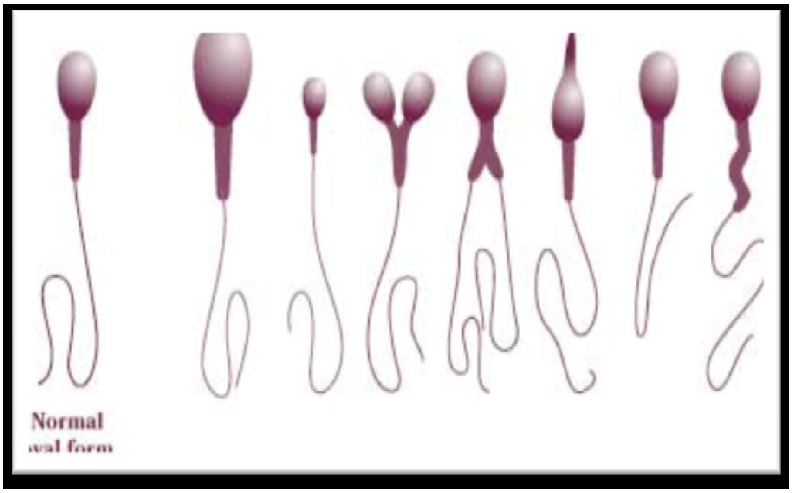
If a man has a normal number of sperm but there are issues with motility, morphology or excessive antibodies or white cells, he may have problems with fertility.

Men with <15 million spermatozoa per ml (oligozoospermia) are typically deemed subfertile. Fertility potential is significantly impaired.

They are not infertile, but it may take them a longer period of time to achieve a pregnancy. Men with counts <5 million spermatozoa/ml are considered infertile.

After the sperm have been produced in the testes, they pass into the **epididymis.** This looks like a solid cap of tissue which lies over the back of the testes.

In fact, it is a very long, fine tube which is folded in upon itself. Here the sperm come to full maturity and a proportion of them are stored here until required.



B-3 Sperm Morphology (the one on the left has normal morphology)

Vas Deferens

These are two thick muscular tubes which emerge from the end of each epididymis, and pass up through the inguinal canal to join the prostate gland. It is the tube through which the sperm travel on their journey to the outside of the body.

The vas deferens is accompanied by nerves, arteries and veins as it passes up from the scrotum and through the inguinal canal. All of these together are sometimes referred to as the spermatic cord. It is the structure which is cut and tied when the male is sterilized following a vasectomy.

After the vas deferens passes behind the bladder it widens slightly into an ampulla or storage space for sperm. Branching off the ampulla are two glands called the seminal vesicles.

Seminal Vesicles

These are two sac-like glands located behind the prostate gland and are attached to the vas deferens.

The seminal vesicles secrete a significant proportion of the fluid that ultimately becomes semen. About 65-75% of the seminal fluid originates from the seminal vesicles. Seminal vesicle fluid is alkaline, The alkalinity of semen helps neutralize the acidity of the vaginal tract prolonging the lifespan of sperm. The vesicles produce semenogelin, a protein that causes semen to become sticky and jelly-like after ejaculation.

The thick secretions from the seminal vesicles contain proteins, enzymes, fructose, mucus, vitamin C, flavins, phosphorylcholine and prostaglandins. The high fructose concentrations provide nutrient energy for the spermatozoa. The seminal vesicles have also been found to contain luteinizing hormone receptors, and hence may also be affected by luteinizing hormone. LH is important in the production of testosterone within the testes and testosterone is important in the final maturation of sperm.

The vas eventually joins the **urethra** which serves to empty the bladder as it passes through the prostate.

Prostate

This is a chestnut shaped gland which lies at the base of the bladder. It contains both muscular and glandular tissue. The function of the prostate is two fold. The glandular portion of the prostate produces a fluid which contributes up to a third of the seminal fluid. This fluid enters the urethra through approximately 40 tiny openings. The muscular portion of the gland helps propel the seminal fluid containing the sperm cells, out of the urethra.

The system is designed so that the portion of the urethra from the bladder to the point where the vas deferens joins is closed off. This ensures that no urine escapes with the seminal fluid and no seminal fluid passes back into the bladder.

The entire gland is divided into three portions or lobes by the urethra and vas deferens as they pass through it. The prostate along with the seminal vesicles are dependent upon the presence of androgens for their growth and functioning.

Urethra

This is the muscular tube leading from the bladder to the end of the penis. As described above, it connects with the vas deferens in the middle of the prostate gland. The urethra then has the dual function of emptying urine from the bladder and carrying seminal fluid from the seminal vesicles and prostate gland.

Just beyond the prostate are two small mucus producing glands called **bulbourethral glands** (also known as **Cowper's glands**).

They produce a small amount of clear, sticky mucus like fluid in response to sexual arousal before ejaculation. The fluid is released into the urethra prior to ejaculation.

The fluid changes the environment of the urethra by neutralizing any residual acidity in the urethra and enables sperm to survive as they pass through it. The now neutralized urethra is a more hospitable (as opposed to harmful) environment for the sperm to travel through.

Sperm may be found in this fluid therefore it is possible that pregnancy could result from penile entry into the vagina without ejaculation. During orgasm the urethral muscles assist in expelling the seminal fluid from the penis.

Penis

The penis functions as both a reproductive organ and an excretory organ. As a reproductive organ, the penis becomes erect during arousal and intercourse in order to deliver semen more effectively into the vagina.

The penis is a cylindrical structure extending outward from the pubic area, in front of the scrotum. It is composed of 3 cylindrical bodies of tissue each of which is capable of becoming erect during sexual stimulation.

During sexual arousal, the blood coming into these 3 bodies increases as the arteries open up. At the same time the blood leaving the penis through the veins is slowed so the penis fills with blood. All three bodies are wrapped in a tough layer of tissue so the penis, when filled with blood, is firm and erect.

The skin around the penis has a great number of sensitive nerve endings concentrated on the underside of the body of the penis, especially near the glans and over the whole of the surface of the glans. Stimulation of these nerve endings results in a build up of sexual tension and erection of the penis may also occur without orgasm.

The glans is covered by a separate sheath of skin called the **foreskin or prepuce.** This skin retracts during erection exposing the glans. It is this foreskin which is removed at circumcision. Circumcision is most commonly performed for cultural or religious reasons, although occasionally there are medical reasons. It is becoming increasingly uncommon in the general population.

1.3 The Nervous System's Role in the Sexual Response of the Male

The mechanism of erection and ejaculation is a reflex activity controlled by the lower portion of the spinal cord. Interruption of the spinal cord above the level of this reflex will not interfere with erection and ejaculation. The types of nerves involved in this reflex are part of the autonomic (or automatic) nervous system, specifically the parasympathetic portion of the autonomic nervous system. The parasympathetic nerves also control many of the internal organs such as the stomach, bowels, bladder and heart. This system works best in a state of relaxation. These nerves control the blood flow into the penis for erection and the actions of the prostate, seminal vesicles and urethra during ejaculation. The reflex control can be enhanced or impeded by mental or emotional influences through messages sent from the brain down the spinal cord. Drugs and alcohol can also influence sexual response by directly impeding the nerves and their messages to the sex organs. Thus, a nervous or intoxicated man is apt to perform less well sexually than a relaxed sober one.

1.4 Sexual Response Cycle in Males

There are four phases of sexual response in males:

1. Desire and excitement
2. Plateau
3. Orgasm
4. Resolution

Desire - is an interest in sex often referred to as libido. It may be thinking about sex or feeling attracted to a person.

Excitement - the phase where the man feels aroused. Sights, sounds, thoughts, smells, tastes, scents, as well as direct physical contact, may start the process of sexual arousal. In general the male sexual response is much quicker to develop than the female.

The first physical sign of sexual arousal is erection of the penis. This is caused by congestion of blood and the tightening of the muscles in the sexual organs. Retraction and tightening of the foreskin

occurs, often exposing the glans penis if uncircumcised. There is swelling and ascension of the testes. The skin of the genitals deepens in colour, the scrotum tenses and thickens. Pre-ejaculatory fluid is released. The heart rate, blood pressure and respiratory rate increases, muscle tone increases, and a feeling of tension rises in the whole body. Men may also experience facial and neck flushing and erection of the nipples.

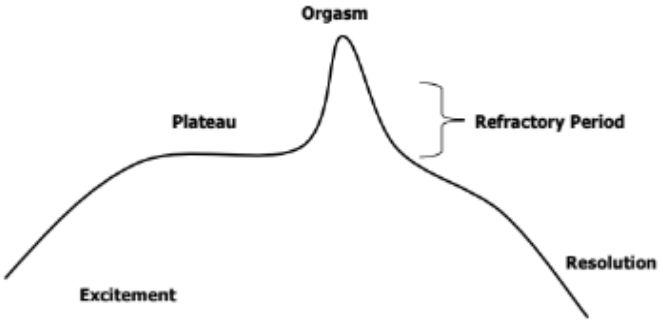
Plateau - during this phase the excitement phase is intensified and maintained. Sexual arousal is at its peak before orgasm. Muscle tension increases again as does blood pressure, heart rate (at least doubles) and respirations which may result in sweating. If a man does not reach orgasm, the resolution phase still takes place, but more slowly.

Orgasm - At the peak of tension the seminal vesicles, vas, ampulla of the vas, and the prostate gland start rhythmic contractions expelling seminal fluid into the urethra. The urethra and muscles of the pelvic floor then contract rhythmically to push the seminal fluid forcefully out of the tip of the penis. This orgasm may last 5 to 30 seconds.

Resolution - Following orgasm there is a general relaxation of the body muscles, blood drains out of the genital area, the sexual organs relax, and the penis loses its erection. If orgasm has not occurred, pelvic vasocongestion can take over an hour to dissipate. This may result in an aching sensation in the pelvic region.

The total time for this process varies tremendously depending on the age of the individual, his sexual experience, degree of relaxation, techniques of stimulation, ingestion of drugs or alcohol, and other psychological factors.

Men have a **refractory period.** This is an amount of time following an orgasm when men are unable to have another orgasm. This tends to get longer as a man ages.



B-4 Sexual Response Cycle in Males

2 FEMALE REPRODUCTIVE SYSTEM

2.1 Objectives

The student will be able to:

1.	Given an anatomical diagram of the human head, identify the hypothalamus and pituitary gland within the brain, and explain their function in relation to the female and male reproductive systems.
2.	Identify the vagina, labia minora, labia majora, clitoris, pubis, prepuce, bartholin's gland, hymen, anus, perineum and urethra on an anatomical diagram of the female and explain their functions in reproduction (as applicable).
3.	Identify the bladder, vagina, cervix, uterus, fallopian tube and ovary on an anatomical diagram of the female and explain their functions in reproduction (as applicable).
4.	Explain the changes that the cervix undergoes prior to ovulation.
5.	Name the hormone responsible for these changes.
6.	Explain the functions of the cervical glands in reproduction and the relationship of cervical mucus to sperm survival.
7.	Name the hormone responsible for changes in the cervical mucus after ovulation.
8.	Explain the main functions of the fallopian tubes.
9.	List the main functions of the ovaries.
10.	Describe the stages of ova development under the influence of hormones.
11.	Define ovulation.
12.	State ovum survival time after ovulation.
13.	State how long after first ovulation that a second ovulation may occur.
14.	Explain the process of fertilization.

15.	Explain the relationship between female sex hormones and the development of female secondary sex characteristics.

The Menstrual Cycle

16.	Define menstruation.
17.	Explain the interplay between hormones and the pituitary gland and the significance of the rise and fall of the hormones regarding the fertile and infertile phases of a woman's cycle.
18.	Explain the changes that occur in the cervical mucus under the influence of oestrogen.
19.	Explain the changes that occur in the uterus under the influence of oestrogen.
20.	List other symptoms a woman may experience at the time of ovulation.
21.	Given a sample chart of the menstrual cycle, show the rise in basal body temperature that occurs after ovulation.
22.	Name the hormone which influences the length of the post-ovulatory phase of the menstrual cycle.
23.	Name the hormone that is responsible for the sustained temperature rise after ovulation.
24.	Describe the role of the corpus luteum after ovulation.
25.	Define implantation.
26.	State how soon implantation takes place after the egg is fertilized.
27.	Describe the function of the corpus luteum after implantation has been successful.
28.	Name the hormone that is produced by the conceptus once implantation has occurred.
29.	Name the hormone that is tested for in urine or blood to confirm a pregnancy.
30.	Explain why a woman does not menstruate after implantation has occurred.
31.	State the signs and symptoms that may indicate the onset of menstruation.

2.2 Anatomy & Physiology

An understanding of the organs which make up the female reproductive system and the manner in which they work together to carry out the process of reproduction is essential if one is to really understand natural family planning and subsequently be able to teach others.

For ease of explanation, we will first review the various parts of the female reproductive system and then look at the way in which these organs, under the control of hormones interact to prepare the woman's body each cycle for a possible pregnancy.

External Genitalia

The name given to all the external female genital area is the **vulva** or **vulva area.** The vulva includes:

Mons veneris (mons pubis)
This is the firm cushion-like mound of fat tissue which is directly over the pubic bones of the pelvic girdle. After puberty it is covered with pubic hair.

Labia majora
These are two rounded folds of fat tissue with an overlying skin. They extend from the mons pubis downward throughout the area of the vulva. By folding back the Labia Majora, other structures of the external genitalia are visible.

The Labia minora
These are two parallel folds of soft tissue which begin at the clitoris and end at the lower vulva area. As the female matures, they increase in size.

Clitoris
Found immediately below the mons pubis and more or less covered by folded tissue, is the pea-shaped external projection of the clitoris (erectile tissue made up of blood vessels and many nerve receptors). In recent years, the clitoris has been extensively imaged using MRI scans, which has led to the discovery of the internal structure of the clitoris. Upon sexual stimulation, the clitoris becomes engorged with blood and ultimately contributes to the achievement of female orgasm. It is considered to be the female counterpart of the male penis.

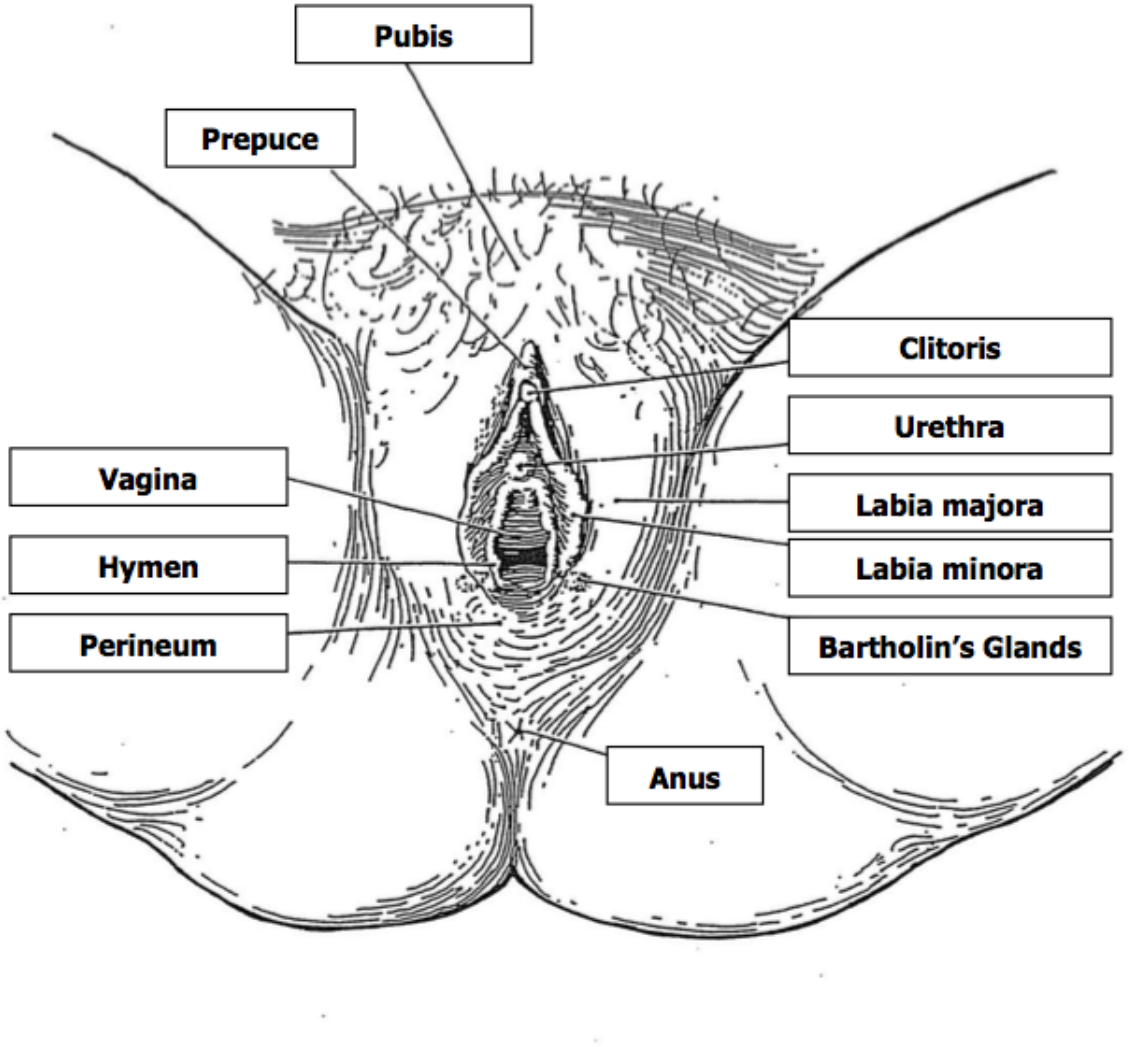
Bartholin's Glands
These are a pair of glands that open at the junction of the vagina and the external genitalia. Their secretions lubricate the vulva and so assist penetration by the penis during intercourse.

Vaginal Opening
This is the relatively larger opening located about 5cm (2") below the clitoris. It is the beginning of the tube that connects the internal and external parts of the female reproductive system. On either side of the vaginal opening, deep within the tissue, are the Bartholin's Glands, about the size and shape of a small bean.

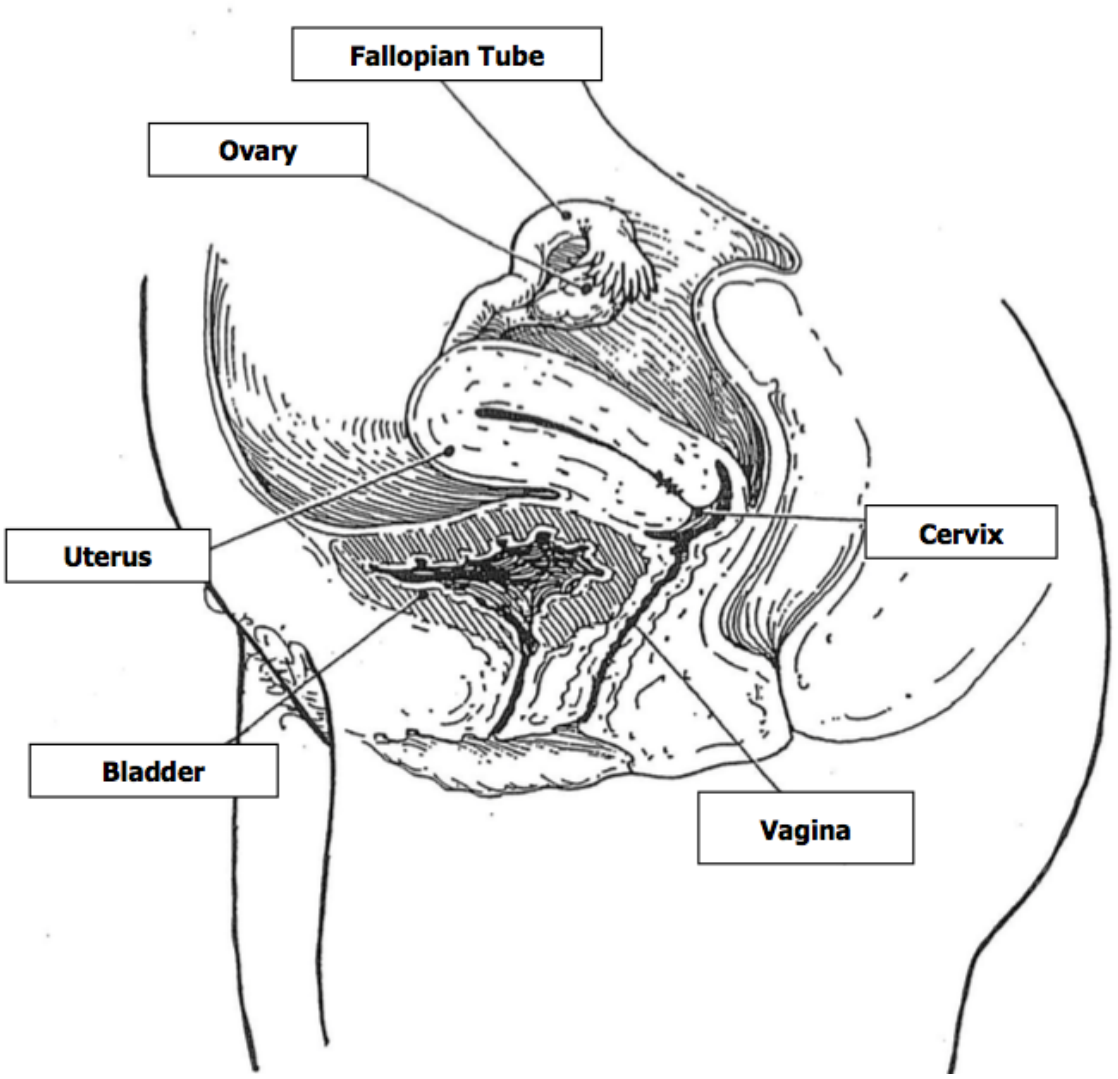
These glands produce a fluid secretion which keeps the vagina moist and acts as a lubricant during sexual intercourse.

Hymen
Is a membrane that covers the opening of the vagina at birth but usually perforates spontaneously at puberty.

Urethra
This is also located in the area of the external genitalia, below the clitoris and above the vaginal opening. It is part of the urinary system, and has no role to play in reproduction.



B-5 Diagram of Female External Genitalia



B-6 Internal Female Reproductive Organs

Internal Reproductive Organs

The majority of the organs of the female reproductive system are located in the **pelvis** - a bone structure formed by left and right hip bones which are firmly bound to each other and to the bones of the spinal column. It acts as the protective structure for the delicate reproductive organs.

These five major organs are:

- the vagina
- the cervix
- the uterus
- the fallopian tubes
- the ovaries

Vagina

This is a highly muscular canal lined with a mucus membrane which is approximately 10 cm (4") in length. It leads from the cervix to the outside of the body with two main functions:

1. The female organ for sexual intercourse, when sperm is deposited high up in the canal near the cervix.
2. The birth canal, with the capacity to expand significantly because of the various layers of muscle. The internal texture of the muscular vaginal wall is not smooth, but rather is composed of many small folds or ridges known as "rugae" (which play an important role in allowing the canal to stretch).

The normal pH (pH is the commonly used term of the comparative measurements of alkalinity and acidity), of the **vaginal canal** is mildly acidic.

Cervix (Latin - neck)

If one compares the shape of the uterus to that of an inverted pear, the cervix corresponds to the neck of the pear. It has two openings - the external **os-** which dips down into the vagina and the internal **os** - which opens into the cavity of the uterus. The **endocervical** canal connects these two openings.

In the non-pregnant woman the cervix acts as a biological barrier to infective organisms ascending from the vagina. It also acts as a barrier to sperm throughout a large part of the menstrual cycle. However, under the influence of Oestrogen, a hormone produced in the ovaries, this barrier action is reversed in the days just prior to ovulation. The cervix then produces a slippery, more watery mucus which makes it easier for sperm to swim through. After ovulation, the mucus becomes thicker, which prohibits sperm movement and penetration.

During pregnancy the cervix retains the foetus in the uterus until the rhythmic contractions of labour cause it to open and thus allow the foetus to enter the birth canal.

The cervix is **firm** (as the tip of the nose) during menses and in the **early** pre-ovulatory phase of the cycle.

It progressively **softens,** becoming spongy and rubbery (as a lip) at the time of **ovulation.** It gradually resumes its firm consistency in the post-ovulatory phase.

The **cervix** is elevated in the pelvis **before** ovulation and **descends afterwards.** A relatively high position is due to oestrogenic effects. At the time of ovulation, it is barely within reach of a woman's finger. It dimples and opens at the approach of ovulation and **closes after ovulation.** It attains maximum dilation at the time of ovulation and closes quite quickly after, and remains tightly closed in the post-ovulatory phase. (Not all women experience changes in the cervix as described here).

Uterus or Womb

This is a hollow pear-shaped muscular organ approximately 7.5 cm long and the size of a clenched fist in a non-pregnant woman.

It is located in the lower abdomen and is protected by the bones of the pelvis. It is connected to the vagina via the cervix, and at its upper end it has openings leading to the fallopian tubes. It is capable of a large amount of stretching so that during pregnancy it can attain a length of 30-37.5 cm (12"-15"). After childbirth it shrinks back to a size that is nearly as small as it was before pregnancy.

The uterus has two basic parts. The much larger upper part called the corpus or body of the uterus, and a smaller lower portion which dips down into the vagina called the cervix (already mentioned above). The corpus is that part which receives the fertilised egg and allows it to burrow into the lining and thereby grow.

The uterus is rather like a hollow bag, and its walls are made up of an outer coat, a thick, strong muscular layer (called the **myometrium)** which stays unaltered unless a pregnancy intervenes, and a thinner lining, called the **endometrium.** It is the endometrium which is built up during a cycle and then shed approximately every four weeks in the process known as menstruation.

Fallopian Tubes

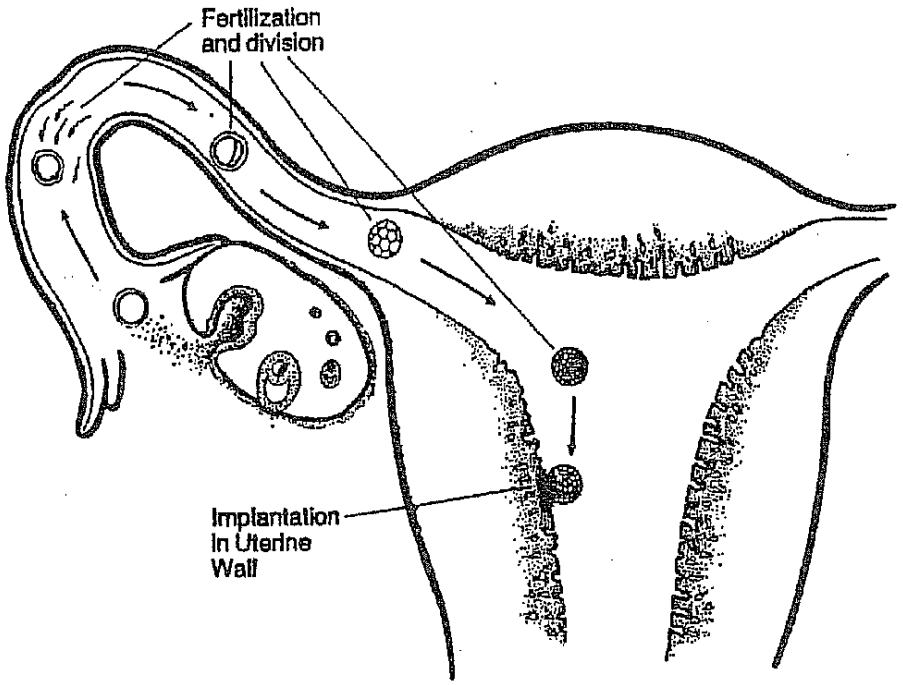
These are two tubes approximately 10-12.5 cm (4"-5") in length and only as wide as a pencil.

They are muscular structures with two important functions:

1. The "fimbriae" - finger-like appendages at the funnel end near the ovary, act like tentacles to attract the ovum. Throughout most of the cycle, they are inert and inactive. During the periovulatory phase of the cycle, probably as the result of oestrogenic action, the fimbriated end of the fallopian tube is positioned over the site of ovulation on the ovary in readiness to sweep up and collect the released ovum. The ovum is rapidly transported to the ampulla section of the tube where it is held temporarily in readiness for fertilization.
2. It is also the work of the fallopian tube to **transport** the egg from ovary to uterus. Unlike sperm, the ovum cannot move by itself. It moves towards the uterus as a result of contractions of the fallopian tube and the activity of minute hair-like structures known as "cilia" on the inside of each tube. The cilia "beat" so as to propel the egg towards the uterus.

Conception or fertilization, takes place when a spermatozoon unites with the ovum, usually in the ampulla segment of the fallopian tube. Once fertilized, the ovum begins to divide as it is transported down the tube towards the uterus where it will embed itself in the endometrium approximately six days after conception.

Occasionally, the fertilized ovum will become implanted in the fallopian tube. This is a serious medical complication (known as tubal or ectopic pregnancy) and usually requires surgical removal of the tube.



B-7 Fertilisation and Implantation

Ovaries

The ovaries are two almond-shaped glandular organs about 5 cm (2") long. They are located 10-12.5 cm (4"-5") below the waist, inside the pelvic girdle and are attached to the uterus by a series of ligaments. When a girl is born, her ovaries hold about 400,000 microscopic cells known as **ova** or **egg cells** contained in primordial follicles. Only a small number of these will ever grow to maturity.

The **ovary** is the **female sex gland.** It serves **two** basic functions:

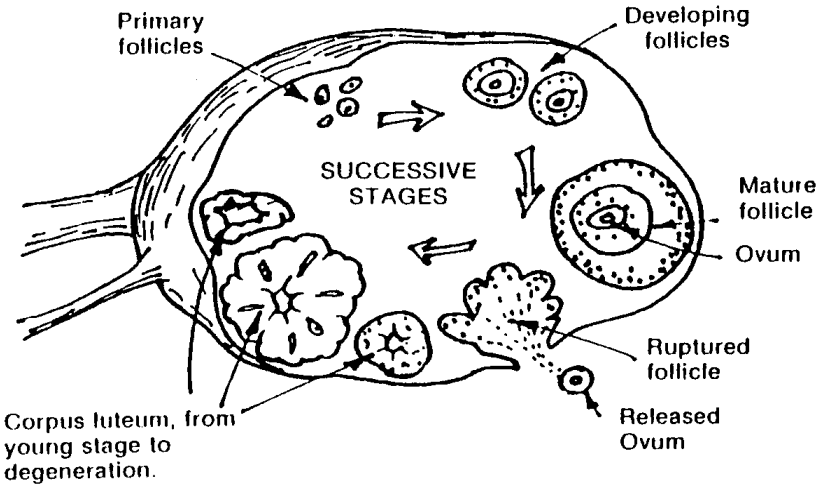
1. It is a reservoir of primordial follicles from which between first menstruation and menopause one is selected each 28 days on average to mature and proceed to ovulation.
2. Production of the female sex hormones. (oestrogen and progesterone).

At puberty (average 11-13 years, variation 9-18 years) under the influence of the hormones produced by the pituitary gland and the ovary, changes take place in a girl's body which eventually lead to her ability to reproduce.

In response to increased circulatory levels of follicle stimulating hormone from the pituitary, primary follicles in the ovary can be recruited for further growth and maturation.

The ovarian structure in which the egg cells grow is known as a **follicle.** At the first stage of development, the follicle is known as a **primary** follicle. Later it is called a developing or **secondary follicle.** Finally when it has reached full size and emerges through the surface of the ovary, it is known as a **mature** or **Graafian follicle.**

The ovum develops surrounded by its supporting cells, which also undergo changes. The cells immediately around the egg cell and contained within the follicle are called 'granulosa' cells. These also line the fluid-filled cyst which forms as the egg develops. Immediately outside and surrounding the follicle are 'theca' cells. Acting together these cell types produce oestrogen (oestradiol in particular), the female equivalent of androgen or testosterone.



Diagrammatic section of the ovary.

B-8 Diagram of Section of Ovary

As the egg develops, under the influence of oestrogen, the pocket of fluid surrounding it enlarges until, near the time of ovulation, the follicle has attained a size of 20 mm in diameter. Ovulation is the release of the egg from the follicle by means of rupture of the follicle and extrusion of the egg and supporting fluid.

Ovulation may be preceded 24-48 hours earlier by mild to severe pain in the pelvic area. This is called **Mittelschmerz** (mittle = middle and schmertz = pain in German). The pain may last minutes or hours. Approximately 50% of women experience this pain.

There are a number of hypotheses as to why this pain occurs which include: pain as a result of the released fluid around the egg irritating tissues, spasms of the fallopian tubes, or congested blood flow around the ovary.

In each cycle usually about 20 primary follicles are recruited for maturation but only one is destined to mature fully into a Graafian follicle and ovulate. The remainder become Matrophied. Occasionally two follicles will undergo full maturation and ovulate. When this occurs, the ova are believed to be released within 24 hours of each other. If each is fertilized, non-identical twins are conceived. In the great majority of cases, however, it is believed that the ovaries each release a single ovum more or less alternatively.

The **life of the ovum** is said to be 'up to 24 hours'. In fact, it is believed ovum life is closer to 12-18 hours. If not fertilized, it will disintegrate in the fallopian tube or uterus and is simply absorbed into body tissue. Actual ovum SIZE is said to be 'about that of a pinpoint'. It's nucleus contains 23 chromosomes, the mother's genetic contribution to the child. After ovulation, the follicle does not disappear, but undergoes changes in itself called **luteinization** or formation of the corpus luteum and this process allows the production of the second hormone, progesterone.

B-9 Diagram of Follicle Development

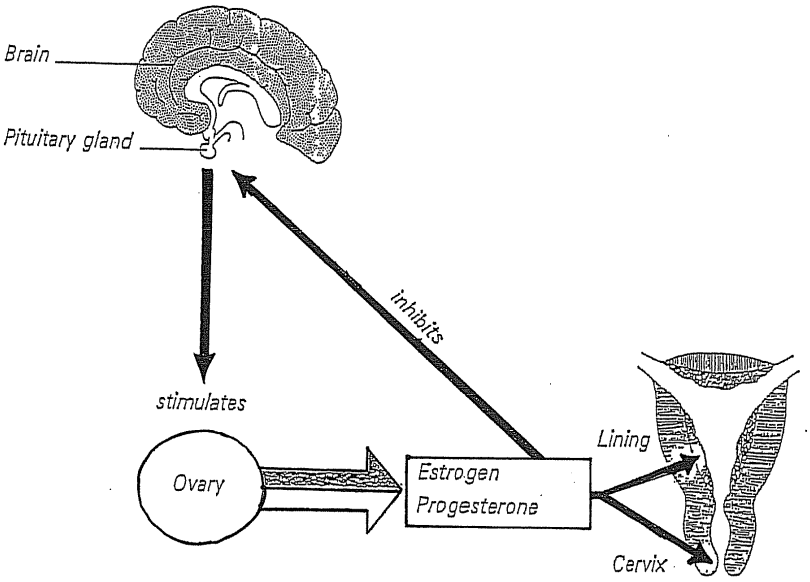
Oestrogen is responsible for the secondary sex characteristics of the female - enlarging breasts, broadening of hips and 'rounded' appearance, as well as contributing to the growth and maintenance of the uterus, fallopian tubes and vagina.

The function of progesterone is essentially that of an anti-oestrogen, i.e. inhibiting oestrogen action in stimulating cell proliferation and also inhibiting formation of prostaglandins, agents which stimulate uterine contractions among other actions.

The female reproductive system is controlled by a delicate interplay of substances called **hormones** which rise and fall throughout the menstrual cycle. Hormones are chemical 'messengers' which are produced in and secreted by specialised tissues called endocrine glands. Hormones travel via the blood stream to target organs where they cause certain changes to take place. The glands involved in reproduction are:

- the hypothalamus
- the pituitary
- the ovaries in women - the testes in men

The **hypothalamus** is a region in the brain that is involved in many regulating processes, for instance the control of body temperature. It is also responsible for secreting substances called **releasing hormones** which travel to a tiny bean-shaped organ located at the base of the brain known as the **pituitary.**



B-10 Diagram of Female Hormone Regulation

2.3 The Menstrual Cycle

Initial Stages of the Menstrual Cycle

The menstrual cycle begins because the level of hormones secreted by the ovaries begin to fall. The **hypothalamus** registers this drop in ovarian hormones and in turn secretes **gonadotrophin releasing hormone (GnRH).** This hormone stimulates the pituitary to secrete the hormone **follicle stimulating hormone** (**FSH).** As its name suggests this hormone must stimulate a cohort of immature eggs or follicles in the ovary so that they can begin to grow. The pituitary also produces a second hormone **luteinizing hormone(LH)** in response to **GnRH**.

Another event that is precipitated by a falling level of ovarian hormones, particularly progesterone, is that of menstruation. The thick lining in the uterus called the **endometrium,** which has built up during the previous cycle is shed, along with a little fresh blood. So we have the end of one cycle and the beginning of the next occurring simultaneously.

Because menstruation is a fairly obvious event, for practical purposes the first day of bleeding is called **Day 1** of the cycle.

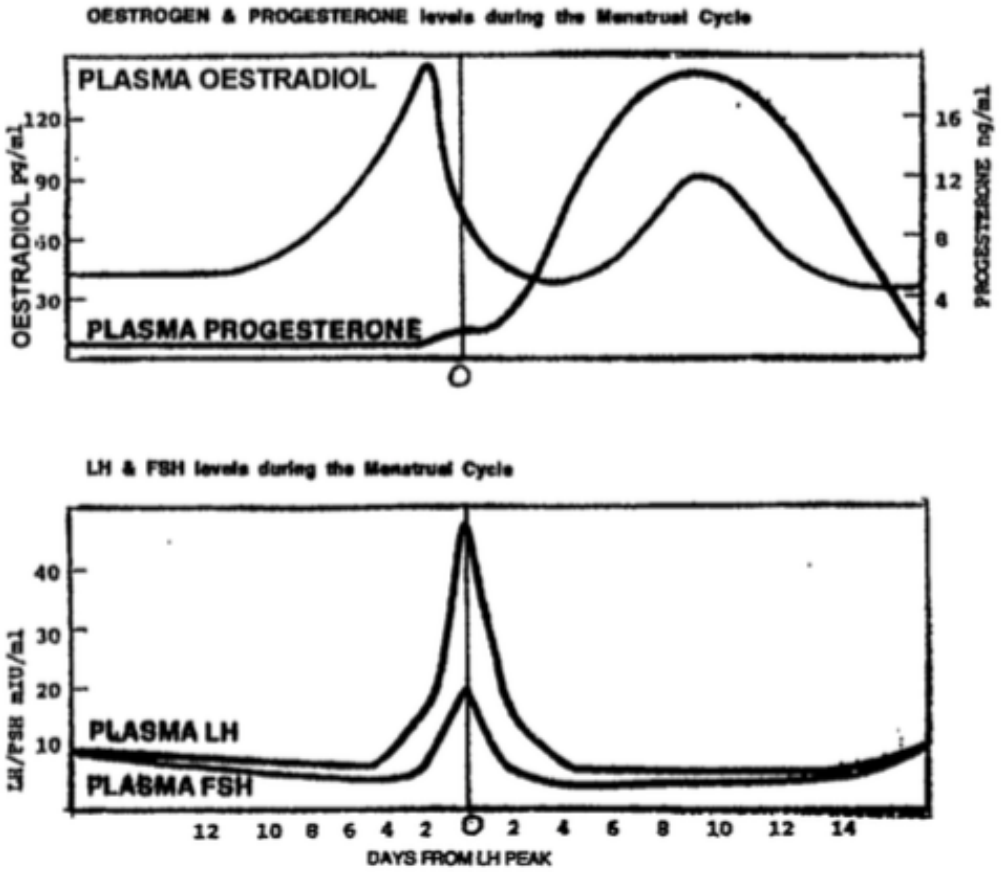
SUMMARY OF INITIAL STAGES OF THE MENSTRUAL CYCLE	
1.	Falling ovarian hormones registered by hypothalamus
2.	Hypothalamus produces GnRH
3.	GnRH stimulates the pituitary
4.	Pituitary secretion of FSH and LH increases
5.	FSH stimulates new group of follicles
6.	Follicles begin to grow
7.	Menstruation occurs simultaneously

The Pre-ovulatory Phase

Stimulation of the immature follicles into secondary follicles by FSH continues for several days. For reasons that remain unclear, at about day 7 of the cycle one of the secondary follicles assumes dominance over the others. While they stop growing and undergo atresia (degenerate), this one follicle continues to develop to full maturation. As this follicle begins to mature, in response to FSH and LH it starts to produce a hormone called **oestradiol,** a potent **oestrogen.** Oestradiol travels to its target organ, the uterus. Here it has the effect of renewing the growth of glands, blood vessels and most specifically the tissue lining of the uterus (endometrium). By the time ovulation occurs this lining will be 4-5 times the thickness it was at the end of the period. However, it is not yet fully prepared to support a pregnancy. This final preparation does not take place until after ovulation.

During this phase there is a great build up or proliferation of cells due to the action of oestrogen. The time from the end of the period until ovulation is called the **proliferative phase.** It is also referred to as the **pre-ovulatory** or **follicular phase**

Also during these days, particularly as the dominant follicle becomes more mature and produces increasing quantities of oestrogen, changes occur in the cervix. The cervix starts to rise, the os opens and it feels soft. Cervical mucus produced at this time contains more water, salt and sugars. Its protein molecules become arranged in a different pattern so that instead of being an impenetrable barrier to sperm it actually assists the passage of sperm into the body of the uterus. This is a very fertile phase of a woman's menstrual cycle. If intercourse takes place during this time, even though the woman has not yet ovulated, a pregnancy may occur. This is because the sperm can survive for up to seven days in the crypts lining the cervix. From here, the sperm are transported up the reproductive tract, thus being available to fertilize the ovum once it is released into the fallopian tubes.



B-11 Hormone levels during the menstrual cycle

The granulosa cells of the growing follicles also produce **inhibin** a hormone, which has a specific action on the pituitary of inhibiting FSH release, but not LH.

Remember that hormones circulate right around the body in the blood stream, so that as the ripening follicle produces more oestradiol and inhibin, the rise in circulating levels of these hormones will be registered in the brain.

In response to this, rather like a thermostat in a hot water system, the pituitary secretes less FSH because it is no longer needed. The follicle continues to ripen under the influence of FSH and the oestradiol it itself produces. However, when the amount of circulating oestradiol reaches a critically high level or peak, once again, GnRH from the hypothalamus triggers the pituitary to produce a surge of LH. This results in ovulation occuring 24-48 hours later.

At this time there is also a second, but less significant, rise in FSH.

SUMMARY OF EVENTS IN THE PRE-OVULATORY PHASE	
1.	FSH stimulates 10-20 follicles to begin to grow.
2.	Developing follicles produce oestrogen.
3.	Oestrogen stimulates the lining of the uterus to begin reconstruction. Also affects cervix causing increased production of the type of mucus which will assist transport of sperm.
4.	When the level of circulating oestrogens reaches a critical level the pituitary releases LH and FSH which results in final maturation of the ovum and its release from the ovary.

The Luteal Phase

After the ovum has left the ovary, luteinizing hormone (LH) continues to effect changes within the ovary. The cells which line the follicle from which the ovum has erupted begin to grow and change colour. This reorganization results in a round orangey-yellow structure, which is called the **corpus luteum** (Latin: yellow body). This corpus luteum now becomes a gland in its own right and begins to secrete two hormones. One of these is **oestrogen** - so that the level of oestrogen rises again after ovulation. The second hormone is **progesterone,** which is secreted in greater amounts. As its name suggests it is there to protect the pregnancy for which the woman's body prepares each cycle.

Progesterone does this in several different ways:

- **Firstly,** by its anti-oestrogenic action it cuts off the flow of mucus from the cervix and makes the mucus more viscous and hostile to sperm penetration.
- **Secondly,** it prepares the woman's whole body for the possibility of pregnancy. A 'byproduct' of this preparation is the fact that a woman's basal body temperature rises slightly after ovulation and this temperature rise is sustained until the progesterone levels fall again at the end of the cycle.

- **Thirdly,** it causes a further build up of cells and an increase in size and number of the glands and blood vessels in the uterus. The shape of the blood vessels alters to become tightly coiled so that the surface area is increased and will offer a hospitable place in which the developing embryo can embed when it has reached the uterus.

After ovulation has occurred and mucus production has decreased or stopped and is inhospitable to sperm, the woman's menstrual cycle moves into an infertile phase until the next period starts.

Implantation occurs approximately 6-7 days after conception. The phase from ovulation to the next period is referred to as the **secretory phase** (because the endometrium is secreting fluids at this time), or the **luteal phase** (referring to the time during which the corpus luteum is active). High levels of circulating oestrogen and progesterone stop the production of FSH and LH from the pituitary and while they remain high, no more follicles can be stimulated to grow.

If the woman does not conceive at the time of ovulation the corpus luteum which appears after ovulation has a finite life span i.e. it can only continue to produce oestrogen and progesterone for 12-16 days.

Towards the end of this time it becomes shrivelled and the excretion of hormones diminishes. This fall in oestrogen and progesterone causes the blood vessels at the base of the endometrium to go into spasm, thus effectively closing off the blood supply to the tissues beyond. Approximately 24 hours later, when the spasm relaxes, the cells which have died, plus a little fresh blood, start to come away from the wall of the uterus and the period begins. The drop in circulating oestrogen and progesterone also allows the hypothalamus to 'switch on' and release 'releasing hormones' which in their turn cause the pituitary to begin to produce follicle stimulating hormone (FSH) - so the cycle begins again.

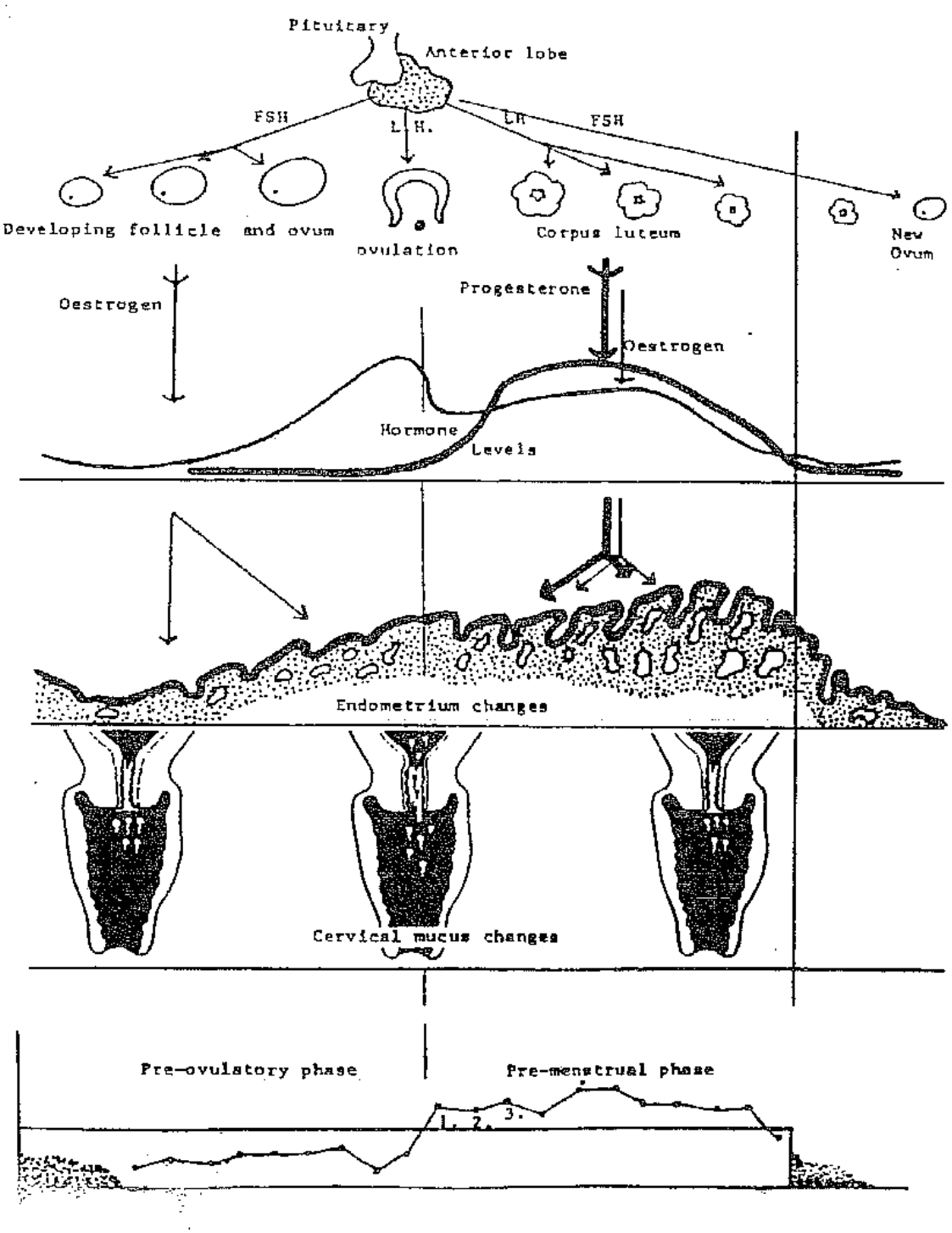
If the woman does conceive at the time of ovulation and implantation takes place 6 or 7 days later, the embedding conceptus (the cells that will eventually form the embryo, placenta and membranes), produces a hormone of its own called **human chorionic gonadotropin** or HCG. The presence of this hormone in the blood stream prevents regression of the corpus luteum. It not only prevents regression but causes it to double in size by the end of the first month of pregnancy and to continue producing increasing quantities of oestrogen and progesterone. The corpus luteum continues to function and to produce these hormones until about the 12th week of pregnancy, by which time the placenta has developed sufficiently to take over the task. Its function is necessary to sustain pregnancy through the first 12 weeks.

Because the level of ovarian hormones remain high the pituitary does **not** produce FSH so no more follicles are stimulated to begin ripening. Once again, because oestrogen and progesterone levels remain high, the events which lead to menstruation do not occur - in fact, the endometrium must remain intact to ensure the continuing existence of the embryo. Therefore, if a woman is pregnant she does not ovulate or menstruate until sometime after the foetus is born.

Human chorionic gonadotropin (HCG) will begin to appear in the urine of a pregnant woman shortly after implantation, and detection of this hormone in a woman's urine forms the basis for our current pregnancy tests. These tests for HCG can detect its presence in serum or urine at about the time of the missed period.

Because the progesterone present during early pregnancy keeps the body temperature elevated, an elevated basal body temperature sustained for 18 consecutive days will indicate that pregnancy has begun without the necessity of a pregnancy test.

SUMMARY OF EVENTS IN THE LUTEAL PHASE	
1.	Luteinizing hormone causes the granulosa cells that surround the mature ovum to change, re-organise and become the corpus luteum.
2.	The corpus luteum begins to produce both progesterone and oestradiol.
3.	Progesterone causes the mucus at the cervix to change to a thick gel, which will once again prevent the passage of sperm. It also continues the build up of cells, blood vessels and glands in the lining of the uterus. A secondary effect is a rise in basal body temperature – approximately 0.20C above the pre-ovulatory level.
4.	The active life span of the corpus luteum is only 12-16 days. If a woman has not conceived, the corpus luteum will begin to degenerate after approximately 10 days and the level of oestrogen and progesterone will fall – thus precipitating menstruation and the beginning of a new cycle some days later.



B-12 Summary of Hormonal Events

2.4 Sexual Response Cycle in Females

A woman's sexual response is complex. Her physical and emotional well-being can affect her response, as can drugs, alcohol, stress, fatigue, self image and previous sexual experiences – positive and negative.

There are four phases of sexual response in females:

1. Desire and excitement
2. Plateau
3. Orgasm
4. Resolution

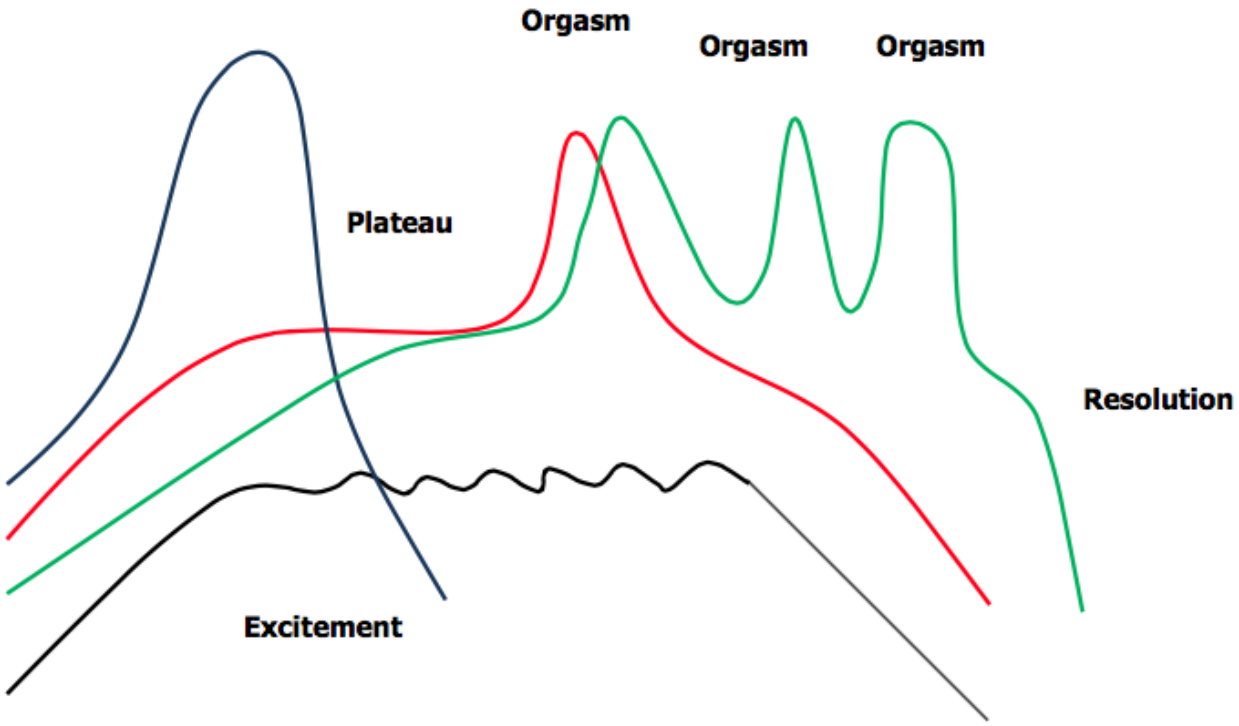
Desire – is an interest in sex, also known as libido. It may be thinking about sexual intimacy or feeling attracted to a person.

Excitement – is the phase where a woman feels aroused. Sights, sounds, thoughts, smells, tastes, scents, as well as direct physical contact, may trigger sexual arousal. The excitement phase in women is generally longer than that of males. The emotional and physical responses come together resulting in physical changes in the woman's body. These changes include: an increased heart rate, increase in blood pressure and respirations, genitals deepen in colour due to vasocongestion, the vagina becomes moist and increases in depth and width, the clitoris becomes erect, and labia swell, there is elevation of the cervix and uterus, breasts swell, nipples become erect, if the woman is fair skinned, a faint pink rash may develop at the base of the neck and over the breasts and sweating may occur.

Plateau – during this phase the excitement phase is intensified and maintained. Sexual arousal is at its peak before orgasm. Heart rate, blood pressure, respirations and muscle tension increase again. The plateau phase may not always lead to orgasm.

Orgasm – is the peak (climax) or release of the build up of sexual tension. Waves of rhythmic muscle contractions occur throughout the woman's body. It may last only seconds. Heat rate, respirations and blood pressure are at their highest. A woman can experience multiple orgasms during the same sex act because she can move back and forth between the plateau phase and orgasm phase before entering the resolution phase. Women, unlike men, do not have a refractory period. Some women have orgasms regularly with sex and some women do not. This is normal.

Resolution – is the return of the body to its unexcited state. Heart rate, respirations and blood pressure decrease. Some women may experience a mild ache in the genitals and lower pelvis until the extra blood drains out of the engorged area. The whole body may sweat. Muscle tension yields to relaxation. The resolution phase is much longer in women compared to the abrupt resolution in men.



B-13 Various Sexual Response Cycles in Females

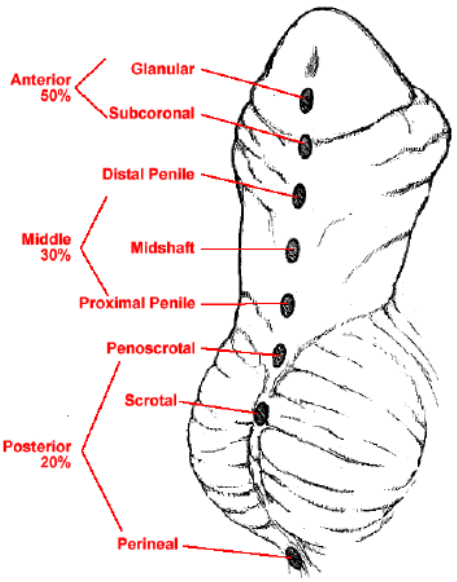
3 PATHOPHYSIOLOGY OF MALE REPRODUCTIVE SYSTEM

Introduction

This chapter incudes a short summary of some of the common alterations to the Male Reproductive System. Further detail relating to fertility is in the Infertility chapter.

3.1 Alterations of the Male Reproductive System

Congenital



Hypospadias
1 in 300 males born in NZ have hypospadias, which occurs when the urethra is not at the end of the penis, but at another location (as show in the image). Corrective surgery is normally performed between 6 – 18 months of age. Some males may experience ejaculatory dysfunction later in life, with some experiencing lower levels of satisfaction due to psychological and social reasons.

Cryptorchidism
Undescended testicles occur in 4% of full term boys and 20% of pre term boys. The cause is due to hormonal and mechanical factors. Research shows that maximum fertility results from surgery in males less than one year of age.

Congenital absence of the vas deferens
The vas deferens did not fully form, leading to azoospermia (no sperm in the ejaculate). A common cause of this defect is Cystic Fibrosis.

Infections

Mumps
1 in 4 males who have a mumps infection after puberty may develop orchitis (inflammation of the testis). This inflammation can result in a decrease in testicular size, and a subsequent reduction in sperm count.

Sexually Transmitted Infections
These include; chlamydia, gonorrhoea, syphilis, and non-specific urethritis. Infections are discussed in further detail in the Sexual Health chapter.

Anatomical Alterations

Ejaculatory Disorders
The absence of ejaculation is called **Aspermia,** the most common cause of aspermia is **Retrograde ejaculation**. Other causes are chronic health conditions, recreational drug use, blockage in the ejaculatory ducts, or psychological factors leading to a failure to orgasm.

Varicocele
The formation of varicose veins on scrotum. The varicose veins increase the circulating heat of the testes, causing oxidative damage to the sperm.

Vasectomy

An elective surgical procedure that involves the vas deferens being cut and then sealed with stiches, clips, a mild electrical pulse, or by tying their ends off. If successful, this results in no sperm in the ejaculate (azoospermia).

Benign Prostatic Hyperplasia (BPH)
Age related enlarging of the prostate, which leads to frequent and altered urination, with symptoms worsening as the prostate enlarges. While BPH does not directly affect fertility, some of the pharmaceutical treatments for BPH result in a relaxing of the pelvic muscles, leading to sexual dysfunction. If surgery was performed on the prostate, then this may also result in difficulty achieving and maintaining an erection.

Alterations to Sexual Function

Erectile Dysfunction (Impotence)
The inability of a man to achieve or to sustain an erection. This can be caused by a number of factors, including but not limited to:

- Chronic diseases such as Type 2 Diabetes, and Renal Failure – both conditions lead to restricted blood flow.
- Age related
- Trauma to the Penis
- Surgery (in the case of BPH above)
- Pharmaceutical drugs, such as treatments for anxiety and depression
- Lifestyle factors such as recreational drugs
- Psychological issues, such as anxiety or depression leading to arousal dysfunction.

4 PATHOPHYSIOLOGY OF FEMALE REPRODUCTIVE SYSTEM

Introduction

In this chapter, students will learn about the alterations and dysfunctions associated with the female reproductive system, and menstrual cycle. PCOS and Endometriosis will be examined thoroughly, their signs and symptoms and the treatment available. Infections are discussed in the Sexual Health chapter.

4.1 Objectives

The student will be able to:

1.	Explain the common medical terms relating to ovulation, menstruation, and sexual dysfunction.
2.	Explain the difference between PMS and PMDD.
3.	Understand the difference between the various anatomical alterations and conditions effecting the female reproductive system.
4.	Explain the term polycystic ovary syndrome (PCOS).
5.	Explain the cause of PCOS and how it is diagnosed
6.	List the signs and symptoms of PCOS.
7.	Explain how PCOS can affect the menstrual cycle.
8.	Explain the role of the drug Metformin in clients with PCOS.
9.	Explain the potential ongoing health risks of those with PCOS.
10.	Define endometriosis.
11.	List the symptoms of endometriosis.
12.	Explain how a diagnosis of endometriosis is made.
13.	Outline current trends in treatment.

14.	Describe various ways of managing endometriosis

4.2 Ovulatory, Menstrual Alterations and Sexual Dysfunction

Menstruation

Dysmenorrhoea
Pain associated with menstruation.

Amenorrhoea
The absence of menstruation.

Post-partum Amenorrhea
The temporary absence of menstruation during the post-partum period. Also called Lactational Amenorrhea.

Primary Amenorrhea
The complex absence of menstruation after puberty in an apparently healthy woman.

Secondary Amenorrhea
The absence of menstruation for at least three months in a woman who has previously menstruated and who is not pregnant or breastfeeding.

Oligomenorrhea
Sparce or infrequent menstruation.

Menorrhagia
Heavy bleeding during Menstruation.

Intermenstrual Bleeding
The appearance of bleeding, spotting, or a brownish mucus discharge between two menstrual periods. It may be associated with ovulation or may indicate the need for a medical assessment.

Ovulation

Anovulation
The absence of ovulation.

Oligo-ovulation
Irregular ovulation.

Mittelschmerz
The abdominal or pelvic discomfort or pain experienced by some women around the time of ovulation.

Sexual Dysfunction

Dyspareunia
Pain that occurs before, during or after intercourse. Painful intercourse effects women in all stages of life, which can be due to a number of causes.

Vaginismus
Involuntary contractions and tightening of the muscles at the opening of the vagina leading to painful penetration, and intercourse.

4.3 PMS and PMDD

Premenstrual Syndrome (PMS)

PMS is a common disorder that occurs in the lead up to menstruation. It is caused by the fluctuating levels of hormones: either oestrogen being high, progesterone being low, or it may be a combination of the two factors. Women report experiencing a range of physical and emotional symptoms, that can vary from cycle to cycle - however they can be managed with dietary and lifestyle changes.

Physical Symptoms	Emotional Symptoms
• Headaches or Migraines • Fluid retention and Bloating • Weight Gain • Tender Breasts • Cravings • Fatigue, Poor Concentration • Sleep Disturbances • Changes to Bowel Movements • Acne	• Irritability • Increased Anxiety • Tension • Mood Swings • Close to Tears • Low mood • Depression • Decreased Libido

Premenstrual Dysphoric Disorder (PMDD)

PMDD is a severe form of PMS, that effects approximately 3-8% of women with PMS. Unlike the manageable symptoms of PMS, PMDD is debilitating with sufferers struggling to manage the disorders effect on daily life. Due to its severity, PMDD requires the attention of a health care professional. PMDD can be differentiated from Depression by the fact the PMDD resolves soon after menstruation has started. Research indicates that women suffering from PMDD are particularly sensitive to the changes in neuro-transmitters caused by the hormonal fluctuations of the menstrual cycle.

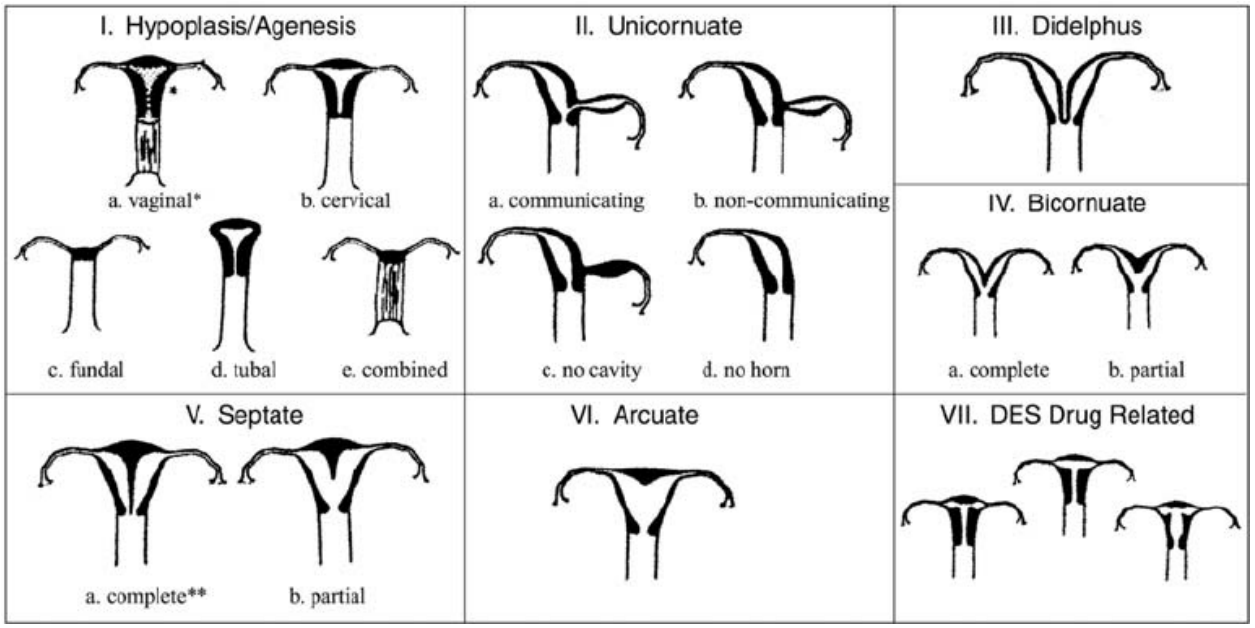
4.4 Anatomical Alterations

Congenital

Mullerian Anomalies

A Mullerian Anomaly is a type of malformation that causes the reproductive organs to not form properly in utero. It effects approximately 3-4% of women - this % is likely to be higher as some of these anomalies, such as the arcuate uterus, has no impact on fertility outcomes and is usually only discovered during a laparoscopy, or caesarean section. There are several variations, which are best illustrated in the diagram below. The fertility implications vary for each variation. For more information:

https://www.reproductivefacts.org/news-and-publications/patient-fact-sheets-and-booklets/documents/fact-sheets-and-info-booklets/abnormalities/



Vaginal Septum

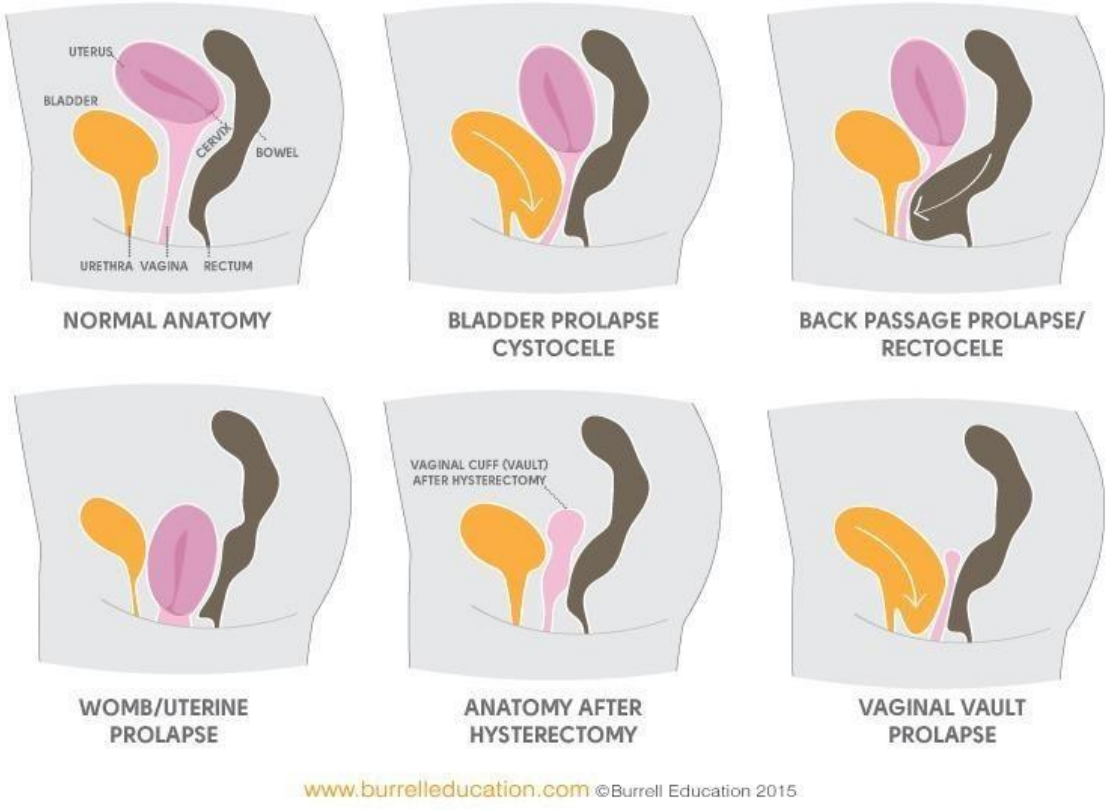
A septum (wall of tissue) that divides the vagina either longitudinally, or transverse. A transverse septum is usually only discovered at menarche (as the blood has no outlet to flow, leading to cyclic pain and swelling). Septum's can be removed surgically.

Imperforate Hymen

The hymen does not have a small opening, therefore at menarche the blood has no outlet. The hymen is surgically perforated to allow for menstruation flow.

Prolapses of Pelvic Organs

A prolapse occurs when the ligaments and fascia holding the pelvic organs in place relax, causing the pelvic organs to drop out of their place. Prolapses are more common with age, after childbirth, and after a hysterectomy. Pelvic floor training can help to strengthen the pelvic floor.



Adenomyosis

Adenomyosis is when endometrial tissue grows into the muscular lining of the uterus, it is essentially endometriosis of the uterus. It is more common in women who have had uterine surgery, or after childbirth. The symptoms are; heavy painful periods, pain during intercourse, swollen tender uterus, and bleeding between periods.

Fibroids

Fibroids are non-cancerous growths that form either in the lining of the muscular tissue of the uterus or inside the uterus. Fibroids are not normally removed surgically, unless they are very large and are causing discomfort – or if they are growing fast. Fibroids can cause very heavy and prolonged bleeding during menstruation. Fibroids shrink after menopause.

Ovarian Cysts

A cyst is a sac or pouch filled with tissue or fluid. Cysts on the ovaries are very common, and usually resolve on their own.

Functional
Cysts that form as part of the ovarian cycle, they usually resolve on their own and do not require treatment.

- Follicular Cysts – formed when the follicle does not burst at ovulation, resulting in a cyst that persists.
- Corpus Luteum Cyst – formed when the corpus luteum persists past the normal luteal length.

Non-Functional
Cysts that form as part of abnormal cell growth, or a disease process. These are normally monitored for changes, and only removed if they grow very quickly or cause discomfort.

- Endometrioma or Chocolate Cyst – caused by endometriosis on the ovary.
- Teratoma or Dermoid Cyst – a cyst filled with connective tissue such as hair and skin.

Surgical

Hysterectomy
The surgical removal of the uterus.

Oophorectomy
The surgical removal of the ovaries, the removal of which induces immediate menopause.

Salpingectomy
The surgical removal of a fallopian tube.

4.5 Polycystic Ovary Syndrome

PCOS is a metabolic and hormonal disorder and it is the most common endocrine disorder among young women. The incidence of PCOS in New Zealand women of reproductive age and worldwide is 5-10%. As many as 21% of women have some characteristics of the syndrome e.g polycystic ovaries found on ultrasound.. It is a leading cause of infertility. Other names for Polycystic Ovary Syndrome are Stein-Leventhal Syndrome, Hyperandrogenic Chronic Anovulation, Functional Ovarian Hyperandrogenism, and Polycystic Ovary Disease.

What occurs with PCOS?
High levels of insulin stimulate the production of multiple follicles which in some cases, do not mature and therefore progesterone levels remain low. The endometrium requires progesterone to continue its development, so without it, a build up develops of friable material. When the period does arrive it can be heavy and irregular in occurrence.
Elevated insulin levels and insulin resistance contribute to increased androgen production thereby worsening PCOS symptoms.

There is currently no cure for PCOS, but the condition does need to be managed. It should not be considered purely as a gynaecological problem but also a metabolic issue with associated complications which may lead to earlier death.

Cause

The cause of PCOS prior to May 2018 was unknown. There was some speculation that it may be genetic or acquired. 30% of PCOS sufferers may have a family history of PCOS or other presentation in the form of diabetes, lipid abnormalities, or premature baldness within their family.

New research released from the French National Institute of Health and Medical Research now points to PCOS being triggered before birth by excess exposure in the womb to a hormone called anti-Müllerian hormone.

The researchers discovered that pregnant women with polycystic ovary syndrome have 30 per cent higher levels of anti-Müllerian hormone than normal. Since the syndrome is known to run in families, they wondered if this hormonal imbalance in pregnancy might induce the same condition in their daughters.

To test this idea, they injected excess anti-Müllerian hormone into pregnant mice. As their female offspring grew up, they displayed many of the hallmarks of polycystic ovary syndrome, including later puberty, infrequent ovulation, delays in falling pregnant, and fewer offspring.

The excess hormone seemed to trigger this effect by overstimulating a set of brain cells that raise the level of testosterone.

The team were able to reverse this effect in the mice using cetrorelix, an IVF drug routinely used to control women's hormones. After treatment with this drug, the mice stopped showing symptoms of polycystic ovary syndrome.

The research team are now planning a clinical trial of cetrorelix in women with the condition, which they hope to start before the end of 2018.

If the syndrome is indeed passed from mothers to daughters via hormones in the womb, that could explain why it's been difficult to pinpoint any genetic cause of the disorder.

The findings may also explain why women with the syndrome seem to get pregnant more easily in their late 30s and early 40s. Anti-Müllerian hormone levels are known to decline with age, usually signalling reduced fertility. But in women who start out with high levels, age-related declines may bring them into the normal fertility range – although this still needs to be tested.

Journal reference: *Nature Medicine*, DOI: 10.1038/s41591-018-0035-5

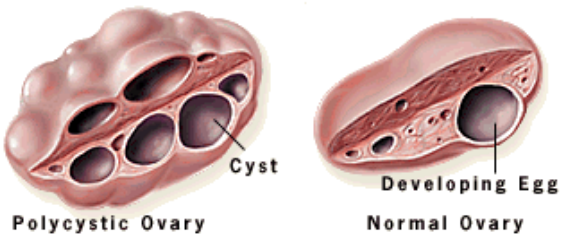
Diagnosis

PCOS is diagnosed by physical examination (general and reproductive), vaginal ultrasound of the ovaries, client history and blood tests. The Rotterdam Consensus on Diagnostic Criteria for PCOS (consensus adopted internationally), says that two of the three of the following conditions must exist:

1. Oligoovulation (infrequent ovulation, diagnosed by 8 or less periods in a year) or anovulation (no ovulation)
2. Clinical and/or biochemical signs of hyperandrogenism - eg Hirsutism (abnormal growth of hair on a woman's face and body). acne, male pattern baldness, elevated testosterone
3. Polycystic ovaries - confirmed by ultrasound

Diagnosis can be difficult due to the variation in presenting symptoms and because symptoms differ with age at presentation and change over time.

A classic PCOS ovary is enlarged and has a "string of pearls" appearance, where the pearls are the cysts. Ultrasound diagnosis of polycystic ovaries is made if there are at least 8-10 cysts that are less than 10mm in size on each ovary. It is not known how long each individual cyst will last, or what caused the arrested development of the follicle leading to the formation of the cyst in the first place. The polycystic ovary tends to be enlarged to 1.5-3 times the size of a normal ovary and often has an increase in the stromal (connective) tissue in the centre of the ovary and around the follicles. Both the cysts and the stroma produce hormones, so the more cysts and the more stroma, the more likely one is to have other signs and symptoms of PCOS.



B-14 Polycystic Ovaries
(Source: http://on health.com)

Signs and Symptoms

Signs and symptoms can include:

- Menstrual disturbances such as Infrequent or absent periods, anovulation 60-70%
- High androgen levels i.e. testosterone
- Infertility - 70%
- Polycystic Ovaries found on the ultrasound scan - 22-33%
- Chronic pelvic pain
- Mood swings
- Weight gain
- Obesity - 35-50%
- High insulin levels or diabetes
- Lipid abnormalities
- Hypertension
- Hirsutism – excess hair on the upper lip, chin, cheeks, lower abdomen, genital region and thighs 70%
- Male pattern baldness or thinning hair -10%
- Miscarriage rate of at least 30% and can be up to 50%
- Acrochordons - skin tags
- Acanthosis nigricans – darkened skin patches usually found in armpit and back of the neck 1-3%
- Acne - 30%

Treatment - General

Obesity

Up to 50% of women with PCOS are obese. Dietary changes and weight reduction are important in improving insulin uptake and thereby reducing androgen levels. This in turn helps to normalise periods and reproductive functions. This may be achieved by reducing carbohydrate intake and increasing daily exercise as well as the use of insulin-sensitizing medications such as Metformin (discussed later in this section).

Weight reduction is very important. A 5% reduction in overall body weight has resulted in some anovulatory PCOS women ovulating.

Ultimately, women who succeed in losing weight are more likely to achieve and have a healthier pregnancy and reduce their risk of gestational diabetes. Longer term benefits of weight loss result from the reduction in insulin resistance. Note that weight loss is not necessary if BMI is within normal range.

Diet

It is preferable to alter eating habits without reducing calorie intake below 1800-2000 calories for long-term results.

The liver produces a substance known as sex-hormone-binding globulin (SHBG). Excess hormones in the bloodstream attach to the SHBG helping maintain hormone balance and ensuring that any free hormones act only when needed. Production of SHBG requires a diet that is adequate in soluble fibre such as: soy, flaxseeds, lentils, legumes, asparagus, nuts, seeds, yams and kumara. Bacteria in the stomach ferments these foods and produces short-chain fatty acids (SCFAs). One of these acids (propionic) stimulates the liver to produce SHBG. A diet high in refined carbohydrates is usually low in soluble fibre. This type of diet can predispose a person to insulin resistance. A diet that is low in soluble fibre is often also low in nutrients such as selenium, zinc, magnesium and essential fatty acids. These are essential elements necessary for follicular development and maturation. We would recommend that any NFNZ clients seek the advice of a health professional qualified in nutritional supplementation to have their needs assessed.

A diet high in foods that have a low Glycemic Index (GI) is recommended as this is more effective for those with insulin resistance. The GI refers to how quickly (or slowly) a carbohydrate food is converted to glucose in the bloodstream. Choosing low GI carbs – the ones that produce only small fluctuations in our blood glucose and insulin levels – is paramount to long-term health reducing the risk of heart disease and diabetes and is the key to sustainable weight loss. High GI foods include foods such as white bread, processed breakfast cereals, sugar, rice, potato, soft drink, sports drink, lollies, tropical fruits and many low fat muffins and muesli bars. Low GI foods include grainy breads and breakfast cereals, pasta, low fat dairy foods, stone fruit and kumara. Whether a carbohydrate food has a low or high GI is dependant on a number of different factors including how processed the food is, the physical structure of the food, and portion size. Generally speaking, the more processed or the more sugar a food has added to it, the higher its GI will be.

Exercise

Exercise can help use glucose in the bloodstream for energy and thereby help reduce blood glucose levels. It may also help the body use insulin more efficiently and will result in gradual reduction of insulin levels even if a mild but structured exercise plan is followed. It also improves circulation, builds muscles, and may aid weight loss.

Any increase in activity can help the body use insulin more efficiently. Most doctors would suggest at least 30 minutes of exercise three times a week for general health, and more frequent exercise if weight loss is the goal.

It may help to start slowly and build up the exercise routine. Walking and working with small hand weights, is often a good place to start. (See the end of this section for new research released on the effects of dietary and exercise programmes on fertility for those with PCOS).

Treatment - Specific

Male Pattern Baldness

Thinning hair is associated with elevated androgen levels. Reducing levels and restoring hormone balance may lessen hair loss. It may also be associated with hypothyroidism. Any rapid hair loss should be brought to the attention of a doctor. Treatment possibilities include using Minoxidil (Rogaine), Spironolactone, hair transplants, and hair weaves.

Acne

Acne can be caused by increased androgen levels. The androgens increase sebum — a combination of skin oils and old skin tissue — and the sebum plugs skin pores allowing bacteria to thrive and cause inflammation.

Some over-the-counter medications applied to the skin may reduce outbreaks.

If a client is not wanting to conceive, prescribing the Combined Oral Contraceptive Pill (one that contains cyproterone acetate, and/or the diuretic spironolactone) has an anti-androgenic effect that can reduce acne.

Accutane (Isotretinoin), a prescription medication used to treat severe nodular acne that has not responded to other therapies, is contraindicated in pregnancy or while trying to conceive as it is known to cause foetal deformities.

Insulin-sensitizing medications such as Metformin may reduce acne by restoring hormone balance.

Excessive Hair Growth

One of the more frequent cosmetic concerns among women with PCOS is the excess facial and body hair. The hair growth is triggered by either a lack of oestrogen or excess androgen production.

Normalization of hormone levels may reduce unwanted hair growth, but will not remove what is already there. Insulin-sensitizing medications such as Metformin can help restore hormone balance as can low dose Combined Oral Contraceptive pills (COC) or a COC and an anti-androgen tablet such as Spironalactone (Aldactone). Pharmaceuticals need to be taken for several months before any signs of benefit can be seen. For those unable to take a COC, they can try using a Progestogen only pill (POP) for 12 days each month. These medications cannot be used while trying to conceive.

Another option is removing unwanted hair. Various methods can be used such as tweezing, shaving, depilatory cremes, waxing, electrolysis and laser. Bleaching works by lightening the colour of dark, coarse hairs so they are harder to see and often softens them slightly.

Skin Tags

Skin tags are benign growths that vary in appearance from smooth or rough, flesh-coloured or darker than surrounding skin. They can hang from a stalk or be slightly raised above the skin. They are typically found on the eyelids, neck, armpits, upper chest and groin. They do not need to be removed unless they are irritating. Skin tags can be removed by a doctor or specialist using various methods such as: freezing with liquid nitrogen (cryotherapy), electrically burning off (cautery), burning off with laser, or cutting with a scalpel or scissors.

Darkened Skin Patches (Acanthosis Nigricans)

The exact cause is not known, but is often seen in association with endocrine disorders such as insulin resistance and PCOS. This is a darkening of the skin ranging from tan to dark brown/black that commonly appears on the back of the neck, armpits, under breasts, in the groin area, and sometimes on the elbows, knees and hands. The skin is usually velvety or rough to the touch. It may look as if it is dirty and could be scrubbed off. It cannot be cured, but individuals may see improvement if hormone balance is restored or weight loss is achieved. Some prescription medications may reduce discolouration.

Mood Swings, Anxiety and Depression

This is an area where more research is needed. It does appear that many women with PCOS suffer some physical or psychological manifestations of depression. There is some medical literature suggesting a link between diabetes and depression, and perhaps that might be extended to early stages of insulin resistance. It may be that the hormone imbalances, including hyperinsulinemia and hyperandrogenism, create a physical source of depression. Medications that help restore hormonal balance in conjunction with antidepressants sometimes have a positive effect in reducing mood swings, anxiety and depression.

Another possible source of depression is the effect that PCOS symptoms may have on self-esteem. Skin, hair, and weight can each cause discomfort with one's appearance that damages confidence. Infertility may also lead to frustrations with one's body and the feeling it can't do anything right, or perhaps a notion that one is being punished for some past action. Miscarriages are common in women with PCOS, and the grief associated with this type of loss can be far-reaching.

Anyone who feels she is showing signs of depression should consult her doctor as well as consider seeking emotional support. Be sure to find a doctor who is willing to listen to concerns and not dismiss this potential side effect of PCOS.

Abnormal Bleeding

Women with PCOS usually have irregular cycles or a lack of periods. Some women will have more frequent and heavy periods. Heavy periods can lead to anaemia. Women with PCOS can develop endometrial cancer in their 30s rather than in their 50s or 60s for the general population. Any abnormal bleeding needs to be investigated by a doctor and usually involves pelvic examination and ultrasound.

Infertility

Lack of ovulation is usually the reason for fertility problems in women with PCOS. Several medications that stimulate ovulation can help women with PCOS become pregnant. Other reasons for infertility in both the woman and man should be ruled out before fertility medications are used. Also, there is an increased risk for multiple births (twins, triplets) with fertility medications, but especially so for women with PCOS, whose ovaries are particularly sensitive to the hormones. Regular professional monitoring while taking any fertility medication is important.

For most patients, **Clomiphene citrate** (Clomid®, Serophene®) is the first choice in therapy to stimulate ovulation. Of those with PCOS, 40-50 percent of those who ovulate on it will become pregnant. Most doctors would recommend trialling Clomiphene for 6-9 cycles. Prolonged use has not been found to be beneficial. If ovulation does not occur in this time, it is advised to move on to another type of treatment. After 6 months of Clomiphene use, clients qualify in NZ for publicly funded IVF treatment if they meet certain other criteria. Clomiphene is usually taken early in the cycle – days 2-6.

Metformin (an insulin-sensitizing medication) taken in tablet form with Clomiphene is usually tried in NZ. When Metformin is taken along with fertility medications, it may help women with PCOS ovulate on lower doses of medication. Metformin can also be prescribed without Clomiphene to help with cycle regulation. (See more in-depth information later in this section).

Gonadotropins can also be used to stimulate the ovary to mature ova but are usually tried after Clomiphene and Metformin. Gonadotropins are given as injections. This is known as ovarian stimulation and, where there is an additional sperm problem, can be combined with intrauterine insemination (IUI) around the time of ovulation. Live birth rates after ovarian stimulation following failed Clomiphene treatment reach 54% after six months and 62% after 12 cycles.

Another option is in vitro fertilization **(IVF)**. IVF offers the best chance of becoming pregnant in any one cycle and gives doctors better control over the chance of multiple births.

In New Zealand the current success rate of IVF in first cycles for women under 38 years is 45-50%. This includes cycles using thawed embryo transfers (Dr Guy Gudex – Auckland District Health Board).

Surgical Intervention

Surgical treatment for PCOS is intended to reduce levels of androgens and restore the menstrual cycle. Although these surgeries remove or destroy a portion of the ovaries, they do not impair fertility. In fact, they were often done to help restore fertility. Two different surgeries have been used in the past to treat PCOS: **ovarian wedge resection** and '**ovarian drilling**'.

Wedge resection (which is rarely used today), is major abdominal surgery that removes a portion of the ovary.

Ovarian drilling is more commonly performed and is done by outpatient laparoscopic surgery. Ovarian drilling is a less invasive procedure with less risk of scarring. A small needle is used to make 4-20 punctures in the ovary. An electric current is passed through the needle and a small portion of the ovary is destroyed. Often a small amount of cyst fluid can be seen escaping as the puncture is made. Alternatively, lasers have been used for the same effect with the potential disadvantage of greater surface injury and scar tissue formation.

The success rate for ovarian drilling is generally less than 50 percent. Surgical intervention for PCOS should not be considered as a first step in treatment in part because it is unclear what the long-term effects might be.

Ovarian wedge resection is no longer performed in NZ but laparoscopic ovarian drilling (LOD) is performed on women who have anovulatory cycles.

Basal Body Temperature

Women with PCOS who are mostly anovulatory will have erratic basal body temperatures BBTs) — spikes and dips. If a woman with PCOS has an ovulatory cycle, the BBT chart should show a thermal shift, but it may be harder to read.

Specific information on Metformin

Metformin (Glucophage®) is used to treat type 2 diabetes. It also has been found to help with PCOS symptoms. It works primarily by suppressing hepatic glucose production and increasing glucose utilization in peripheral tissues. It may also reduce intestinal glucose absorption. More simply put, Metformin affects the way insulin controls blood glucose. Since it does not stimulate production of insulin, it does not cause hypoglycemia if used alone (though hypoglycemia may result if used with insulin, or with consumption of an excessive amount of alcohol). Metformin is metabolized by the kidneys.

The drug Metformin improves insulin resistance thereby establishing regular periods and ovulation (this may take several months once starting the medication). Nine out of ten women can spontaneously ovulate and become pregnant as long as there are no other underlying causes of infertility. Miscarriage rate in PCOS women is higher and Metformin may help in this situation as well.

Metformin also lowers testosterone production thereby slowing down abnormal hair growth that some PCOS clients suffer from. Recent research has shown Metformin to have other positive effects, such as decreased body mass and improved cholesterol levels.

Side effects of Metformin

Gastrointestinal problems such as diarrhoea, nausea, vomiting, abdominal bloating, flatulence, and anorexia are the most common reactions. Usually the side effects are dose dependant and diminish over time. Starting with a low dose and building up to the desired maintenance level may help.

Drinking alcohol while on Metformin is not recommended, though not completely banned either. One may feel the effects of the alcohol sooner and become intoxicated more easily. Alcohol may work with Metformin to increase blood lactate levels, increasing the risk of lactic acidosis (although extremely rare 1:33,000). Symptoms of lactic acidosis include feeling weak, muscle aches, trouble breathing, lightheadedness or dizziness, or suddenly developing a slow or irregular heartbeat.

How long do the nausea and diarrhoea last after starting Metformin?
Usually symptoms lessen over time and go away with long-term use (usually after 3-4 weeks at the same dose). If diarrhoea and nausea continue, try taking the medication in the middle of a meal. Also consider diet — the uncomfortable side effects may be prolonged by a diet that is high in carbohydrates and/or high in fat. Reducing both may lessen symptoms.

Metformin Dosage

The maximum recommended dose of Metformin is 2550 mg per day (3 x 850 mg pills). The usual dose in diabetics is 1000 mg twice daily. Clients with PCOS are usually prescribed Metformin 500 mg, three times a day or 850 mg twice daily.

PCOS and Pregnancy

There appears to be higher rates of miscarriage, gestational diabetes, pregnancy-induced high blood pressure (pre-eclampsia), and premature delivery in women with PCOS. Researchers are studying how the diabetes medicine Metformin can prevent or reduce the chances of developing these problems while pregnant. Metformin also lowers male hormone levels and limits weight gain in women who are obese when they become pregnant.

Unfortunately, women with PCOS tend to have a higher risk of miscarriage than women without PCOS. Some studies have suggested that as many as 50% of women with PCOS experience a miscarriage compared to the average rate of 15% among the general population.

It appears that continuing Metformin use at least through early pregnancy may reduce the chance of miscarriage, especially in patients with repeated miscarriages. A recent abstract, "Metformin throughout pregnancy in women with polycystic ovary syndrome reduces first-trimester miscarriage" (CJ Glueck et al, J Invest Med 2000), revealed a group's experience with 59 pregnant PCOS women. Of these, 23 were kept on Metformin for the entire pregnancy. The other 36 did not continue Metformin in pregnancy. This is a very small sample, but the miscarriage rate was 45 percent without Metformin and only nine percent with Metformin.

While the exact reason for the increased miscarriage risk is unknown, experts do have a few theories.

Insulin resistance is thought to be a contributing factor, as women with PCOS and insulin resistance seem to be at a greater risk of miscarriage than women with PCOS but no insulin resistance issues. Insulin resistance becomes worse as a pregnancy continues so it is reasonable to continue taking Metformin.

However, it is also thought that the increased LH (Lutenizing hormone) levels present in some women or the high androgen levels in women with PCOS could also be a factor.

Despite the problems that can present themselves to PCOS sufferers looking to get pregnant, a successful pregnancy is entirely possible and has been experienced by numerous women with PCOS. In fact, for many women, getting pregnant the second time around is much easier. Furthermore, it is not unusual for PCOS sufferers to notice that their menstrual cycles begin to regulate themselves after a pregnancy but PCOS is not cured by pregnancy.

There have been no studies on pregnant women taking Metformin to confirm its safety. But a study, done in 2002, suggests that Metformin may reduce the risk of birth defects caused by the symptoms of PCOS by as much as 30% (www.thelaboroflove.com/articles/can-metformin-cause-birth-defects/). Clients already on Metformin who are trying to conceive should discuss the issue of taking Metformin throughout their pregnancy with their doctor.

Metformin product information recommends switching to insulin during pregnancy. Any change over needs to be done under the supervision of a specialist to maintain optimum glucose control and reduce the risk of congenital anomaly from maternal hyperglycaemia.

Recent data provides some reassurance about the safety of Metformin in respect of lack of teratogenicity when taken in early pregnancy, although no long-term follow-up data is available. Properly conducted randomized trials are required, as well as a large enough database to exclude rare unanticipated adverse outcomes, such as birth defects.

It is not known if continuation of Metformin in early pregnancy provides any better outcome than either ceasing the drug (in women with polycystic ovary syndrome) or changing to insulin (in women

with type 2 diabetes). In some circumstances, use of Metformin may be preferred, but patients should be individually advised of the harms and benefits.

Non-randomised data from New Zealand, where a number of pregnant women with type 2 diabetes have been treated with Metformin, suggest that there may be no difference in outcomes when compared with similar women treated with insulin. A small randomized trial in Australia showed no difference in foetal beta cell activity, as measured by cord C-peptide concentrations at delivery, between the babies of women with gestational diabetes treated with Metformin and the babies of women treated with insulin. A randomized Metformin in Gestational Diabetes trial is currently underway to establish the efficacy of Metformin compared with insulin, using neonatal outcome as a primary end point. The results may be available soon. After reviewing the results from 600 women, the independent data monitoring committee recommended that the trial continue as there was no indication for early closure. www.australianprescriber.com/magazine/30/3/68/9/

PCOS and Breastfeeding

There are no adequate studies to say that women who have PCOS have problems with breastfeeding but the hormone imbalances that go along with PCOS appear to reduce one's ability to breastfeed exclusively. Most PCOS women have no trouble, and breastfeeding may improve glucose tolerance a short time after giving birth.

Metformin is excreted in breastmilk. There have been three published studies of Metformin in breast milk. One of these studies showed the amount of Metformin found in the milk was well below the medically established level of concern. The studies reassure women that their Metformin use has no significant effect on their babies. There is no risk of neonatal hypoglycaemia in contrast to other drugs used to control the mother's hyperglycaemia. For further information read William Hague's article published June 2007 www.australianprescriber.com/upload/pdf/articles/885.pdf

PCOS and Menopause

Because PCOS (a metabolic and hormonal disorder) affects many systems in the body, many symptoms persist after menopause, even though ovarian function and hormone levels change as a woman nears menopause. For instance, excessive hair growth, male pattern baldness or thinning hair continues after menopause. Also, the risks of complications from PCOS, such as heart attack, stroke and diabetes, increase as a woman gets older.

Long Term Health and PCOS

PCOS women are more likely to be insulin resistant, especially if overweight (BMI greater than 25) and this can be associated with elevated insulin levels, diabetes, hypertension, cholesterol and heart disease especially if there is a family history of heart disease or diabetes.

Women with PCOS have at least seven times the risk of heart attacks and heart disease. By 40 years, up to 40% can have Type 2 diabetes or impaired glucose tolerance test.

Endometrial hyperplasia occurs when the endometrium, the lining of the uterus, becomes too thick. It is not cancer, but in some cases, it can lead to cancer of the uterus.

What can clients do to minimise their risk?

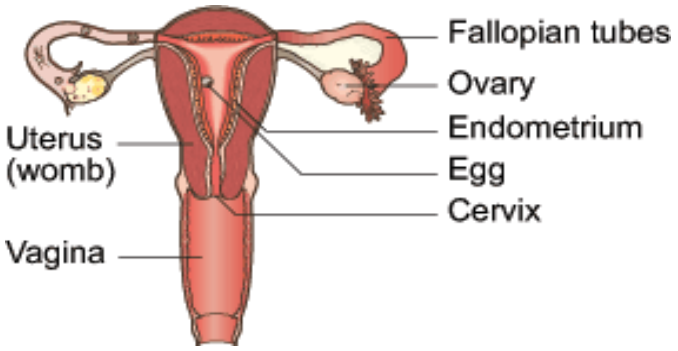
- Stop smoking
- Regular daily exercise
- Maintain a healthy body weight
- Long-term use of COC helps many women who do not want to conceive.
- Weight, blood pressure, fasting lipids and glucose should be checked regularly
- 3-yearly cervical smears

Further Reading

- Polycystic Ovary Syndrome Pamphlet, Fertility NZ www.fertilitynz.org.nz
- Polycystic Ovary Syndrome (PCOS) Article written for Northern Courier by Dr Hanifa Koya – Obstetrician and Gynaecologist
- www.pcosupport.org
- www.4woman.gov/faq/pcos.htm
- www.inciid.org
- www.pcos-info.com
- www.greenjournal.org/cgi/reprint/105/6/1437
- www.australianprescriber.com
- www.thelaboroflove.com/articles
- www.strotknet.com/experts/infertility
- www.ivf-et.com/tic/forum/endocrinology.html
- Polycystic Ovary Syndrome Association of Australia www.posaa.asn.au
- National Institute of Child Health and Human Development (NICHD), NIH, HHS www.nichd.nih.gov/womenshealth
- American Association of Clinical Endocrinologists (AACE) www.aace.com
- American Society for Reproductive Medicine (ASRM) www.asrm.org
- Center for Applied Reproductive Science (CARS) www.ivf-et.com
- InterNational Council on Infertility Information Dissemination, Inc. (INCIID) www.inciid.org
- Polycystic Ovarian Syndrome Association, Inc. (PCOSA) www.pcosupport.org
- The Hormone Foundation www.hormone.org
- Good Health in the 21st Century by Dr Carole Hungerford

4.6 Endometriosis

Endometriosis is when fragments of endometrial-like tissue (lining of the uterus) grow in places outside the uterus where it shouldn't be. These growths or lesions, known as endometriosis, are usually found in the pelvic region in places such as on the ovaries, bladder, bowel and on the pelvic wall. Occasionally, endometrial tissue can be found in other parts of the body. These growths respond to oestrogen just like the endometrium in the uterus and can cause inflammation. It is common for scar tissue and adhesions to form.



B-15 Female Reproductive Organs

In New Zealand it is estimated the incidence is 1:10 of all women, and 1/3 in women presenting with subfertility/infertility. It is most commonly diagnosed in women aged 25-40 although symptoms usually begin in the teen years. Endometriosis is rarely found actively in post-menopausal women though it can cause long term damage to pelvic organs if left untreated. Women sometimes continue to experience some symptoms, particularly those which are bowel related (often referred to as IBS – irritable bowel syndrome).

Endometriosis cannot always be cured, but it can usually be treated and managed

Causes of Endometriosis

The cause of **endometriosis** is unknown, although there are many theories. Research continues in this area. Some of the theories include:

Metaplasia theory - Metaplasia means to change from one normal type of tissue to another normal type of tissue. It has been proposed by some that endometrial tissue has the ability in some cases to replace other types of tissues outside the uterus. Some researchers believe this happens in the embryo, when the uterus is first forming.

Others believe that some adult cells retain the ability they had in the embryonic stage to transform into reproductive tissue.

Vascular or lymphatic transplantation - Endometrial fragments may travel through blood vessels or the lymphatic system to other parts of the body. This may explain how **endometriosis** ends up in distant sites, such as the lung, brain, skin, or eye.

Iatrogenic transplantation - **Endometriosis** has been found in surgical scars (most often, C-section scars, but also in laparotomy or laparoscopy scars) which was likely caused by transplantation of endometrial tissue during surgery.

Sampson's theory of retrograde menstruation – This theory was promoted by Dr. John Sampson in the 1920s. He surmised that menstrual tissue flows backwards through the fallopian tubes (called "retrograde flow") and deposits on the pelvic organs where it seeds and grows. However, there is little evidence that endometrial cells can actually attach to women's pelvic organs and grow. Years later, researchers found that 90% of women have retrograde flow. But since most women don't develop **endometriosis,** some doctors have concluded that something else (perhaps an immune system problem or hormonal dysfunction) may be the trigger for **endometriosis.** The Retrograde Menstruation Theory also doesn't explain how **endometriosis** develops in women who have had a hysterectomy or a tubal ligation. It also doesn't explain the fact that in rare cases, men have developed endometriosis when they have been treated with oestrogen after prostate surgery.

Other Clues:

Immunology - Many women with endometriosis display certain immunologic defects or dysfunctions. Whether this is a cause or effect of the disease remains unknown.

Genetic Predisposition - Studies by researchers such as Dr. Stephen Kennedy at Oxford University show that first-degree relatives of women with this disease are more likely to develop endometriosis. And when there is a hereditary link, the disease tends to be worse in the next generation.
Endometriosis is familial (in that it 'runs' in families) and we are closer to identifying the genes responsible

Environmental Factors - Some studies have shown a link to environmental factors being involved.

The cause of endometriosis is likely to be multifactorial with several contributing factors causing the disease. Until cause is properly determined, it is important to access best practice treatment and management to improve quality of life and reduce the possibility of compromised fertility.

Symptoms

- Pain with periods (dysmenorrhoea) and/or ovulation.
- Painful intercourse (dyspareunia).
- Bowel involvement often associated with a period such as bloating, pain before and / or with defecation, painful wind, constipation and/or diarrhoea.
- Subfertility or Infertility –it is estimated that about 1/3 of women with endometriosis are infertile.
- Other abdominal pain
- Lower back pain.
- Pain before or with urination, frequency and urgency of urination.
- Premenstrual Syndrome (PMS), headaches
- Mood fluctuations and depression (often associated with chronic pain conditions)
- Tiredness, fatigue, exhaustion, low energy.
- Abnormal menstrual bleeding.

The amount of pain is not always related to the extent of the disease. For example, some girls and women with mild endometriosis can suffer severe symptoms. Not every woman with endometriosis will have regular monthly symptoms though some have persistent symptoms throughout the month which vary in intensity.

Diagnosis

Often endometriosis is initially misdiagnosed as irritable bowel syndrome, PID, sometimes appendicitis or other pelvic pain conditions.

The best way towards reaching a diagnosis is to listen to your patient's story. If the story 'stacks up' the suspicion that endometriosis will be confirmed is very strong. Pelvic examination, bloods, ultrasound or MRI can be useful but are not tools to diagnose endometriosis. Endometriosis can only be truly diagnosed by performing a surgical procedure called a laparoscopy. This is performed by a specialist gynaecologist under general anaesthetic. The gynaecologist inserts a laparoscope (a long thin tube with a tiny camera at its tip) through a small incision in the abdomen at the base of the navel. The laparoscope allows the inside of the abdominal cavity to be viewed. Other instruments are also introduced into the lower abdomen, to allow for the endometriosis to be excised. The abdominal cavity is inflated with carbon dioxide gas to improve visibility and allow room for the procedure. The abdominal and pelvic cavities are examined for inflammation, endometriosis lesions, scarring/adhesions and any other abnormalities. Advanced laparoscopic surgeons usually excise (remove, cut out or re-sect) the endometriosis, and take down any adhesions or areas which are suspicious.

Treatment

A multidisciplinary approach is now recommended and is known as best practice. This will include gynaecologists who specialise in endometriosis and advanced laparoscopic surgery and a team from other disciplines which may include pelvic physiotherapy, osteopathy, pain specialists, fertility specialists, musculoskeletal specialists, and more. Combining advanced laparoscopic excision of disease, a medical management plan if appropriate and self-help options has been found to give patients the best long-term outcome.

Treatment will often include:

1. Intervention to relieve symptoms in the first instance which may include analgesics and NSAIDs. This will depend on the age, fertility concerns and what is in the best interest of the patient and her wishes.

2. Best practice surgery by a specialist gynaecologist who will excise the endometriosis and restore normal anatomy. Advanced stage endometriosis may require more extensive surgery.

3. A medical management plan (IUD, hormone medications)

4. Evidence based self-management

More information can be found at www.nzendo.org.nz as well as clicking the links to the specialised services.

Management

The physical and emotional effects of **endometriosis** are serious and far reaching but can be managed by:

A healthy, well-balanced diet. This will improve symptoms of constipation, bloating, wind and bowel pain. An appointment with a nutritionist may be helpful.

- Eat 5-8 servings of vegetables a day.
- Drink 1-2 litres of water daily.
- Reduce or stop caffeine intake. Caffeine is thought to impair ovarian function and so affect fertility. It also impairs the uptake of vitamins and minerals.
- Eat a high fibre diet – a well functioning digestive system eliminates oestrogen more effectively.
- Reduce or stop drinking alcohol – alcohol increases oestrogen levels in the blood. It also robs the body of vitamins A, D, E, K and all the B vitamins and magnesium. Research has found that the risk of endometriosis is 50% higher in women who consume any amount of alcohol over those who consume no alcohol.
- Take a daily multivitamin and ensure an adequate intake of B vitamins.
- Increase consumption of Omega 3 oils which can decrease inflammation and pain. Omega 3 is found in oily fish, linseed, sunflower and flax seeds.
- Certain foods e.g. linseed, can act as oestrogen blockers, lowering the body's ability to take up oestrogens from the environment.
- Minimise refined carbohydrates – sugar and white flour.
- Consider antioxidant supplementation i.e. vitamins C and E and minerals zinc and selenium.

Use of complementary therapies e.g. massage, acupuncture, homeopathy, naturopathy, osteopathy, reflexology, chinese herbal medicine for pain management and treatment.

Physiotherapists can develop a programme of exercise and relaxation techniques designed to help strengthen pelvic floor muscles, reduce pain, and manage stress and anxiety. After surgery, rehabilitation in the form of gentle exercise, yoga, or pilates can help the body get back into shape by strengthening compromised abdominal and back muscles.

- Regular gentle exercise.
- Reducing stress.
- Developing good sleep habits.
- Warm showers and using heat packs can help with pain management.
- Support groups also play a vital role in learning how to cope with endometriosis and provide information and support.

Further reading

- Endometriosis NZ https://nzendo.org.nz
- www.endometriosis.org
- https://www.southerncross.co.nz/group/medical-library/endometriosis-symptoms-diagnosis-surgery-treatment
- 'Endometriosis: A key to healing and fertility through nutrition" by Dian Shepperson Mills and Michael Vernon. Published by Element Books
- Endometriosis – a New Zealand Guide. Andrea Molloy. Published by Random House
- Endometriosis and other Pelvic Pain. Dr Susan Evans

5 SEXUAL HEALTH

Introduction

This chapter provides students with an overview of the main sexually transmitted infections their cause, diagnosis and treatment. It also looks at how these STIs may affect a client's sexual health and fertility.

Students will develop a basic understanding of cervical smears and the New Zealand National Cervical Screening Programme. This section closes with an overview of the BreastSecreen Aotearoa Programme.

5.1 Objectives

The student will be able to:

1.	Describe each of the following infections and how they may affect the clients fertility: a. Chlamydia b. Gonorrhoea c. Syphilis d. Non-specific Urethritis e. HPV and Genital Warts f. Genital Herpes g. Trichomoniasis h. Pelvic Inflammatory Disease i. Thrush j. UTI k. Bacterial Vaginosis
2.	Explain the purpose and function of the New Zealand National Cervical Screening Programme.
3.	Explain the process involved in having a cervical smear.
4.	Explain the importance of breast awareness
5.	Explain what a mammogram is.
6.	Explain the purpose of the BreastScreen Aotearoa Programme.

5.2 Sexually Transmitted Infections (STIs)

STIs are serious infections which are caused by bacteria, viruses or other micro-organisms. Some are curable with antibiotics, e.g. chlamydia, gonorrhoea and syphilis. They should be treated as early as possible to avoid any long-term health problems such as infertility. Genital warts and genital herpes are incurable although their symptoms can be treated. This is a huge topic and Fertility Educators need to have some basic background knowledge of these infections and how they may impact on a client's fertility. Most Family Planning Clinics have a range of pamphlets about STIs https://www.familyplanning.org.nz/advice as do most of the District Health Board Resource Centres. Another source of information is the Ministry of Health's website, www.moh.govt.nz

In the following notes, you will find a brief description of the common STIs that our clients may have a history of. There is also information on the cause and treatment. It is important to ascertain when taking a history if the client has ever had a STI as this may have impacted on their fertility. They may also have unresolved questions that they may want to raise with you. You are not expected to have an in-depth knowledge of all the STIs, but enough information to answer standard questions and be able to refer clients to appropriate information or services. Clients expect personal questions about their sexual health when they contact a service such as ours. It is easy to state right at the beginning of the first appointment that some personal questions will be asked, so that when it comes to the question "Have either of you ever had a sexually transmitted infection?" it comes across as a relevant and professional question.

Chlamydia

It is the most commonly diagnosed sexually transmissible infection (STI) in Aotearoa New Zealand. Chlamydia has a 3-5% population prevalence in both men and women. It is most common in those under 25 years old. It has a single exposure male-to-female transmission rate of 40%, and a single exposure female-to-male transmission rate of 32%. This refers to the risk that an individual will get chlamydia after having unprotected sex with a partner who has chlamydia. Chlamydia rates in New Zealand are two to three times higher than chlamydia rates in Australia, the UK and the US.

Chlamydia is a bacterial infection of the mucous membranes lining the genitals, rectum or throat. It can lead to Pelvic Inflammatory Disease (PID), ectopic pregnancy and infertility in women. In men, chlamydia can cause urethritis, epididymitis and infertility.

It is transmitted by vaginal, anal or oral sex (without a condom) with someone who has the infection. There can also be transmission between mother and baby during birth resulting in neonatal conjunctivitis (30-50%) and pneumonia (11-20%).

Symptoms: Chlamydia is asymptomatic in 70-90% of women and 30-50% of men. Women may present with painful intercourse, lower abdominal pain, a discharge from the vagina, pain when urinating or bleeding between periods. Men may have a watery or thick discharge from their penis or pain on urinating, irritation of the urethra and pain in the testicles. Chlamydia in the rectum may result in a discharge and discomfort.

Diagnosis of chlamydia involves a simple urine test and/or swab.

Treatment is with antibiotics. This can be administered as a one-off dose or for 7-10 days. All partners need to be treated even if they have no symptoms (due to it being highly asymptomatic).

It is recommended not to have any unprotected intercourse until 7 days after finishing the antibiotics. Intercourse can occur using a condom.

Gonorrhoea

A bacterial infection of the genitals, throat or rectum which can lead to infertility in men and women. Gonorrhoea can lead to Pelvic Inflammatory Disease (PID), ectopic pregnancy due to scarring, sterility in women and epididymitis and sterility in males.

Gonorrhoea rates in New Zealand are three to four times higher than national gonorrhoea rates in Australia and the UK, but considerably less than in the US.

It is transmitted by someone who is infected having anal, vaginal or oral sex without a condom. It can also be transmitted from mother to baby during the birthing process.

In the last five years the number of Gonorrhoea cases in New Zealand has increased by over 50%.

Co-infection with Chlamydia is common.

Gonococcal infections rates are higher among young adults (under 25s) and among men who have sex with men. In a single act of vaginal intercourse between an infected man and an uninfected woman, her chance of contracting gonorrhoea is around 60-80 percent. If the woman is infected and the man is not, his chance of contracting gonorrhoea is 20 percent from that single act.

Symptoms: Gonorrhoea can be asymptomatic. Approximately 95% of males with gonorrhoea will be symptomatic (compared to 50% of females) therefore males are more likely to seek treatment. If symptoms are present, women may experience painful intercourse, a vaginal discharge, bleeding between periods or lower abdominal pain. Men may experience a discharge from the penis or rectum, testicular pain or pain on urinating.

Diagnosis is from the patient history and swabs.

Treatment is antibiotics often followed by ant chlamydial tablets as gonorrhoea and chlamydia often occur together. Sexual partners must be tested and treated if positive. No unprotected intercourse is advised until treatment is finished.

Syphilis

In New Zealand, syphilis rates have been increasing, particularly in men who have sex with men (MSM). However, syphilis rates in heterosexual men and women have also been increasing. Similar trends have also been seen in recent years in Australia, the UK and the US, with increasing syphilis cases first seen in the MSM population, then in the heterosexual population. The increase in syphilis cases in the heterosexual population leads to an increased risk of congenital syphilis.

Syphilis is a bacterial infection which enters the body through broken skin or the linings of the genital area. The bacteria are transmitted by having oral or vaginal intercourse without a condom with someone who has the infection. Transmission can also be from mother to baby across the placenta during pregnancy.

If contracted while pregnant, there is a 50% chance of miscarriage or stillbirth. If during delivery, a baby contracts the disease there is a 10% chance of the baby dying within the first few days of birth.

Symptoms: The first stage of infectious syphilis presents as a painless, solitary ulcer usually found on the genitals that heals spontaneously. If left untreated, secondary syphilis develops in two to eight weeks and presents as swollen glands, a rash and hair loss. Men can experience epididymitis (inflammation of the epididymis) and if not treated can go on to damage nerves resulting in erectile

dysfunction. In approximately one-third of cases, tertiary syphilis develops several years later. The latter stage of the disease can damage internal organs of the body including the heart, brain and spinal cord.

Diagnosis is via a blood test and visual examination of the ulcer if present.

Treatment is with antibiotics and follow-up with blood tests to ensure the infection is resolved. Sexual partners must be tested and treated if tests come back positive. No intercourse is advised until the infection is cleared.

Syphilis is routinely screened for when NZ women have their antenatal blood tests done.

Non-Specific Urethritis (NSU)

These are bacterial infections that can cause inflammation of the urethra. They can be caused by chlamydia, bacteria, viruses or other organisms. If left undetected and untreated, NSU can lead to: spread of the infection into the prostate or testicles in males. infertility can occur in extreme cases by the spread of the infection to a female partner who may develop pelvic inflammatory disease (PID), which can cause infertility. Although not all cases are sexual in origin, the majority of cases are in people who are sexually active.

Symptoms: Women usually have no symptoms, but if they do, it is usually a non-smelling vaginal discharge. Men may have a discharge from the penis, pain on urinating or an increased frequency to urinate. They can be asymptomatic.

Diagnosis: There is no specific test to diagnose NSU but once Chlamydia and Gonorrhoea have been ruled out NSU is usually diagnosed on symptoms if present and patient history.

Treatment: is with antibiotics. Partners need to be examined and treated. It is advised that no intercourse takes place until those infected are cleared. If intercourse occurs, a condom must be used to prevent reinfection.

HPV and Genital Warts

Human Papilloma Virus (HPV) is the most common sexually transmitted viral infections in the world and may occur in up to 80% of sexually active people. Most people won't know they have it as they are symptom free. In most cases it resolves and clears by itself without any treatment within 1-2 years. There are many different types of HPV. Some forms of HPV can cause genital warts or changes to the cells that can lead to cancer, such as cancer of the cervix, vulva, penis, anus or throat. There is a vaccine that can help protect the individual from a number of HP viruses (more on this later in this section).

More than 150 types of HPV have been identified and more than 40 HPV types can infect the genital area and throat

Some HPV types cause warts but are very unlikely to lead to cancer. Other HPV types are related to cervical cancer, but rarely cause warts. An individual can be infected with more than one HPV type at the same time. Only a small number of those infected will develop warts. Evidence of HPV infection can appear within several weeks of exposure or may take months to appear. HPV can lie dormant for many years. It may not be detected in a cervical smear therefore it is important to continue having regular smears.

Symptoms: HPV may produce raised or flat lumps (warts) that appear on the vulva, in or around the vagina or anus, on the cervix, and on the penis, scrotum, groin or thigh. They may be single or multiple, small or large. Some cluster together forming a cauliflower-like shape. They are generally painless although rarely those affected may complain of pain, itchiness or bleeding. They may not be visible to the naked eye (sub clinical infection).

Transmission is by direct skin to skin contact, vaginal, anal or rarely oral intercourse with an infected person. It can also be transmitted from mother to baby during the birthing process, but this is rare. Warts on other parts of the body such as the hands, are caused by different types of HPV. Contact with these warts does not generally cause genital warts. Sometimes there is no identifiable source of transmission.

Diagnosis – there is no routine diagnostic test (such as a blood test) for subclinical HPV. However subclinical HPV infections of the cervix are common and may be detected by cervical smear. The cervical smear's primary function is to detect precancerous cell changes of the cervix – not HPV. Subclinical HPV infection of the cervix is of no significance unless it leads to the development of precancerous changes. Warts are diagnosed by physical examination.

Treatment involves applying various treatments directly onto any visible warts. These include: liquid nitrogen (freezing), diathermy (heat), chemical paints, creams or liquids. Several treatments are often required. After treatment, the area must be kept clean and dry as warts thrive in moist conditions. Salt water baths soothe and heal the genital area during treatment (two handfuls of plain salt in a bath). The goal of treatment is to remove any visible warts and relieve any annoying symptoms. As the infection is caused by a virus, the treatment will not get rid of the HPV. The warts may come back in the future. At least 70% of partners of people with HPV also have the infection so it is important for them to be examined and treated as needed. There is no specific treatment for subclinical HPV infection. Subclinical HPV infection is usually temporary and resolves spontaneously.

Thrush infection is common, especially when the genital area is raw, and it is often helpful to be treated for thrush at the same time as the warts are being removed. Xylocaine (2% Lignocaine gel) is a useful local anaesthetic to put on raw areas two minutes prior to micturition or defaecation.

Genital warts very rarely cause problems during pregnancy and delivery. There is no link between HPV and miscarriage, premature labour or other types of pregnancy complications. Genital warts may grow more rapidly in size and number during pregnancy due to the expected decline in immunity as well as increased blood supply. A woman with genital warts does not need to have a caesarean section delivery unless warts are blocking the birth canal, which is extremely rare. Rarely, babies exposed to HPV during birth may develop warts on the vocal cords (respiratory papillomatosis). In some cases, having HPV can increase the risk of developing precancerous or cancerous cells in the cervix, which could affect fertility and the ability to carry a baby to term.

Clients who are pregnant and have genital warts need to speak to their health care provider, as some methods of treatment cannot be used during pregnancy.

The use of condoms and oral dams may reduce, but does not eliminate, the risk of transmission to uninfected partners.

HPV and Cervical Cancer

Most sexually active people will acquire genital HPV within 2 years of onset of sexual activity. Most will never know that they have this virus as they have no symptoms

The 14 most cancer-causing HPV types include types 16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 59, 66 and 68. Types 16 and HPV 18 are most commonly associated with abnormal cell changes on the cervix which place a small number of women at a higher risk of developing cervical cancer. Together these two HPV strains account for 70% of invasive cervical cancers. However, the clear majority of infections with HPV 16 or 18 do not progress to abnormal cervical cells or cancer. This is because the individual's immune system fights the virus and most of the time, HPV goes away on its own. This clearing of the virus can occur over two years and then the cervical cells return to normal.

In addition, HPV 16 is strongly associated with anal cancer and throat cancer. Current research indicates that high-risk HPV changes the host (human) cell but its growth needs additional triggers to cause cancer.

Sometimes HPV lingers and continues to change the cells on a woman's cervix. These cellular changes can lead to cancer over time, if they are not treated. Cervical screening detects these abnormalities, and most can be treated before the cellular changes become cancer. (See information later in this section on cervical screening). The interval between HPV infection and an abnormal smear result can vary from months to decades. It is unlikely that HPV infection alone is enough to cause cancer. HPV infection is only one event in a multistep pathway to cancer. There are many theories about co-factors but the most commonly implicated include smoking and a weakened immune system. Evidence suggests that smoking decreases the immune system's ability to deal with the wart virus and therefore may increase one's risk of developing abnormal cell changes.

Women are advised to have regular cervical smears as per the New Zealand National Cervical Screening Programme to detect any early changes which can be monitored and/or treated, thereby preventing their progression to cancer.

The HPV types that cause external visible warts are rarely associated with abnormalities on the cervix that can cause cancer.

Prevention and HPV Vaccines

HPV immunisation protects against nine types of the virus. The vaccine targets the types of HPV responsible for around 90 percent of cervical and other HPV-related cancers, and 90 percent genital warts. Clinical trials show it is highly effective in preventing these types of HPV in young people who have not previously been exposed to them.

Vaccination with the HPV vaccine prior to becoming sexually active gives the best chance of preventing HPV infection. It is still worthwhile being vaccinated even if the individual is already sexually active. HPV vaccine is currently available free to males and females aged from 9 years up to the 27th birthday.

The vaccine can be accessed through the client's GP, school-based programme or some Family Planning Clinics.

People who are not eligible for the free vaccine can purchase the vaccine from their health provider.

Together, the HPV vaccine and cervical screening are the best protection against developing cervical cancer.

Genital Herpes and HSV

There are two types of Herpes Simplex Virus (HSV) – HSV1 and HSV2. Although the infections are basically the same, type 2 is more commonly associated with genital lesions and type 1 is more often associated with oral lesions (80% of the population in NZ have oral herpes). However, HSV1 can infect genitals and HSV2 can infect the oral cavity.

HSV enters the body through cracks in the skin or through the lining of the mouth and genital area. As many as one in five people (20%) have the virus that causes genital herpes. Genital Herpes is more common in women (approximately one out of four women) than in men (almost one out of five). This may be because male to female transmission is more efficient than female to male transmission. Over 80% of people who have genital herpes, got it from people who didn't know they were infected with it.

Once a person has been infected with HSV, the virus never goes away and can recur at any time. HSV travels down the nerves connected to the affected area. It stays there without any symptoms until it is reactivated. Triggers can include being premenstrual, tired or stressed. The number of episodes in a year can vary from one to two a year up to 12 or more. Each episode is less severe than the last and they become less frequent as time goes on.

It is transmitted by close skin contact, vaginal, oral or anal sex with someone who has the virus. People with herpes can be infectious either at the time of symptoms or sometimes when no symptoms are present. It can be also transmitted from mother to baby during the birthing process if the mother has HSV in the vaginal area. HSV can also be transmitted to a baby by a kiss from someone with HSV who has an active cold sore.

Symptoms: can be painful red blisters, sores or ulcers on or near the genitals, flu like symptoms, painful urinating, pain in the genital area, painful and enlarged glands in the groin and sometimes a discharge from the sores. It can also present as a mild rash. The number of sores can vary from one or two up to several dozen when a person is first infected. The blisters eventually burst and heal, but during this time may be itchy. The symptoms can last several weeks if not treated. When the symptoms recur, the illness is usually less severe and does not last as long. Symptoms may include: tingling where the sores may develop, feeling irritable, pains in the thighs, buttocks or groin and feeling unwell. Blisters will last a few hours and then leave sores that will heal within four to ten days. The blisters and sores usually appear on the thighs, buttocks or groin. Some people with HSV never develop any signs or symptoms but can pass the virus on to their partners.

Approximately 80% of people experiencing a first episode caused by HSV2 will have at least one recurrence, while only 50% of persons with HSV1 on their genitals will experience a recurrence. Genital herpes caused by HSV2 recurs on average four to six times per year (but can be as little as 1-2 or as many as 12), while HSV1 infection occurs less often, only about once a year. Recurrences are more likely in the first two years after acquiring genital herpes.

Diagnosis – is made from taking a history, physical examination and swabbing the blister/ulcer. Blood tests are also available, but results are variable and can present with false negatives This is due to the time it takes to develop antibodies - usually 2 to 6 weeks after infection, but it may be up to 6 months

Treatment needs to be started as soon as possible (even prior to laboratory confirmation) and involves taking an antiviral to help healing, shorten the attack and reduce the number of outbreaks (doctors currently prescribe Acyclovir). Analgesia four-hourly helps with the pain. There is no cure.

The infected person can bathe daily in salted water (1 cup of salt added to a bath) to help with the healing process and pain management.

Increase fluid intake to help dilute the urine and minimise pain on micturition. Female patients are encouraged to urinate while sitting in warm water – once again easing the pain of micturition. It is also important to keep the affected area clean and dry.

Topical anti-virals are available over the counter but are not subsidised. These are unproven in most clinical trials and published trials may have been using a formulation different from the one that is available in NZ. They are not recommended for use.

Having HPV does not affect fertility even though it is a virus that affects the genital area. HSV has no effect on fertility and is not transmitted in a man's sperm or woman's ova.

Having HPV **doesn't** impede conception, but it makes it more difficult in one respect: the fact that during an outbreak partners are encouraged to avoid close intimate contact, which could limit "availability" during the most fertile time of the cycle.

Partners may or may not develop HSV. Intercourse is not advised while open sores are present. Using condoms reduces the risk of passing on the virus by 50% but doesn't completely eliminate it.

Having genital herpes is not associated with the development of cervical cancer.

HSV and Pregnancy

Women with genital herpes can experience a safe pregnancy and vaginal childbirth. This is especially so when a woman has a diagnosis of genital herpes **prior** to becoming pregnant. In the situation when the mother already has a history of genital herpes, she will have antibodies circulating in her blood which will protect the baby during the pregnancy and delivery. Even if HSV is active in the birth canal during delivery the antibodies help protect the baby.

HSV can cause neonatal herpes (babies up to 28 days old infected by herpes), a rare but life-threatening disease. Neonatal herpes can cause eye or throat infections, damage to the central nervous system, brain damage or death. Medication may help prevent or reduce lasting damage if it is given early.

Fewer than 0.1% of babies born in the United States each year contract neonatal herpes. The limited information from Australia suggests the incidence is even lower in Australia and New Zealand (4/100,000 live births in Australia). By contrast, some 20-25% of pregnant women in the United States have genital herpes. This means that most women with genital herpes give birth to healthy babies.

Babies are most at risk from neonatal herpes if the mother contracts genital HSV late in pregnancy. This is because a newly infected mother does not have antibodies against the virus, so there is no natural protection for the baby during birthing.

If a woman has her first HSV genital infection in the last 6 weeks of her pregnancy, a caesarean section is recommended, even if no outbreak is present, as the risk of neonatal HSV is greater than 50%. The health professional may prescribe an antiviral. If a vaginal delivery is unavoidable the mother is usually treated with an antiviral and an urgent referral is made to a paediatrician experienced in HSV infection. Primary infection in the second or third trimesters may be associated with preterm delivery.

Trichomoniasis

Trichomonas vaginalis is a small parasitic organism which causes irritation in the vagina in women and can cause non-specific urethritis (NSU) in men. Commonly referred to as 'trike'. It is transmitted during unprotected sexual intercourse with an infected person.

Symptoms: Women can be asymptomatic or have a smelly, yellowy-green frothy vaginal discharge., experience itchiness, painful intercourse and urination. Men usually experience pain when urinating and a discharge from the penis.

Treatment is with antibiotics and may include vaginal pessaries for women. Asymptomatic partners must be treated as re-infection may occur. Avoid intercourse until cleared infection or use a condom.

Left untreated, trichomoniasis can lead to severe health problems. Trichomoniasis can lead to inflammation of the vagina, urethra and cervix and to pelvic inflammatory disease. In pregnant women, the infection has been known to cause premature labour due to preterm premature rupture of the membranes and result in low-birth-weight babies.

5.3 Infections transmitted both sexually and by other means

Infections that can be transmitted either sexually or in other ways include: Hepatitis A, B and C, HIV, Pelvic Inflammatory Disease (PID), Pubic Lice and Scabies. For the purpose of this training we will just outline PID due to its importance in Fertility.

Pelvic Inflammatory Disease (PID)

Is an infection of the uterus and fallopian tubes that can cause infertility. PID may be caused by getting a sexually transmissible infection (STI) such as chlamydia or gonorrhoea, which then spreads further into the reproductive system. Other causes of PID include infections post IUD insertion or post abortion. The normal bacteria in the vagina can also cause PID. After an infection, scars may form in the fallopian tubes partly or completely blocking them. Scarring increases the risk of an ectopic pregnancy.

Symptoms: The individual can initially be asymptomatic but as the disease progresses a woman may experience pain with intercourse, a sore abdomen or back, heavy, irregular or painful periods, spotting, be febrile or experience nausea.

Treatment is with antibiotics. Sexual partners need to be checked for infection and treated to avoid re-infection. Sexual intercourse must be avoided until clear of the infection.

You are more likely to get PID if you have had it before.

5.4 Non-sexually transmitted infections

Infections that are not sexually transmitted but can affect the genital area include Thrush, Cystitis and Bacterial Vaginosis.

Thrush (Candidiasis)

Thrush or candidiasis is caused by a yeast organism that irritates the mucous membrane of the genitals. It is called balanitis if it is under the foreskin of the penis of uncircumcised men, and vaginitis or vulvitis if inside or around the vagina or vulva.

Thrush or candidiasis is not an STI.

It is estimated that 75% of all women will experience a thrush infection at least once in their lives. It is also important to realise that candida may be present in the vagina in approximately 20-30% of women and cause no symptoms at all, as the amounts are small and held in balance by the natural acidity of the vagina.

Bacteria called lactobacilli are normally present in the vagina and they keep the vaginal secretions slightly acid, which does not favour the growth of candida.

Thrush is caused by an overgrowth of yeast in the vagina which results in irritation of the mucus membranes. It can occur when antibiotics or the oral contraceptive pill have been used, during pregnancy, with diabetes and when immunity is low. It is not a sexually transmitted infection, but sexual intercourse can irritate the vagina, triggering the condition. Semen is also alkaline and thus favours the growth of candida.

Symptoms: in women can include: vaginal or vulval itching, irritation and vulval soreness, painful urination, painful intercourse, thick, whitish vaginal discharge. Most men don't have any symptoms although 20% may complain of itching and may have a red rash on the head of the penis or a discharge from under the foreskin.

Diagnosis: Accurate clinical diagnosis of the condition requires a laboratory test of the vaginal discharge, but more often than not thrush is diagnosed by patient history and symptoms only.

Treatment: may involve the use of anti-fungal tablets, creams or pessaries. Vaginal creams and pessaries are specially formulated to be inserted high into the vagina with a special applicator (including during your period or menstruation). Treatment with an oral antifungal such as fluconazole or itraconazole may be preferred by some women, as relief from symptoms can be more rapid. Treatment has a success rate of 80-90%. Some antifungal preparations may cause damage to latex rubber and this is important for condom and diaphragm users. This needs to be discussed with the prescriber. Treatment can be purchased 'over the counter' at a pharmacy in consultation with a pharmacist. Hands need to be washed before and after inserting a pessary or applicator into the vagina. A single dose may be all that is needed for a mild infection but those with severe thrush should be treated for five to seven days (occasionally longer).

Sexual partners only need treatment if showing symptoms.

Women with recurrent unexplained thrush should have the cause investigated.

Prevention

- Wash and thoroughly dry the genital area at least once a day. Avoid perfumed and coloured soaps, bubble baths.
- Wipe with toilet paper from front to back after a bowel movement.
- Do not wear tight clothes or tight underwear. Cotton is better than synthetic.
- Avoid intercourse until the thrush has cleared up.
- Eating acidophilus yoghurt is recommended by some women to stop yeast infections.
- Bathing in warm salty water can relieve the itch and aid recovery.
- Taking probiotics (lactobacillus) orally in tablet or powder form can help restore the normal balance of gut flora.
- Some women apply plain lactobacillus yoghurt to the vaginal area, although there is not much scientific evidence to support this.
- Having an anti-fungal treatment available during a course of antibiotics may be useful.
- A diet low in sugar and refined carbohydrates and high in vegetables and antioxidants.
- Using pads rather than tampons if vaginal creams or pessaries are being used to treat the thrush
- Taking showers instead of baths
- Avoiding douching, which may alter the natural microbial balance inside the vagina
- Avoiding using feminine hygiene sprays and deodorants on your vagina

Urinary Tract Infection (UTU)

A urinary tract infection (UTI) is when bacteria grow in the urinary tract and cause infection and inflammation.

This can affect:

- The bladder - called cystitis and is the most common type of UTI.
- The urethra. - called urethritis.
- The kidneys - called pyelonephritis and is more serious.

It is most commonly caused by bacteria from around the anus getting into the urethra and bladder. This is most likely to happen when wiping after going to the toilet or after having intercourse.

Anyone can get a UTI, but females are more at risk because of the urethra's proximity to the anus.

Other factors that can increase your risk of getting an UTI include:

- Not emptying your bladder properly
- Being pregnant

Symptoms: may include a burning sensation when urinating, needing to urinate urgently and more frequently, cloudy, bloodstained or smelly urine, aching in lower abdomen and back.

Diagnosis is made by a urine test in conjunction with patient history.

Treatment involves antibiotics for the infection, pain relief, plenty of water to dilute the urine, and urine alkalises such as Ural or Citravescent.

It is important not to ignore a UTI, as untreated infections can lead to more serious health problems.

Bacterial Vaginosis (BV)

Bacterial vaginosis is not an STI. It is the overgrowth of normal vaginal bacteria. This is accompanied by a depletion of the normal hydrogen peroxide-producing lactobacilli which create a healthy acid environment. The condition can recur until lactobacilli are re-established. This can be brought on by anything that changes the balance in the vagina, e.g., new sexual partners, increased sexual activity. The acid/alkaline balance is upset and irritation results. The normal pH of the vagina is acidic and is between 3.8 and 4.5.

Symptoms can be a greyish white, smelly vaginal discharge. Smell is often worse after intercourse or around period time.

Diagnosis is by swabs of the offensive smelling discharge and physical examination.

Treatment is with antibiotics While being treated alcohol should not be consumed. Partners do not need to be treated. 80–90% of women will have an initial response to treatment but 15–30% will get a recurrence within 3 months. It is very important to continue with treatment until the infection is resolved.

BV is strongly implicated in female infertility. If left untreated, it can spread to the uterus and fallopian tubes - then called PID.

A research study published in the European Journal of Obstetrics and Gynecology and Reproductive Biology in 2013, found that the prevalence of BV was significantly higher in infertile women than fertile women (45.5% vs 15.4%). The highest prevalence was found in patients with Poly Cystic Ovary Disease (PCOD) (60.1%) and unexplained infertility (37.4%). The cumulative pregnancy rate in both patients with PCOD and unexplained infertility were significantly higher in the patients who were treated for BV. The study showed that BV was one of the significant factors interfering with pregnancy. www.sciencedirect.com/science/article/pii/S0301211512004976

Further reading and Information

- www.moh.govt.nz
- http://www.familyplanning.org.nz/advice/sexually-transmissible-infections
- Herpes and HPV Helpline phone toll free 0508 11 12 13
- NZ Herpes Foundation - website www.herpes.org.nz
- HPV website www.hpv.org.nz
- www.familydoctor.co.nz
- Bacterial vaginosis and infertility: cause or association? European Journal of Obstetrics & Gynecology and Reproductive Biology. Volume 167, Issue 1, March 2013, Pages 59-63 www.sciencedirect.com/science/article/pii/S0301211512004976
- https://bpac.org.nz/resources/handbook/sti/sti.asp
- www.familyplanning.org.nz
- www.healthnavigator.org.nz
- https://www.justthefacts.co.nz/

5.5 Cervical Screening & Colposcopy

Introduction

More than 60 women die of cervical cancer and approximately 160 develop cervical cancer each year in NZ. Cervical cancer is most often caused by being infected with human papillomavirus (HPV). Almost everybody is exposed to HPV if they have had sexual intercourse. The cervical screening test looks for abnormal changes in cells on the surface of the cervix. Some of these abnormal cells can develop into cancer if they are not treated.

Cervical Screening Programme

NZ has a National Cervical Screening Programme in place. The aim is to reduce the number of women who develop cervical cancer and the number who die from it. All women who have cervical smears are part of the programme unless they say that they do not want to be. The programme keeps a record of all previous cervical smear results for each woman, sends a reminder letter if the next test is overdue and checks that clients get the right follow-up if an abnormal smear result occurs. The programme is regularly checked to ensure it is meeting national quality standards and that women are receiving the best possible screening and treatment. Women who have regular smear tests every three years as part of the national screening programme in NZ reduce their risk of developing cervical cancer by 90%.

Current guidelines for cervical smears are:

- All women who have been sexually active are advised to have smear tests from the time they turn 25 until they turn 70 on a 3-yearly basis.
- If it is your first smear, or you have not had one for over five years you will be advised to have a second cervical smear test in a year's time. This is to reduce the chances of any abnormal cells being missed. If both results are normal, then you will move onto the 3 yearly screening programme.
- Women who have never had sex do not need to have cervical smear tests.
- Family Planning (FP) advise women to wait for a year after commencing sexual activity before having your first cervical smear.
- If you have had an abnormal result you may be advised to be tested more often i.e. annually.
- Women who have had a total hysterectomy (with both the uterus and cervix removed), do not usually need to have smear tests – there are some exclusions to this rule and the woman needs to discuss this with her health professional.
- Women who have had a hysterectomy in which the cervix was not removed need to continue to have cervical smear tests.
- Women who are pregnant are advised to wait until their baby is born and they have had three periods return before having their next cervical smear.
- Even if you have gone through menopause, you still need to have regular smears.
- If you are no longer having intercourse but have had intercourse at any time of your life, you still need regular smears.
- Even if you have been vaccinated against HPV you still need a regular smear. Not all cancers are caused by HPV.

Cervical smears are performed by doctors, nurses or qualified smear-takers at your GP practice, Family Planning (FP), marae-based or other Maori health clinics, community health clinics such as Pacific health clinics, women's health centres, and sexual health clinics.

The cost is that of a normal consultation. Some organizations provide this service free or at low cost.

For more information visit www.timetoscreen.nz/cervical-screening/

Procedure

Smear tests only take about ten minutes. Once the procedure has been explained to the client they will then be asked to remove their lower clothing if wearing trousers or shorts. A skirt or dress does not need to be removed as it can be lifted to the waist. They are then asked to lie on the examination bed on their back with knees bent. A sheet is draped over the lower part of the body for privacy. The smear taker will leave the room during this time for the client's privacy. The smear-taker will return after a few minutes and then sit at the end of the bed adjusting the lights and then slowly and gently insert a plastic or metal instrument called a speculum into the vagina. This is usually warmed first. There is the option for you to insert the speculum yourself (Family Planning).

The speculum holds the walls of the vagina open and allows the smear-taker to view the cervix using a bright light and then take a sample of cells from the surface of the cervix with a small soft brush. The sample is then sent to the laboratory to check for any cell changes. Swabs are also taken at this time if required or requested for a sexual health check. The smear taker will then remove the speculum and ask you to get dressed.

The test can be uncomfortable but is not usually painful. It is common for people to be embarrassed or nervous.

Some tips to make the process easier on the client: wear a skirt you can leave on, ask for a female smear taker, request someone from your own culture to take your smear (book in with a provider who has this service available), try to breathe deeply and relax your legs, try laying on your side, take a friend or whanau for support, get your test done with a friend.

Watch Family Planning's video on cervical screening
https://www.familyplanning.org.nz/clinics/services/cervical-screening

Have a look at this link about cervical screening on youtube
https://www.youtube.com/watch?v=QjuEYqQvb0E

Timing of a Smear

The best time to have a smear test done is in the week after a period has finished. Smears are not taken while a woman has her period as this can distort the results or make them unreadable. If the client no longer has periods, the test can be done at any time.

Results

The test results are available within two weeks of it being sent to the laboratory. The smear-taker will usually discuss with the client at the time of the smear test how they would like to be informed of the results.

Ninety percent (90%) of results are normal. A cervical smear test will not always pick up early abnormalities. However, if abnormalities have been missed in one test, it is very likely that they will be picked up in the next test hence why it is important to have regular tests. An abnormal result hardly ever means cancer, but it still needs to be followed up. Either a repeat smear test is carried out within the next few months or a referral will be made for a colposcopy (see notes at the end of this section re colposcopy). Many low-grade changes will return to normal by themselves. It can take as long as ten or more years for abnormal cells to develop into cancer. If treatment for cell changes is needed, it will successfully remove abnormal cells more than 90% of the time.

Understanding the results

Normal
Things look good - next smear in 3 years' time

Unsatisfactory result
Sometimes the sample may be insufficient to be sure that everything is OK. This can be due to not enough cells being collected, too much cervical mucus present at the time of test, the presence of blood or infection, laboratory issues. A repeat smear within 3 months is required.

Inflammation or infection
There are a number of infections that can be present. A doctor's visit is required clear up the infection.

Atypical cells
It is difficult to be sure whether cell changes are starting to develop or not. Mild atypical changes are usually the problem, and these often clear up before the next test.
If 30 years of age or older, a test for HPV (human papillomavirus) will be done automatically. If HPV is detected, client will be referred to a specialist for a colposcopy. If HPV is not detected, or if client is under 30, a smear test in a year's time is required. If the atypical cells are still there, a referral to a specialist for further investigation will be made. Occasionally the atypical cells are more developed and might mean a moderate to severe change. It doesn't mean there is a problem, but referral to a specialist for colposcopy is required to investigate further.

Mild (low-grade) changes
Looks like the cells are beginning to change, but it may take several years to become a problem. Changes are due to an HPV infection and it usually clears up by itself.
If 30 years of age or older, a test for HPV (human papillomavirus) will be done automatically. If HPV is detected, referral to a specialist for a colposcopy. If HPV is not detected, or under 30, a further smear test in a year's time is required. If the atypical cells are still present, then a referral to a specialist for further investigation. Is required

Moderate to severe (high-grade) changes
These are more developed cell changes. This doesn't mean cancer (most women will have cell changes that can be successfully treated) but a colposcopy is required to investigate further.

Glandular cell changes or adenocarcinoma-in-situ
Although the cervical smear test is not designed to detect glandular cell changes, such changes are sometimes found. Referral for a colposcopy to investigate further.

Cancer
If the smear test shows any changes suggestive of cervical cancer, a referral is made to a specialist.

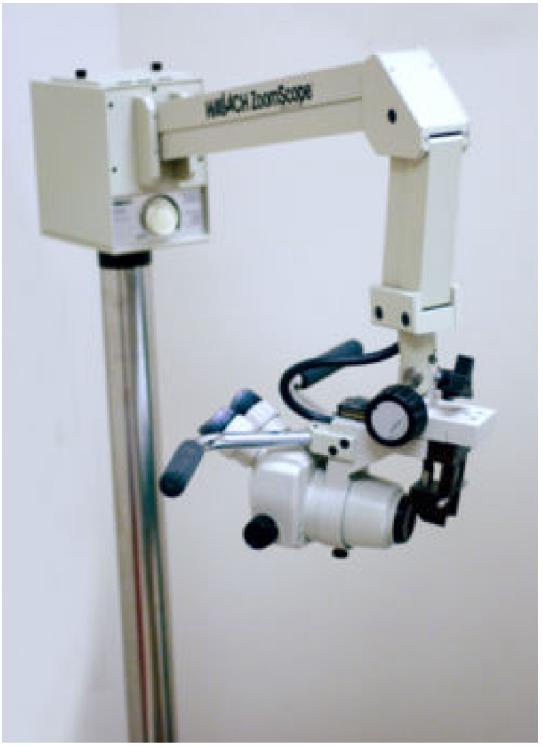
Investigation of Abnormal Cells

Colposcopy

Introduction

A colposcopy is when a specialist examines the cervix using a special microscope called a colposcope.

Colposcopies are free at a public hospital as part of the National Cervical Screening Programme. If a client chooses a private colposcopy service, they will have to pay.



B-17 Colposcope

The Procedure

The patient is asked to lie on her back on a raised bed with her legs up in leg rests. The colposcope is placed near the entrance of the vagina and makes the cells on the cervix appear larger. A speculum is inserted as for a cervical smear test and this makes it easier for the doctor to see the cervix. A liquid is painted on to the cervix so that abnormal cells show up. The liquid may sting a little, but it is not harmful. The doctor may take a small sample of tissue (about the size of a match head) from the area with abnormal cells. This is called a biopsy. When the tissue is taken the woman may feel a quick, sharp pinch. Afterwards she may experience some pain like that experienced with a period. The sample is then sent to the laboratory for examination. The doctor performing the colposcopy examination may provide treatment at the same time.

He/she will advise whether:

- The abnormal cells were treated at the time of the biopsy.
- Further treatment is required.
- Colposcopy needs to be repeated after a certain time.

He/she will discuss what has been seen and done during the appointment. The whole visit including the colposcopy takes about an hour.

Women often experience cramps following a biopsy procedure. She may also experience some bleeding or have some reddish discharge from the vagina. This is because the area that was biopsied has left a small raw area on the cervix.

Until the discharge stops and the cervix is healed, the patient is advised to use sanitary pads rather than tampons, have showers instead of baths, avoid sexual intercourse and avoid spa pools and swimming pools. If bleeding persists longer than a week, she needs to consult the colposcopy clinic.

A colposcopy cannot be performed when a woman has her period. It is safe to have a colposcopy when a woman is pregnant.

Results from Colposcopy biopsy

The client will receive her results within 2-4 weeks. Sometimes the results will be different, showing less severe or more severe cell changes than the smear test result suggested. Sometimes the result will be normal. Occasionally the biopsy will show that cancer is present.

Biopsy results may show the following abnormal cell changes:

- Mild changes (CIN 1)
- Moderate changes (CIN 2)
- High grade changes (CIN 3)
- Glandular cell changes or adenocarcinoma-in-situ (AIS).

CIN: Cervical intraepithelial neoplasia

Cells that have only changed a little (CIN 1) usually change back to normal by themselves. CIN 2 and 3 which are more abnormal, may turn into cancer over a number of years if they are not treated.

Treatment for Abnormal Cervical Cells

Treatment is successful 95% of the time. The treatment for cervical abnormalities involves removing or destroying the abnormal cells. The type of treatment used will take into account the sort of abnormality and where it is in the cervix.

Treatment options include:

- LLETZ - (Large Loop Excision of the Transformation Zone). This treatment uses an electrical wire loop to remove abnormal cervical cells under local anaesthetic. The tissue that is removed is sent to the laboratory for testing.
- Laser Treatment - Heat from a laser beam is used to remove or destroy abnormal cervical cells under local anaesthetic.
- Diathermy – Heat is used to destroy abnormal cervical cells under local anaesthetic.
- Cone Biopsy – A cone shaped section of the cervix containing the abnormal cells is surgically removed under local or general anaesthetic. The tissue will be sent to a lab for testing afterwards.
- A total hysterectomy is an operation to remove the uterus and cervix. It is performed under general anaesthetic. Hysterectomies are only rarely advised. Usually when women choose this option, it is because they have finished having children and have other problems a hysterectomy can resolve e.g. heavy bleeding, fibroids.

The above treatments for abnormal cells of the cervix will not affect a woman's ability to become pregnant (except hysterectomy). On rare occasions after a cone biopsy, the cervix may be weakened. This can lead to an increased risk of miscarriage or premature delivery.

After the initial treatment another colposcopy should be carried out four to six months later to check that the treatment was effective in removing all abnormal tissue. A cervical smear will be taken at the same time (unless a total hysterectomy has occurred).

Further Reading

- www.moh.govt.nz
- https://canterbury-west-coast.cancernz.org.nz/
- https://www.timetoscreen.nz/cervical-screening/

5.6 Breast Health

Breast Awareness

The Breast Cancer Foundation of NZ encourages women to know their breasts and be aware of any changes that are not `normal' for them using the acronym TLC – touch, look and check your breasts. Women are encouraged to check their breasts regularly when in the shower/bath or getting dressed in front of a mirror. It is common to experience changes in the breast during: the menstrual cycle, pregnancy, lactation, taking the contraceptive pill and menopause. This exemplifies the reason for women needing to know what their `normal' is.

Have a look at the following video on 'TLC'
https://www.breastcancerfoundation.org.nz/breast-awareness/breast-changes/check-your-breasts

Even those women who have regular mammograms are still encouraged to know what is normal for them.

If on examination, a woman finds: a lump or thickening, a change in breast size or shape, a change in the nipple (turned in or discharging), puckering or dimpling of the skin, lumpiness which is not normal for her, or is experiencing pain, she should be encouraged to have this checked by her GP.

A lump or thickening could be a:

Benign breast lump

Most breast lumps which develop before menopause are benign (not cancer) and do not change into cancerous lumps. Some common benign lumps are:

- **Lipomas** - these are lumps made up of fatty tissue.
- **Cysts** - these are fluid-filled sacs. There can be a single cyst or multiple cysts of varying
- **Fibroadenomas -** these lumps are smooth, hard and movable and are common in women 18-30 years old.

  To read more about benign breast conditions
  https://www.breastcancerfoundation.org.nz/breast-awareness/breast-changes/benign-breast-conditions

Breast cancer

Breast cancer is usually found in women over 40.

Investigations

A GP will examine both breasts and check the lymph nodes in the neck and armpit. There are a number of tests or investigations that may be arranged to ascertain if the lump or thickening is benign or cancerous. These may include: mammography (mentioned later in this section), ultrasound, fine needle aspiration, core biopsy, excision biopsy or laboratory examination of nipple discharge sample.

Treatment

Benign lumps or thickenings are usually not treated, but cysts can be drained. Cancerous lumps/thickenings are treated in various ways but treatment is dependent on the type of cancer, size, position, spread, the woman's age and her general health. Treatments may include: surgery, chemotherapy, radiotherapy, hormone therapy, targeted therapy or a combination of treatments.

Breast Screening Programme

Introduction

In conjunction with breast awareness, BreastScreen Aotearoa is a free national breast-screening programme that checks women for early breast cancer. The programme aims to reduce the number of women who die from breast cancer. Any woman between the ages of 45-69 is entitled to enrol in the programme and have a free mammogram every two years (a target population of over 500,000.00 New Zealand women).

The risk of developing breast cancer increases with age. Three quarters of women who develop breast cancer are 50 years and over.

Most women who develop breast cancer have no close family relative with the disease. Even for those with a family history of breast cancer, only a small number have an increased risk.

Maori women are equally as likely as non-Maori women to develop breast cancer but have a higher risk of dying from breast cancer in most age groups.

Benefits of Regular Screening

The average size of a lump found by a woman checking her breasts is 22mm, but a mammogram can detect lumps as small as 2mm. Regular mammograms reduce the risk of dying from breast cancer. For women under 50, their risk of dying from breast cancer decreases by 20% while for those over 50, the reduction is 30%. A mammogram can detect 75% of unsuspected cancers in women under 50 and 90% in women over 50.

What is a Mammogram?

A mammogram is a safe, low dose x-ray of the breasts. A Medical Radiation Technologist or Radiologist places each breast, in turn, between two x-ray plates on the x-ray machine. The plates compress the breast tissue for a few seconds while the x-rays are taken. This can be uncomfortable, and some women find it painful. If you are still menstruating, it is best to arrange for your mammogram to be performed once your period has finished that cycle and any breast tenderness has subsided. An x-ray is taken of each breast from the side and from above.

After the mammogram, two radiologists will check the x-rays for signs of breast cancer. The client will receive their results within two weeks and their doctor will be sent a copy of the results if they consented to this.

Mammograms can detect tissue changes in the breast before they can be felt.

Like any other screening tests, mammograms are not perfect. A mammogram may indicate that something is not right, when in fact all is well. This is caused a false positive result. Sometimes cancers do not show up on a mammogram, sometimes they are missed by the radiologists and sometimes a fast-growing cancer will develop between mammograms. Breast tissue is denser in women under 50. This can make it more difficult to detect a cancer. About 25% of cancers in women aged less than 50 years may not be detected. Despite these issues, mammograms are the only proven method for detecting cancers early enough to reduce a woman's risk of dying from breast cancer.

Results

- Most women will receive a normal result and be asked to return in two years for their next mammogram.
- A small number of women will be asked to come in for a further appointment because something needs checking. This may involve further x-rays, an ultrasound and/or a small biopsy (a small sample of tissue is taken for examination under a microscope). Most women recalled will not have breast cancer.
- The few women who do have breast cancer will be referred to a specialist for treatment. This treatment may include: surgery, radiation, hormone therapy, chemotherapy, targeted therapy or a combination of treatments.

Take a moment to watch this short video on Mammograms
www.breastcancerfoundation.org.nz/breast-awareness/mammograms/having-a-mammogram

All women wanting to join BreastScreen Aotearoa can phone 0800 270 200 to make an appointment.

Further Reading

- www.breastcancer.org.nz
- www.breastcancerfoundation.org.nz
- https://www.timetoscreen.nz/breast-screening/

6 PRECONCEPTION HEALTHCARE

The value of pre-conception care or preparation for pregnancy is that it improves both maternal and foetal outcomes leading to a healthier pregnancy and birth, and a healthier baby and post-natal experience.

6.1 Objectives

The student will be able to:

1.	Explain the benefits of pre-conception care.
2.	Give general information on pre-conception care.
3.	Produce a list of practitioners in your area who offer pre-conception care

6.2 Nutritional Factors

One of the most important aspects of preparation for pregnancy is diet. The saying that we are what we eat is nowhere more applicable than pre-conception, where correct nourishment of the building blocks of egg and sperm is vital for a healthy future baby. There is also increasing evidence that adult health is related to in utero nutrition.

In the UK, Foresight, an organization set up to promote healthy conception, birth and babies, has had huge successes since being established in 1978. In 1982, the Preconceptual Care Research Project followed 367 couples over 2 years while using the Foresight Programme. Of these couples, many were classed as infertile, had had previous miscarriages, stillbirths or small-for-dates babies, or malformations. By the end of the study, 80% had given birth to healthy babies, including 81% of those originally deemed infertile.

Much of Foresight's programme is based on improving nutrition and lifestyle, and reducing exposure to chemicals and toxins which have been shown to negatively impact on the health of both parents and baby.

Having trouble achieving pregnancy is one of the first signs of inadequate nutrition. The link between nutrition and foetal development has been demonstrated in various studies. Birth defects such as spina bifida and other neural tube defects, cleft palate, heart defects, diaphragmatic hernia, and club foot, have been reproduced and/or eliminated in the laboratory with animals using dietary manipulations. Other problems such as spontaneous abortion, premature birth and intra-uterine growth retardation are also linked to maternal diet.

Maintaining a healthy body weight is important for both men and women. Both being underweight or being overweight can create cycle anomalies. For obese women, due to fat cells constantly releasing oestrogen, the feedback system between ovaries and pituitary gland can be suppressed, preventing egg development and release. Men who are overweight are also producing oestrogen from fat cells, which interferes with testosterone production and sperm development.

A couple who are planning to conceive should aim to remove all processed foods from their diet, and try to eat fresh food as much as possible. Organic foods should also be eaten in preference to conventionally farmed produce, due to the high pesticide residues which can have an effect on sperm and foetal development.

Trans-fats have been implicated in reduction of fertility. Just 4g of trans-fats per day significantly increased the likelihood of infertility, according to a study from the Harvard School of Public Health.

They found that:

- For every 2% increase in calories obtained from trans-fats, her risk of infertility increased by 73%.
- For every 2% increase in calories from trans-fats instead of omega-6 fatty acids, her risk of infertility increased by 79%.
- For every 2% increase in trans-fats instead of mono-unsaturated fats, her risk of infertility more than doubled.

Trans-fats are found in processed foods such as muesli bars, biscuits, cakes, pastries, margarine and are also created when frying foods in vegetable oils. A study in Denmark found that trans-fats could affect foetal development and lead to low birth weight babies.

Nutrients such as essential fatty acids, vitamins A, C, E and B6, and minerals such as zinc, selenium and magnesium are key factors in hormone production and thus fertility. Antioxidant nutrients are important as free radical damage can affect both the male and female reproductive system, with sperm being particularly vulnerable.

Having adequate amounts of fibre, both soluble and insoluble, is also necessary, as it aids removal of hormone metabolites from the liver, preventing re-absorption which can lead to dysfunctional hormone ratios.

Protein

Protein is the building block of life, and part of every cell. All hormones are created using protein, so protein should be eaten at every meal to ensure adequate amounts. Protein is also necessary to break down β-carotene into vitamin A.

Essential Fatty Acids

These cannot be manufactured by the body, so must be eaten as part of the diet. They are needed by every cell in the body and for sex hormone production. Omega-3 oils, found in fish and linseed, are anti-inflammatory and are a major component of sperm cell membranes. Recent research has indicated that the quality of a woman's EFA status is critical for successful reproduction and lactation.

Best food sources are deep sea oily fish such as tuna, salmon and sardines. Linseed is also a good source of omega-3 fatty acids. These oils go rancid very quickly and need to be bought and eaten fresh and kept refrigerated.

Cholesterol

All sex hormones are created from cholesterol, as are all body cells. It is naturally present in the body and has many roles. The ratio between "good" and "bad" cholesterol can be maintained by eating fresh, unprocessed foods, and cutting out trans-fats and hydrogenated fats.

Vitamin A

Vitamin A has many roles in fertility. It is needed to utilize proteins and to form testosterone. It is needed for eye development in the foetus, and vitamin A deficiency in pregnant mothers can lead to babies born with serious eye defects. Displaced kidneys, cleft lip and/or palate, and abnormalities of the heart can also result in babies whose mothers had vitamin A deficiency in pregnancy.

However, vitamin A can also be teratogenic in high doses, above 25,000IU per day.

Best food sources are liver, eggs, butter, oily fish such as tuna and sardines, and dairy foods. Orange vegetables and fruit such as carrots and pumpkin contain β-carotene which can be broken down to vitamin A if there is adequate protein in the diet.

Vitamin B complex

The most important B vitamin is folic acid, which is vital for preventing neural tube defects in the foetus. It is also necessary for DNA replication and is associated with zinc in aiding sperm development.

Vitamin B12 is needed for healthy cell development, including sperm development, and can also help in preventing miscarriage.

Vitamin B6 is crucial in many body processes. B6 supplementation has been found to reduce nausea and vomiting in early pregnancy, and foetal abnormalities can be present if maternal intake is low.

The oral contraceptive pill depletes B vitamins, so a diet rich in these, with supplementation if indicated, is very important when trying to conceive post-pill.

Best food sources for B vitamins in general are green leafy vegetables, wholegrains, avocados and mushrooms. B12 is only found in a bio-available form in animal foods.

Vitamin C

This is essential to produce and maintain all connective tissue in the body, especially important for foetal development. It is also an important antioxidant, and prevents sperm agglutination. Vitamin C is necessary for sex hormone production, and has been shown to promote ovulation.

Best food sources are citrus fruit, berries and fresh vegetables such as capsicum.

Vitamin D

Vitamin D is a precursor for sex hormone production. It is produced by the action of the sun on the skin, and needs cholesterol for this to happen. Sun exposure needs to be for at least 15 minutes at summer midday strength, and dark skinned people need longer exposure. Application of sunscreen can stop vitamin D from being made in the skin.

Foods containing vitamin D include oily fish, eggs, butter and other dairy products.

Vitamin E

This has been called the “fertility vitamin” as it is so important. It is an essential antioxidant for male fertility, and also helps to normalize oestrogen production.

Best food sources are wheatgerm, nuts and seeds, cold pressed vegetable oils, wholegrains, avocados, eggs, milk, butter, and green vegetables.

Iodine

Due to an increased need for iodine in pregnancy and breastfeeding, the Ministry of Health recommends that pregnant and breastfeeding women take a 150 micrograms (mcg) tablet of iodine daily, as well as eating foods which are important sources of iodine.

Best food sources are well cooked seafoods, milk , eggs, and iodised salt.

Selenium

Selenium acts in concert with vitamin E, and is an important male antioxidant, necessary for sperm cell integrity and motility and for preventing sperm abnormalities. It is also important for testicular growth.

Best food sources are garlic, onions, butter, wheatgerm, Brazil nuts and seafood.

Magnesium

Magnesium is needed for sex hormone production and it also lessens muscle spasms, often a problem for pregnant women. It is also needed to utilise calcium for bone health. Low levels of magnesium deficiency have been associated with pre-eclampsia. Magnesium is depleted in times of stress.

Best food sources are wholegrains, nuts, bananas, kelp, wheat bran and germ, dark green leafy vegetables and dark chocolate.

Zinc

Lack of zinc leads to growth retardation, and interferes with normal male sexual development. Zinc is involved in over 200 enzyme systems in the body. It is needed for proper pituitary function and is also an important antioxidant. It is vital in all aspects of cell division and development so is important for foetal growth.

Inadequate zinc has been associated with an increase in intra-uterine growth retardation, prolonged labour, vaginal bleeding and foetal malformations.

Best food sources are wholegrains, seafood (especially oysters), nuts, meat, milk, green leafy vegetables, mushrooms, onions, ginger, eggs and seeds (especially pumpkin and sesame seeds).

Manganese

This is vital for sperm production and helps to regulate blood sugar.

Best food sources are nuts, wholegrains (especially buckwheat, barley and rye), ginger, parsley, liver and eggs.

Chromium

This is leached from the body whenever refined carbohydrates are eaten, so needs to be replenished regularly. It is necessary for sperm motility and fertilisation ability.

Best food sources are liver, chicken, beef and fish.

Potassium

Potassium is needed for all cell processes, especially in glandular health and nerve function.

Best food sources are kelp, bananas, nuts, potatoes, carrots, mushrooms, green leafy vegetables, beans, avocados, sunflower seeds and wheatgerm.

6.3 Anti-fertility Factors:

Soy

Soy products, such as soy milk, yoghurt, margarine, flour and soy proteins, which have not been traditionally prepared or fermented, can affect both male and female reproductive systems. As soy is a phytoestrogen, in high amounts it can have an oestrogenic effect on the reproductive system, leading to menstrual cycle anomalies and egg maturation, and if eaten while pregnant, can affect the development of male babies.

Soy milk formula should not be given to babies, as it exposes them to extremely high oestrogen levels (see MOH leaflet).

Coffee

Studies have shown that women who drink more than 5 cups of coffee a day can increase their risk of miscarriage. Caffeine takes twice as long to metabolise when pregnant. In men, more than 3 cups per day can reduce sperm production.

Alcohol

Alcohol is a testicular toxin. It reduces testosterone production, causing impotence (brewer's droop) and lessening sperm production and motility and also increases the number of sperm malformations. Part of the reason for this is that alcohol causes zinc to be excreted from the body. Alcohol intake by men can increase miscarriage rates by two times for every drink per day, and reduces the likelihood of conception by 50% each cycle.

There is no known safe level of alcohol in pregnancy. Even 1 or 2 drinks can have effects on the developing foetus (see MOH leaflet). The NZ MOH recommends that women do not drink even while trying to conceive.

Food Allergies

Chronic health conditions may be a result of a food allergy or vitamin or mineral deficiency. Resolving these conditions will minimise the need for drugs during pregnancy, many of which are contraindicated at that time. Some food allergies, e.g. gluten (coeliac disease), may set up a malabsorption syndrome due to intestinal atrophy, and pre-conception care involving an adequate diet and supplementation where necessary is vital.

6.4 Ministry of Health Recommendations

The Ministry of Health provides recommendations regarding supplementation, diet, lifestyle, and immunisations. Please refer to these websites to review the current recommendations:

https://www.healthed.govt.nz/resource/folic-acid-and-spina-bifidaiodine-and-iodine-deficiency

https://www.health.govt.nz/your-health/pregnancy-and-kids/pregnancy/helpful-advice-during-pregnancy

https://www.health.govt.nz/your-health/conditions-and-treatments/diseases-and-illnesses/rubella

6.5 Lifestyle Factors Affecting Fertility

Cigarette smoking

Cigarette smoking decreases testosterone and sperm production, leading to reduced sperm motility and density. It decreases zinc levels and increases free radical damage to sperm, leading to an increase in sperm abnormalities. Paternal smoking leads to a 60% increase in the risk of childhood brain tumours, a 40% increase in risk of childhood leukaemia and a 2.5% increase in congenital malformations.

In mothers who smoke 30 cigarettes a day, the prematurity rate is 33%, compared to only 6% in non-smokers. There is an increased risk in congenital malformations, especially cleft lip and palate, squints, deafness and Central Nervous System (CNS) abnormalities.

Marijuana

Marijuana smoking has similar effects to cigarette smoking. The active ingredient, THC, targets DNA in developing cells, so can lead to foetal malformations. It lowers testosterone and sperm production, and also reduces sperm motility.

Work

Where you work and what you work with can affect fertility. Shift work affects circadian rhythms, with menstrual irregularities and anovulation. Flying, especially across time zones, has a similar effect and the radiation in the upper atmosphere can affect sperm and egg cells. Ionising and non-ionising radiation from VDUs, microwaves, cell phones, laptops etc, and electromagnetic fields can all affect cells in the testes and foetus. Investigate the possibility of working in a less toxic area prior to conception planning.

Environmental Toxins

Pesticides, such as organophosphates (Chlordane, Lindane), inactivate various enzyme systems in the body, leading to conditions such as ataxia, neurotoxicity, cardiovascular problems, memory loss and death. Investigations are underway in the UK on the link between organophosphate pesticides and CHARGE syndrome, a congenital defect in children. If the clients are farmers or gardeners, they may have had direct exposure to these chemicals. Total avoidance is necessary in the time of pre-conception and pregnancy to avoid the risk of congenital malformations. Animal flea collars, treatments or sprays may also contain organophosphates such as Lindane, as can lice treatments.

Other chemicals, such as those used to treat wood products, petrochemicals, solvents, paints and rubber chemicals have also been shown to affect fertility, with low sperm counts in men, lower pregnancy rates and higher incidence of miscarriage in women.

Toxic heavy metals such as lead, mercury, cadmium, aluminium and copper can affect fertility in both men and women. The Oral Contraceptive Pill (OCP) and copper Intra Uterine Device (IUD) can increase copper levels in women. High copper interferes with zinc and iron absorption.

Prenatal exposure to toxins can affect health in later life, by affecting the immune system function and creating exaggerated inflammatory reactions e.g. asthma, auto-immune disorders, cancer and infertility.

Exercise

Exercise is beneficial for increasing oxygenation, reducing weight, raising fitness levels and reducing stress. Regular exercise, at least 3 times a week, is best.

Extreme exercise has been shown to affect menstrual cycles and stop ovulation. It can also raise temperature levels, affecting foetal development early in pregnancy.

Ensure adequate hydration is maintained during exercise, with rest periods as needed.

Bicycle riding can affect testicular health by increasing the temperature of the testes, reducing sperm development, and creating problems with blood flow.

Exercise helps to prepare the body for labour by increasing stamina, fitness and range of motion.

Thermal Regulation

The testes need to be kept at a lower temperature than the rest of the body for sperm development. Wearing tight underwear, gym or exercise clothing, or trousers, and jobs where the man is sitting all day such as long-distance truck drivers, can impair normal sperm development. Hot baths, saunas and spas can affect both sperm development and foetal development, being linked to an increase in spina bifida. Keep the time spent in hot baths, saunas and spas to under 6 minutes and remember to drink plenty.

Stress

High levels of the stress hormone, cortisol, can interfere with fertility by suppressing Luteinizing Hormone (LH) release and inhibiting hypothalamic function. Cortisol can also reduce testosterone, thus reducing sperm numbers, and can delay ovulation and interfere with egg implantation. It can also raise prolactin levels, which reduce fertility.

6.6 Other Factors Affecting Fertility

Genito-urinary Infections

Chlamydia is epidemic in NZ and untreated infections will affect fertility. Chlamydia affects the tubes of the reproductive system. It can cause scarring of the Fallopian tubes in women, which may lead to an ectopic pregnancy, or epididymitis in men, lowering sperm numbers and affecting motility.

Mycoplasmas and other infections are also extremely common and can lead to increased risk of spontaneous abortions or premature births.

Intestinal infections with worms, Giardia or other parasites can affect overall health and nutrition, and should be checked if there has been any overseas travel.

Cytomegalovirus, Toxoplasmosis and Rubella immunity should also be tested for.

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7 INFERTILITY

Introduction

This sub-section looks at the topic of infertility. Students will gain an overview of what infertility is, how it affects males and females and what tests, investigations and treatments are currently available in New Zealand.

7.1 Objectives

The student will be able to:

1.	Explain the main causes of male infertility.
2.	Explain the main causes of female infertility.
3.	Explain the difference between primary and secondary infertility.
4.	Explain the basic tests, investigations and treatment for infertility in New Zealand.
5.	Apply this knowledge in a clinic setting.

7.2 NFNZ and Infertility

NFNZ can assist couples who are having difficulty conceiving by teaching them to recognize the most fertile time of their cycle by recording cervical mucus, vaginal sensation and cervical palpation. Temperature is recorded to establish that ovulation is occurring and to ascertain the length of the luteal phase. Once clients are aware of what these signs mean they can time intercourse appropriately. This is particularly important for women who may have a limited number of days in a cycle where they experience fertile type mucus. By teaching the couple when the woman is most fertile, intercourse can be targeted to this time to increase the chances of conception.

Charting these symptoms can also reveal other information such as irregular vaginal bleeding, vaginal discharges other than cervical mucus, constant pain or a short luteal phase. Any of these symptoms should result in referring the client to their doctor for investigation.

Couples may approach a Fertility Educator at varying times in their quest to conceive. They may have been trying for a few months, a year, or already been though treatment at a fertility clinic. Fertility Educators need to have a basic understanding of both the tests and treatments that clients may have undergone prior to their engaging the services of a Fertility Educator or that the clients may require in the future.

It is important to be aware of the stress that infertility puts on a relationship. The focus of intercourse moves from recreation to procreation. In the initial stages of a couple trying to conceive this can be exciting and an intense time. But after several months this can quickly change to a task or chore rather than a pleasure. This can create issues for the couple when sex ‘is on demand’ and spontaneity is lost. Feelings of failure, guilt and blame can also come into play. It is important that a Fertility Educator is aware of these issues and is able to refer his/her clients to the most appropriate support services to meet their needs.

Infertility is defined as an inability to conceive a pregnancy after one year of intercourse without contraception or the inability to carry a pregnancy to a live birth.

Conceiving takes time:

- 25% will conceive in the first month
- 60% within six months
- 75% within nine months
- 80% within a year
- 90% within 18 months
- 94% within 24 months

Infertility affects one in six New Zealand couples.

Infertility can be described as primary (never conceived), or secondary (client has had a pregnancy which includes miscarriage and ectopic).

The cause of infertility can relate to the woman, the man or both partners. Sometimes no cause can be found.

Causes of Infertility

- Male factors 33%
- Anovulation 20%
- Tubal factor 15% (12% is due to damage caused by STIs)
- Endometriosis 10%
- Sexual Dysfunction 5%
- Unexplained - approximately 15%

1 in 3 couples have more than one cause.

7.3 Male infertility

Causes of Male Infertility

- Testicular and epididymal obstruction
- Vasal obstruction
- Ejaculatory duct obstruction
- Primary testicular failure
- Retrograde ejaculation
- Endocrine disease
- Genetic disease
- Immune infertility
- Environmental/Lifestyle – smoking, alcohol, recreational drugs
- Some prescribed drugs e.g. certain antibiotic therapy may reduce sperm numbers for approximately 3 months.
- High fevers may reduce sperm motility and numbers for approximately 3 months.

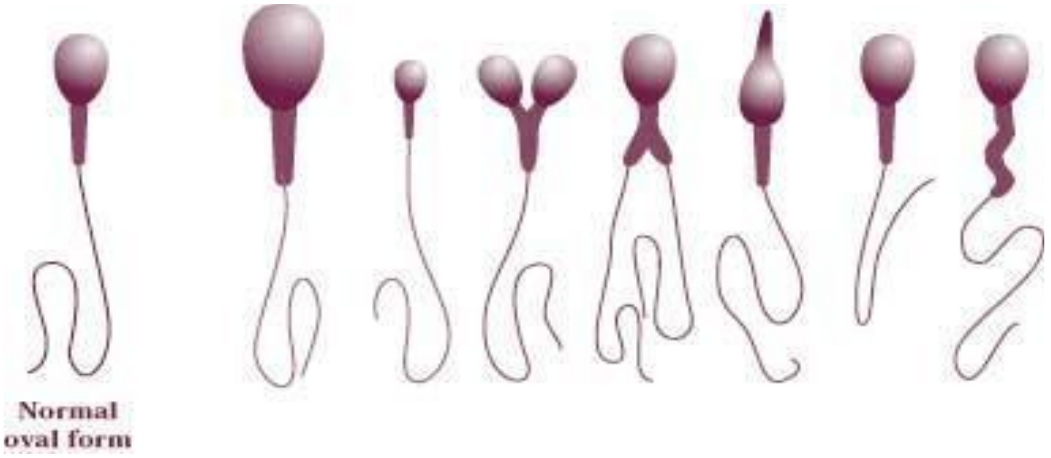
Investigations

Once all the tests and investigations have been completed a cause can be found in approximately 60% of infertile men. For the remaining 40% the cause is described as idiopathic – unknown.

- Semen analysis is the first line of investigation. Abstinence is recommended for 3 days prior to producing the sample. The sample can be produced at home or at the Fertility Centre. The sample needs to be analysed within an hour of production and kept warm in transit to the laboratory (e.g. in a pocket of your clothing). An abnormal result is followed up by a 2nd semen analysis in 4-6 weeks.

Normal semen values

Volume	>2ml
Count	>15 million per ml
White cell count	< 1 million per ml
IgE, IgM anti sperm antibodies	Negative
Motility	>50%
Morphology	>30% or more with normal shape
pH	7.2-8.0



B-18 Sperm Morphology

- History – medical, reproductive and lifestyle. This may include questions about: duration of infertility, STIs including Chlamydia, prescribed medications, recreational drug use, smoking, alcohol consumption, chronic medical conditions, surgery which may include correction of undescended testis, previous vasectomy, inguinal hernia repair, infections such as mumps, orchitis, genital trauma, paternity of children in current and past relationships etc.
- Undescended testicles occur in 4% of full term boys and 20% of pre term boys. The cause is due to hormonal and mechanical factors. Research shows that maximum fertility results from surgery in males less than one year of age.
- Physical examination of the size and consistency of the testicles, checking for any abnormal swellings and that the vas is palpable
- Endocrine blood tests – FSH, LH and Testosterone. Elevated FSH indicates primary testicular failure resulting in abnormal spermatogenesis, and if FSH is low this is due to a pituitary cause. A testosterone concentration <8nmol/L in more than one test requires treatment.
- Karyotype – a blood test that identifies and evaluates the size, shape and number of chromosomes in a sample of cells. Performed to exclude conditions such as Klinefelter's syndrome (XXY Karyotype), which is a recognised cause of azoospermia. It is also a useful diagnostic test for those men who present with small testicles or extremely low or absent sperm count.
- Testicular ultrasound scans are useful if an abnormality, cyst or congenital absence of the vas is suspected.
- Screening for cystic fibrosis gene mutations. Couples in whom the man has congenital reproductive tract obstruction should have a CF gene mutation analysis for the female partner because of the high risk of the male being a CF carrier.
- Testicular Biopsy - local anaesthetic is used with sedation. It has a low risk of complications. Antibiotics may be given post-biopsy to prevent infection. Helpful if FSH is high and testes are small to ascertain if spermatogenesis is occurring so that surgical retrieval of sperm may be possible for later use with ICSI or IVF (see under treatment).

7.4 Female Infertility

Fertility and Age

Increasing numbers of women are now delaying starting their families until they have studied, travelled, established their careers and are financially secure. It is well known that a woman's fertility declines with age. A healthy fertile couple in their 20s has on average a 20% chance of conceiving in each cycle. A healthy fertile couple in their late 30s have half that chance. A woman in her late 30s has a smaller number of eggs which are diminished in quality.

- At 25 years old, 90% of women conceive within one year.
- At 35 years old, 90% of women are pregnant within two years.
- Over 40 years old, more than 50% of pregnancies are miscarried.

Causes of Female Infertility

Ovulatory Disorders (the most common causes)

- PCOS
- Weight related anovulation (low or high BMI).
- Ovarian failure or diminished ovarian reserve.
- Hyperprolactinaemia - an increase in the hormone prolactin in the blood. This suppresses ovulation. Can be caused by medications such as Stelazine or Haloperidol (tranquillizers, medication used for migraine nausea and vomiting such as Maxalon and some medications used for travel sickness).
- Other causes such as thyroid disease or rarer endocrine problems.

Tubal Disorders

- Chlamydia, Pelvic Inflammatory Disease and other STIs
- Endometriosis
- Peritonitiis, most commonly after appendicitis.
- Pelvic surgery e.g. laparotomy with resulting adhesions (scar tissue).
- Ectopic pregnancy resulting in surgery and adhesions (occurs in 1% of all pregnancies).

Other Factors

- Antibiotics sometimes change cervical mucus patterns, but this may be due to the infection rather than the antibiotics
- Cortisone type steroid medication used for asthma, rheumatoid arthritis, allergies and skin conditions can, if given in high or prolonged doses, cause irregularities of the menstrual cycle.
- Some cold and flu remedies not only dry up secretions in the nose, but also reduce mucus produced by the cervix.

Initial Investigations of Female Infertility

- History – medical, reproductive and lifestyle. This may include questions about: duration of infertility, age, menstrual history, pelvic pain, frequency of intercourse, timing of intercourse, STIs including chlamydia, prescribed medications, recreational drug use, smoking, alcohol consumption, chronic medical conditions, and any abdominal surgery.
- Physical examination that includes blood pressure and BMI.
- Pelvic examination including cervical smear and swabs.
- Antenatal blood tests including rubella immunity.
- FSH on day 2 or 3.
- Mid-luteal progesterone (usually day 21).
- If anovulatory – Prolactin, TSH (Thyroid Stimulating Hormone), day 2-5 LH, androgen profile, ovarian ultrasound.

Female Hormone Levels

	FSH	LH	Oestrogen	Progesterone
Proliferative	2-15	2-7	77-920	
Midcycle	9-26	9-74	140-2380	
Luteal	2-15	1-9	77-1145	>15
Post-Menopausal	>23	11-65	<103	<6

Further Investigations of Female Infertility

- **Pelvic Ultrasound** to check the anatomy of the uterus, kidneys, and ovaries.

- **Tubal patency testing** if above screen does not provide explanation e.g. laparoscopy and dye, hysterosalpingogram (HSG), or saline ultrasound.

- **Laparoscopy**
  A surgical procedure carried out in a hospital under a general anaesthetic. It is used for diagnostic and treatment purposes. It is recommended for unexplained infertility, pelvic pain or to examine ovarian cysts and tumours. It allows the surgeon to view the outside of the uterus, fallopian tubes, ovaries and pelvic cavity. An instrument called a laproscope is passed into the abdomen through a small incision at the navel and in the navel. Carbon dioxide gas is introduced to make a space in which the organs can be seen. Another small incision may be made above the pubic hair line or to either side of that to introduce surgical instruments. When the instruments have been removed the carbon dioxide gas is released and a stitch may be put in each of the small incisions. Other investigations such as hysteroscopy or hysterosalpingogram may be performed at the same time.

- **Hysterosalpingogram** (HSG)
  An x-ray of the inside of the uterus and fallopian tubes using a special contrast fluid (dye). It is carried out after a woman's period and before ovulation. The woman changes into a gown at the x-ray department and lies on her back on the x-ray bed as she would for a pelvic examination. A speculum is placed in the vagina and a small tube is inserted into the cervical canal. A dye is slowly passed through this tube and flows into the uterine cavity, up through the fallopian tubes and out into the pelvis. This process is checked on a large screen similar to a TV screen and a permanent record is kept by taking several x-rays during the procedure. During the x-ray a woman may experience heavy cramping pain similar to period pain which can last several hours. It is advised that she takes Panadol or Asprin one hour prior to the procedure and has someone with her to support her throughout the procedure and to drive her home. Following the x-ray she may notice a sticky vaginal discharge that continues for several hours. This is the dye that was inserted during the procedure. It is advised that a sanitary pad is used to absorb the dye rather than a tampon.

- **Saline Ultrasound**
  Performed for the same reasons as an HSG, however instead of an xray, an internal ultrasound is performed whilst the dye or saline solution travels via catheter into the cervix.

- **Hysteroscopy** – an examination of the inside of the uterus and is usually done at the time of laparoscopy. The hysteroscope is inserted through the cervix. Saline (salty water) is then passed through the scope to distend the uterine cavity so that it is possible to see the inside of the uterus. This examination is usually carried out if uterine problems are suspected because of heavy or irregular periods, unexplained infertility, recurrent miscarriage, unexplained pain or fibroids.

7.5 Treatment Options

Treatment is dependent on the cause of infertility. All treatments should take into account the client's age, overall health and the probability that the treatment taken will achieve a pregnancy within a reasonable time frame.

Treatments may include:

Fertility Awareness - teaching the couple about their fertility including the menstrual cycle, fertile phase of the cycle and best times for intercourse.

Lifestyle improvement – cease smoking, drinking alcohol and using recreational drugs. Eat a balanced diet, enjoy regular exercise and have a healthy body mass index (BMI). Find healthy ways to manage your stress. For further information read the pre-conception care section of the training manual.

Natural Medicine - Natural medicine encompasses a number of forms of treatment that work in a holistic way. Fertility and health issues are not seen as separate individual problems but interconnected to the mind, body and spirit. The current conventional model of medicine is one view or way of looking at the human body. There are others that are equally valid. The focus in natural medicine is investigating, finding and treating the cause of the problem. Sometimes this takes only a few treatments and for others, depending how intricate the problems are – it may take many months.

Some of these treatments include:

- Chinese Herbal Medicine
- Acupuncture
- Osteopathy
- Reflexology
- Naturopathy
- Homeopathy
- Herbal Medicine
- Counselling, Hypnotherapy

It is important to find a practitioner who is willing to integrate the conventional medical approach with their own form of treatment. There are registers within NZ for all the practitioner groups mentioned above. Their aim is to ensure a standard level of competence and continuing education of their members.

For referrals of suitably qualified practitioners that specialize in fertility issues contact Fertility NZ on 0800 333 306. If you are having treatment from a complimentary health practitioner and a conventional Fertility Specialist, ensure you inform both parties of this.

Viagra for impotence in men.

Micro surgery to bypass any obstruction in the epididymis, vas or fallopian tubes often secondary to trauma or infection.

In a small number of men treatment with **gonadotrophins** (FSH and LH) injections will improve the sperm count.

Clomiphene – a medication in tablet form which is effective in inducing ovulation. It is usually taken for 5 days near the beginning of the menstrual cycle – commonly days 2-6 or days 5-9. Women respond differently to the medication so are usually started on a low dose which is increased gradually until a satisfactory response is achieved (25mg-150mg). Clomiphene works by blocking the oestrogen receptors in the hypothalamus and pituitary gland. This causes the pituitary to continue producing FSH in higher levels thereby stimulating the follicles to continue to grow. During each cycle, blood tests and vaginal ultrasound are performed to monitor the response to medication and to ensure a reduced risk of a multiple pregnancy (10% risk of twins and 1% of triplets) and Ovarian Hyperstimulation Syndrome. The risk of twins in an unassisted, natural cycle is 1:80. Ovulation is confirmed by a blood test on day 21 to check the Progesterone levels. Between 50-90% of women will ovulate when using Clomiphene and of those who ovulate, 50% are successful in conceiving within the first three cycles of using Clomiphene.

Clomiphene can also be used for women who have regular cycles and tests indicate that she is ovulating. Clomiphene will increase their chances of pregnancy. The reason for this is thought to be due to a change in the hormones within the uterus and mucus of the cervix.

Ovarian Hyperstimulation Syndrome (OHSS) is a rare condition which occurs when too many follicles grow and cause abdominal distension, discomfort, nausea and sometimes difficulty in breathing. In extreme cases hospitalisation is necessary. OHSS is potentially very serious, but can be avoided by careful monitoring.

Human Chorionic Gonadotrophin (hCG) injection (Profasi) - This is similar to the naturally produced hormone LH. It is given to some women taking Clomiphene to enable them to release an egg. It is administered when the oestradiol level and/or scan indicates the egg is mature.

For those women undergoing assisted reproductive techniques (ART) the hCG injection is usually given 36 hours before ovulation is due to occur. This allows for more accurate timing for insemination or egg collection.

At a lower dose, Profasi can be used after ovulation to support oestradiol and progesterone production from the corpus luteum resulting in the continued growth of the endometrium. It is typically given on days 3, 6 and 9 after ovulation or egg collection.

Metformin – is a drug that increases sensitivity to insulin. Insulin is one of the main hormones in the body which controls the uptake and use of glucose (sugar). Metformin has been used for the treatment of type 2 diabetes and there is now good evidence that it is also useful in the treatment of women with polycystic ovarian syndrome (PCOS). Many women with PCOS have insulin resistance which means that they have higher than normal levels of insulin in their blood and do not process glucose efficiently. It is believed that insulin resistance plays an important part in the hormonal abnormalities that occur in the ovary that result in higher than normal levels of male hormones and prevent regular ovulation. Metformin increases the body's sensitivity to insulin and so decreases insulin levels in the blood. This in turn should decrease the symptoms of PCOS. It has also been shown to decrease male hormone levels in the blood, decrease the amount of body hair and improve ovulation rates. It is the increase in ovulation rates that has made it useful for the treatment of infertility. A number of women who do not ovulate regularly while using Clomiphene will ovulate on Metformin. It is taken in the form of a tablet 2-3 times a day after meals throughout the entire menstrual cycle.

Gonadotrophin Injections i.e. Gonal F, Puregon, Metrodin, Humegon, Pergonal - These are synthetic forms of FSH which act directly on the ovary, rather than trying to stimulate the woman's own production of FSH. Used if Clomiphene does not result in pregnancy. They are used to stimulate the development of ovarian follicles to overcome any hormonal imbalance which may not allow

ovulation to occur. It is also used to stimulate the development of ovarian follicles in women undergoing assisted reproductive techniques. Injections are usually started on day 2 or 3 of the cycle and are administered by the client into the fatty tissue just under the skin. Injections are usually given at a similar time each day. Follicular development is monitored by blood tests and ultrasound. An ultrasound is usually performed on day 8.

When the follicles have reached an appropriate size (18-25mm) an ovulation-inducing drug called Profasi will be administered.

Invitro Fertilization (IVF) - This involves taking fertility drugs (Gonadotrophin injections) to stimulate the ovaries to produce several eggs. When the eggs have developed to the required size an injection of Human Chorionic Gonadotrophin (hCG), usually Profasi, is given 34-36 hours prior to egg collection. The purpose of this injection is to initiate the final maturation of the eggs in preparation for the egg collection.

The eggs are then removed from the ovary under light sedation by vaginal ultrasound. A fine needle is guided through the vaginal wall and into the ovary.

Each follicle is aspirated, and the follicular fluid is examined by an embryologist for the presence of an egg. Any eggs that are found are placed into a special medium in laboratory dishes and kept in an incubator at body temperature. 8-10 eggs are collected on average.

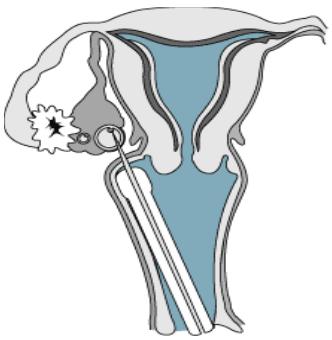
A sperm sample is required on the day of the egg collection. The sperm are 'washed' and the motile sperm are added to the eggs. The next day, the eggs are checked for fertilization. Any fertilized eggs are called embryos.

2-5 days later one embryo is transferred back into the uterus using a fine catheter which is passed through the cervix and into the uterus where the embryo is gently placed. The remaining embryos are frozen for later use if required.

A pregnancy test is performed 12 days later.

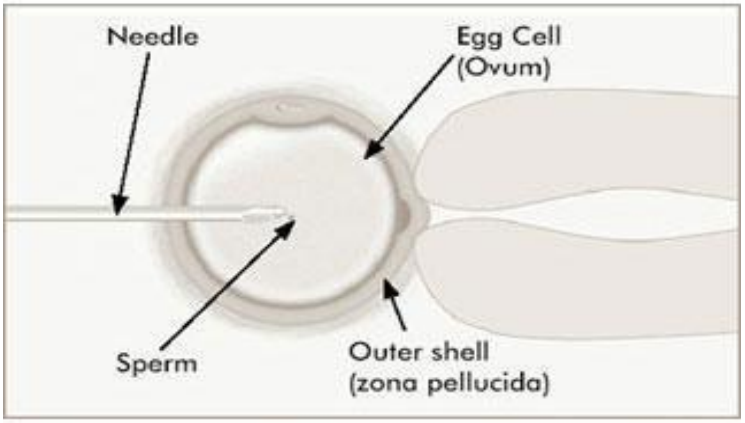
Pregnancy rates of up to 40% with fresh embryo transfer resulting in 30% live births for a woman younger than 35 years. In older women, the success is considerably lower.

Couples at some point will need to decide what they want do with any unused embryos. The options up until 2007 in NZ have been to remove the embryos from storage and allow them to perish or to donate the embryos to a research project. Recent changes in NZ legislation in the latter part of 2007 now make it possible for couples who no longer require their frozen embryos to donate them to another infertile couple.



B-19 Egg Collection

Intra-cytoplasmic Sperm Injection (ICSI) – also known as microinjection. ICSI can be used when there are very few sperm (less than one million/ml), low motility (1-2%) and poor morphology (1-10%). ICSI is also used when there has been poor fertilization using IVF or lengthy unexplained infertility. Sperm are obtained directly from the testis using a fine needle aspiration technique under local anaesthetic. Couples go through a similar programme as for IVF but a single sperm is injected directly into the egg. Eggs are examined the next day under the microscope to see if fertilization has occurred and then 2-3 days after fertilization one embryo is placed in the uterus and extra embryos are usually frozen. Pregnancy rate of 20-30%.



The intracytoplasmic sperm injection technique where a sperm is placed directly into the egg.

B-20 Intracytoplasmic sperm injection

Menevit – a relatively new antioxidant, vitamin and mineral supplement invented by an Australian Gynaecologist which is prescribed once daily to enhance the quality of sperm damaged by DNA fragmentation. Menevit contains: anti-oxidants vitamins C and E, selenium, lycopene, zinc, selenium and garlic oil. It is recommended for men who have semen quality issues and is especially useful for couples who are undergoing IVF combined with ICSI. A recently published study involving 60 couples taking Menevit for severe sperm DNA fragmentation showed that Menevit significantly boosted their viable pregnancy rate – 38.6% pregnancy rate compared to the control group not receiving Menevit – 16% pregnancy rate (Australian and New Zealand Journal of Obstetrics and Gynaecology 2007;47:216-221). The cost is around $1 per day.

Gamete Intrafallopian transfer (GIFT) – no obvious advantages over IVF. More invasive and almost obsolete. Differs from IVF in that the eggs are collected from the ovary, examined, sperm are added and then placed back in the fallopian tube in the same treatment (unlike IVF where fertilization is carried out in the laboratory). This procedure requires a general anaesthetic and laparoscopy. This procedure requires the woman to have healthy fallopian tubes.

Intrauterine Insemination (IUI) - Indicated when total number of motile sperm in washed sample is >1million or where infertility is unexplained. It has a 5-15% pregnancy rate per cycle and live birth rate of 10%. Most successes occur in the first two cycles and success is more likely with men who have higher sperm counts. The aim is to insert the sperm into the uterus so that the sperm have less distance to travel to fertilize the egg.

IUI can be used in a normal cycle when ovulation is about to occur, or in a cycle where the woman's ovulation is artificially stimulated to produce eggs.

Prior to insemination the sperm are prepared by separating them out from the seminal fluid.

If semen was to be inserted directly into the uterus it can result in cramping abdominal pain.

- In a natural cycle using IUI, insemination occurs when LH is first detected in the urine (ovulation usually occurs 36-40hrs after the start of the release of LH). Insemination involves inserting a speculum into the vagina and the sperm are placed into the uterus though a long, fine syringe.
- Stimulated IUI- the ovaries are stimulated by Clomiphene or gonadotrophin injections (gonal F). These are started on day 2 of the cycle. A vaginal ultrasound and blood test are performed on day 8 to ascertain follicular growth. When the biggest follicle is greater than 17mm and no more than two other follicles greater than 14mm, an injection of hCG (Profasi) is given which will result in ovulation. 24-36 hours after the hCG injection, insemination occurs as described in a natural cycle using IUI.

  For both natural and stimulated IUI, a blood test is taken 7 days after insemination to check that ovulation has occurred (raised progesterone).

  Semen can either be provided by the woman's partner (Artificial Insemination Husband (AIH)) or a donor (DI).

Artificial Insemination Husband (AIH) - Research shows that AIH is better than timed intercourse for male infertility when combined with ovarian hyperstimulation and gonadotrophins. The use of AIH for sperm abnormalities is controversial due to the low pregnancy rate of 5-10% per cycle.

Donor Insemination (DI) - DI involves the insemination of semen obtained from a male donor into the uterus (IUI), of a woman to achieve a pregnancy. Indicators for DI are: no sperm in the man's ejaculate, so few sperm that conception is very unlikely, medical or hereditary conditions causing sterility, desire to avoid passing on hereditary disorders to children, or the woman not having a male partner. The waiting list for treatment can be up to 24 months.

Donors must be between 20-45 years old and are required to undergo a full review of their genetic history, a physical examination, semen analysis and complete a health questionnaire. The donors' blood, urine and semen are checked for HIV, hepatitis B and C, syphilis, gonorrhoea, herpes and chlamydia. The semen is frozen and quarantined for six months. Before the semen is unfrozen and used, the donor is tested again for HIV and Hepatitis.

Once thawed, sperm are separated from the semen and placed in a sterile solution. The choice of donor is made prior to the treatment starting. Information about eye colour, hair colour, personality, height, ancestry and interests are available to the recipient. Use of the donors' sperm is restricted to four families.

A successful outcome is dependent largely on the recipients' age and fertility. Conception rates of 5-24% per cycle. Most pregnancies occur within six treatment cycles.

The Status of Children Amendment Act 1987 states that the male partner of the woman inseminated is the legal father of the child.

On the birth registration form, the partner declares his name as the father. The donor has no rights or responsibilities regarding that child. DI is used less these days due to the success of ICSI and the difficulty in recruiting donors now that new legislation is in pla ce.

The HART Act (Human Assisted Reproductive Technology Act 2004) has resulted in the setting up of a register of all births resulting from donor gametes (egg or sperm). The Fertility Centre must supply details, including the identity of the donor, to the Registrar General (Births, Deaths and Marriages) whenever a child is born from donor gametes. This information is available to the child after the age of 18, and to the parents at any time. Details of the provisions of the HART Act can be found at www.legislation.govt.nz. Select 'Statutes' and then 'Human Assisted Reproductive Technology Act 2004'.

Donor Eggs - Donor eggs are used by women whose ovaries have stopped working (ovarian failure) or do not have ovaries. Donor eggs may be used by women with genetic disorders that may affect a child. Women who have had treatment, such as chemotherapy, which stops the functioning of their ovaries, may also need donor eggs. The donor needs to be between 21 and 35 years of age and is either recruited by the 'clinic' or recruited by the couple (a friend or family member).

Each donor provides eggs for one recipient couple. The donor is required to undergo a range of tests and investigations prior to starting their IVF cycle. Drugs are used to stimulate the ovaries to produce a number of eggs. The eggs are collected and fertilised in the laboratory with the recipient partner's sperm.

One of the embryos created is replaced in the recipient woman's uterus while the rest are frozen for later use if required. While the donor is working through her IVF cycle the recipient woman has her cycle matched so that the embryos are able to be put back into an optimal environment in the uterus. The male partner of the recipient woman provides sperm for fertilisation. The pregnancy rate is approximately 47%.

Vasectomy reversal - Over 95% of men who undergo a reversal have sperm in the semen. There is however a difference between technical success as measured by the presence of sperm as opposed to practical success as measured by pregnancies. One of the more important factors influencing the pregnancy related success rate is the duration of time since the vasectomy. The greater the time since the vasectomy, the lower the chance of a successful reversal. This is due to back pressure effects on the testis causing damage to sperm production.

In addition the very fine tubules (epididymis) just next to the testis become damaged from this pressure and they often break open and then scar over so that there is a second blockage very close to the testis. Sperm antibodies can also develop as a result of a vasectomy. This is more common if the epididymis breaks open as a result of back pressure. The presence of sperm antibodies will reduce pregnancy rates.

Less than 3 years since vasectomy	77% chance of pregnancy
3 to 8 years since vasectomy	53% chance of pregnancy
9 to 14 years since vasectomy	44% chance of pregnancy
Greater than 15 years since vasectomy	30% chance of pregnancy

Tubal Ligation Reversal - This is an operation which involves rejoining the fallopian tubes following previous sterilisation where the tubes were cut, cauterised (burnt) or clipped to stop sperm fertilizing an egg.

Women under the age of 40 who have a tubal reversal through traditional surgical methods have a 70% to 80% pregnancy success rate, with conception usually occurring during the first year after the procedure. Women who have microsurgery for reversal have a slightly higher success rate, with about 90% of women becoming pregnant within one year of the procedure.

However, tubal ligation success rates tend to decline with a woman's age. It is important to note, that having a tubal ligation reversal does increase the risk of ectopic pregnancy.

Among the general population, 1 in 100 women will experience an ectopic pregnancy. However, for women who have had a tubal reversal, this risk increases to about 5 in 100 women.

Counselling – is an integral part of the infertility process. The emotional impact of infertility can significantly impair one's self esteem and have major repercussions on a couple's relationship. Counselling is available at any point throughout the process of investigation, treatment or post-treatment.

Adoption – requires a change in focus for the couple. A shift needs to be made from having a genetic child to becoming parents and accepting a child who needs adoptive parents. Adoption in New Zealand is administered by Child Youth and Family (a government department). It is strongly recommended that couples finish any form of treatment before they apply to adopt.

Couples meet with a social worker, attend a series of seminars on adoption and produce a personal profile about themselves. This profile is made available to birth parents to help them select a family for their baby. Home visits throughout the process are carried out by the allocated social worker. A birth mother is not legally allowed to sign the interim adoption order until 10 full days have passed since the birth of her child.

Once the birth mother has signed the papers, the adopting parents sign their part of the agreement to become the legal parents of the child. This interim order becomes a final order after one year by applying to the court. Once approved, an adopted child is given a new birth certificate.

Open adoptions are based on an agreement reached at the time of placing a child with adoptive parents that there will be some form of continuing contact between the birth parents and the adoptive parents and child. The nature of this contact varies between people and also over time within families. The agreement is voluntary and needs to be flexible.

Intercountry Adoption (ICA) allows the adoption of children from certain overseas countries. For more information about this contact Inter-Country Adoption New Zealand – the accredited organization which facilitates ICA for New Zealanders and Child Youth and Family Service.

7.6 Access to Treatment for Infertility

Clients who have initial concerns about their difficulty to conceive need to discuss this with their GP. Some initial tests can be done by their GP and depending on the results and individual circumstances of the couple, they may be referred to a private specialist or publicly funded fertility centre. Ideally, GPs should also recommend that the clients make an appointment to see a Fertility Educator at Natural Fertility NZ to learn and develop a better understanding of their cycle and fertility. Charting of a woman's fertility provides valuable information about cycle length, luteal length, timing of intercourse with fertile mucus and vaginal sensation, ovulation, and the coinciding of ovulation with mucus changes from fertile to infertile.

A study carried out at an Auckland Fertility Centre in NZ showed that of the 80 subjects who were surveyed for knowledge of their fertility, recognition of fertile symptoms, understanding of what the symptoms meat and how this information was used to enhance chances of conception:

- 46% of the women surveyed had NO UNDERSTANDING of their fertility
- Only 26% of women had ADEQUATE understanding
- Only 15% consciously timed intercourse when their chances of conceiving were optimum

Private treatment is available in the North and South Islands. The client pays for their treatment and there is no waiting list.

To receive publicly funded treatment for infertility, clients need to be assessed by the Fertility Centre or Clinic in their area using the CPAC scoring system

Clinical Priority Assessment Criteria (CPAC) Scoring system – a score of 65 is required for publicly funded treatment. Access score is calculated using the information provided by the client i.e.

- Length of infertility – most couples with unexplained infertility will need to have five years of sub-fertility to achieve the CPAC threshold.
- Maternal age <40
- Body Mass Index (BMI) is a calculation between the woman's height and weight. Funders set the range between 18 and 32. BMI>32 is now an exclusion. The aim is to achieve a BMI in the range of 28-32.
- If a woman has a BMI>32 she is given a target weight to reach and is advised to contact the clinic again once this weight is achieved.
- Smoking or non-smoking.
- Number of children in current and previous relationships (both partners).
- Ovarian reserve – established from a blood test on day 3 of a woman's cycle.
- Chance of pregnancy without treatment (calculated by a doctor at the Fertility Clinic).
- Previous sterilisation.

Demand exceeds resources therefore the criteria objective is to balance access to treatment for couples that most need it versus those who will benefit the most.

Those who are eligible for publicly funded treatment receive two fully funded IVF/ ICSI cycles or an IVF/ICSI cycle can be swapped for 4 IUIs. A single embryo transfer is now used instead of a double transfer. Research showed no evidence that transferring two embryos increased the chances of a live birth and there have been growing concerns about the risks of twin pregnancies.

7.7 Treatment Options for Unexplained Infertility While Waiting for Publicly Funded Treatment

Most couples with unexplained infertility do not meet the criteria for publicly funded IVF treatment until 5 years have passed. The generally accepted recommendation is to continue trying for 3 years as spontaneous pregnancy is still likely. After 3 years the following options are available

- **Clomiphene** to enhance ovulation (50% conceive within first 3 cycles).
- **IUI** - 5-15% chance with each cycle.
- **Lipiodol Flushing** 30% conceive within 6 months. This treatment is currently only available in the North Island. There are three providers in Auckland which includes Dr Neil Johnson and a provider in Tauranga.

Flushing with Lipiodol (an oil-soluble contrast medium) by hysterosonography can be effective for unexplained infertility. It was used 20 years ago in NZ along with many other countries as a diagnostic test of a woman's fallopian tubes but was superseded by water soluble media which produced images that were easier to read. Over the last few years various reports had suggested that the pregnancy rate after lipiodol flushing was increased for some couples.

Dr Neil Johnson, a senior lecturer at the University of Auckland, an obstetrician/gynaecologist at National Women's Hospital in Auckland, an REI sub-specialist with Fertility Plus and gynaecologist at the University Specialists headed a trial to test this hypothesis. The trial involved collaboration between Auckland University and Fertility Plus. The trial commenced in 2000 and the results were published in 2004. The results confirmed the effectiveness of flushing with lipiodol in improving the chance of pregnancy and live birth. The specific groups who appear to benefit most from lipiodol flushing are couples with unexplained infertility, but particularly couples where the woman has endometriosis in the context of normal patent fallopian tubes. As a simple, low-cost, minimally invasive intervention that carries a low risk of complications and no increased risk of multiple pregnancies, lipiodol flushing may prove an appealing alternative to established fertility treatments for many couples.

There are two main theories as to why flushing with lipiodol increases the pregnancy rate. Dr Neil Johnson was interviewed by Deborah Bush QSM (CEO of NZ Endometriosis Foundation and on the International Advisory Board for Endometriosiszone.org) at the Ninth National Women's Minimal Access Surgery Course, which was held in conjunction with the Australian Gynaecologic Endoscopy Society in Auckland, 2005. Dr Johnson stated that flushing with lipiodol may have "an effect on the intra-peritoneal environment, and there is some evidence to back this up, that it perhaps does something to enhance the immunology of the pelvic cavity, which perhaps makes the whole environment more conducive to pregnancy, either by a positive effect on the quality of eggs, which are produced, or the interaction between sperm and eggs. Dr Johnson stated that "the other theory, and one that we are now moving toward, and I must say that this is still a hypothesis although we have got some growing data to support it, is that it might simply be an endometrial effect; so, in other words, an effect on the inner cavity of the uterus that possibly improves the chance of an embryo implanting. We need to work that out still further" (www.endometriosiszone.org).

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- www.fertilityassociates.co.nz
- www.akhealth.co.nz/nwhealthinfo/GynaecologyServices/fertility_plus.htm

8 REFERRALS

8.1 Objectives

The student will be able to:

1.	State the current protocol for referral to a doctor if a woman is over 35 years old and trying to conceive.
2.	State the current protocol for referral to a doctor if a woman is under 35 years old and trying to conceive.
3.	Identify local support networks for couples trying to conceive.
4.	Identify other practitioners that can support your clients.

8.2 When do we refer clients back to their GP?

This is all dependent on the client's circumstances and history. A minimum of three charts is required to develop a history, although six is better. Within a year of a couple trying to conceive 80% of those couples become pregnant. Within two years, the percentage rises to 94%. For some clients it is a matter of time so rushing into invasive tests and investigations may be unnecessary and put undue stress on a couple.

Current recommendations state that if a woman is under 35, she should try to conceive for a year, and then if unsuccessful consult with her GP about instigating some investigations. Personal and health circumstances may shorten this time interval such as the client who has recently had endometriosis surgery or someone who wants to use a donor for insemination.

If a woman is over 35 years the advice is to try for six months, and then if unsuccessful, seek medical advice. Educators can provide their clients with a summary of their charts which they can take to their GP.

Be aware of local fertility clinics and services in your area. It may be appropriate to give your clients information on the local support networks available for couples who are trying to conceive such as Fertility NZ (Formerly NZ Infertility Society). Fertility NZ offers information, support and advocacy for those having difficulty in conceiving. www.fertilitynz.org.nz or phone 0800 333 306.

If your client is not yet eligible for publicly funded treatment, or does not want to wait on the waiting list for treatment, then provide them with information about the local fertility clinic, or refer to another health practitioner.

8.3 Referring to other Practitioners or Health Professionals

If your client has a condition that is having an effect on their fertility, and they are already under the care of their GP, you may like to refer them to another practitioner or health professional.

It is good practice to have a list of trusted practitioners in various modalities that you can refer to when needed - as well as an understanding of what these practitioners can provide.

Some examples of other health professionals & modalities that can assist clients who are trying to conceive:

- Fertility Specialist at a private fertility clinic
- Chinese Herbal Medicine
- Acupuncture
- Osteopathy
- Reflexology
- Naturopathy
- Massage Therapy
- Personal Training
- Nutritionist
- Homeopathy
- Herbal Medicine
- Counselling, Hypnotherapy